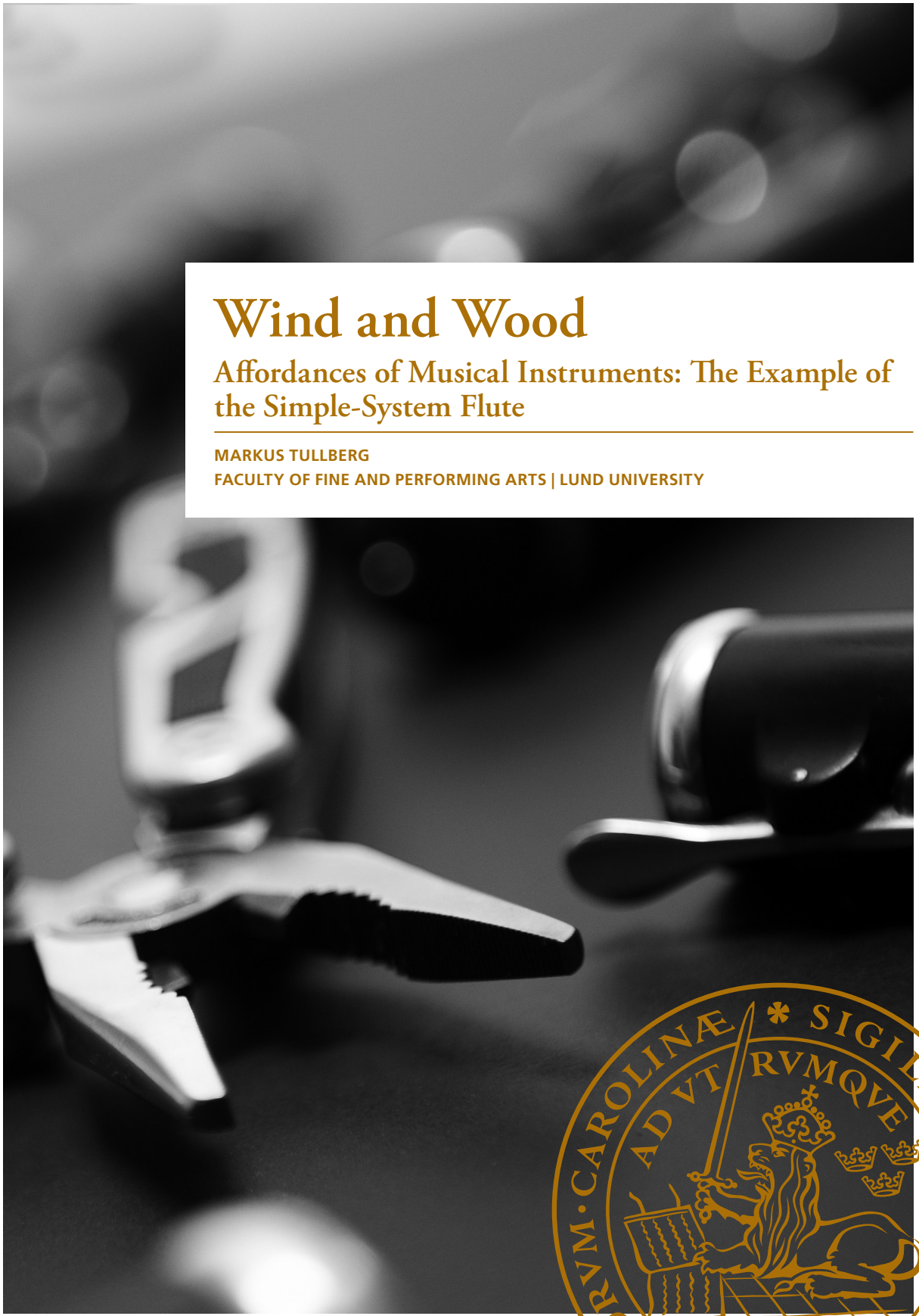
Wind and Wood

Affordances of Musical Instruments: The Example of the Simple-System Flute

Tullberg, Markus

2021



Wind and Wood

Affordances of Musical Instruments: The Example of the Simple-System Flute

MARKUS TULLBERG
FACULTY OF FINE AND PERFORMING ARTS | LUND UNIVERSITY

Wind and Wood

Wind and Wood

Affordances of Musical Instruments: The Example of the Simple-System Flute

Markus Tullberg

LUND
UNIVERSITY

DOCTORAL DISSERTATION

by due permission of the Faculty of Fine and Performing Arts,
Lund University, Sweden.
To be defended at Malmö Academy of Music, March 19, 2021 at 10:00.

Faculty opponent
Dan Lundberg

Organization	Document name
LUND UNIVERSITY, Faculty of Fine and Performing Arts, Malmö Academy of Music, Department of research in Music Education, Box 8203, SE-200 41 Malmö,Sweden	Doctoral dissertation
	Date of issue: March 19, 2021
Author: Markus Tullberg	Sponsoring organization

Title and subtitle Affordances of Musical Instruments: The Example of the Simple-System Flute

Abstract

The aim of this doctoral dissertation is to explore and describe the relationship and interaction between musicians and their instruments. In order to achieve a high level of detail, a certain instrument is in focus: the simple-system flute. Although primarily developed as a product of 19th-century Western art music, this instrument has since become established in other genres and traditions.

Empirical data is generated through two qualitative studies. Study A consists of interviews with six flute players, including one flute maker. Together they represent a variety of European music traditions, and hence, the simple-system flute is perceived and used in different ways. In the cooperative inquiry of Study B, six flute players came together to investigate their own musical practice and approach towards their instruments.

The central analytical concept is *affordances*, as coined by ecological psychologist James J. Gibson. The concept of affordances is combined with ideas from the emerging research paradigm of 4E cognition, in particular ideas from the extended and enactive dimensions.

Through the analysis, affordances of musical instruments are defined as: *perceived opportunities for actions arising from the sensorimotor relationship of the interaction with the instrument, as these unfold in the flow of musical practice.*

The analysis also shows that the cross-modal perceptual experience of the instrument varies between musicians. Viewed through the lens of affordances, this variation entails qualitatively different ways of playing.

The perspective on musical learning that emerges through the analysis is discussed in terms of self-organization in which the development of the relationship between musician and instrument allows for an increasing capacity to perceive and act upon affordances of the instrument.

This perspective on musical learning implies an understanding of music education as a form of eduction, where the learner is given appropriate space for self-organization and the educator assumes to role of sense-maker of the learning process, and facilitator and moderator of new musical experiences. The dynamic relationship between the individual learner and the educational environment is articulated as an ecological responsibility.

Key words: music education, musical affordances, musical instruments, ecological psychology, 4E cognition, cooperative inquiry

Classification system and/or index terms (if any)

Supplementary bibliographical information		Language: Eng
ISSN and key title 1404-6539 Studies in Music and Music Education		**ISBN** 978-91-88409-26-3
Recipient's notes	Number of pages 273	Price
	Security classification	

Signature  Date 2021-02-05

Wind and Wood

Affordances of Musical Instruments: The Example of the Simple-System Flute

Markus Tullberg

LUND
UNIVERSITY

Faculty of Fine and Performing Arts
Malmö Academy of Music
ISBN 978-91-88409-26-3
ISSN 1404-6539
Printed in Sweden by Media-Tryck, Lund University
Lund 2021

To Maria, Miranda and Nora

Table of Contents

Abstract

The aim of this doctoral dissertation is to explore and describe the relationship and interaction between musicians and their instruments. In order to achieve a high level of detail, a certain instrument is in focus: the simple-system flute. Although primarily developed as a product of 19th-century Western art music, this instrument has since become established in other genres and traditions.

Empirical data is generated through two qualitative studies. Study A consists of interviews with six flute players, including one flute maker. Together they represent a variety of European music traditions, and hence, the simple-system flute is perceived and used in different ways. In the cooperative inquiry of Study B, six flute players came together to investigate their own musical practice and approach towards their instruments.

The central analytical concept is *affordances*, as coined by ecological psychologist James J. Gibson. The concept of affordances is combined with ideas from the emerging research paradigm of 4E cognition, in particular ideas from the extended and enactive dimensions.

Through the analysis, affordances of musical instruments are defined as: *perceived opportunities for actions arising from the sensorimotor relationship of the interaction with the instrument, as these unfold in the flow of musical practice.*

The analysis also shows that the cross-modal perceptual experience of the instrument varies between musicians. Viewed through the lens of affordances, this variation entails qualitatively different ways of playing.

The perspective on musical learning that emerges through the analysis is discussed in terms of self-organization in which the development of the relationship between musician and instrument allows for an increasing capacity to perceive and act upon affordances of the instrument.

This perspective on musical learning implies an understanding of music education as a form of eduction, where the learner is given appropriate space for self-organization and the educator assumes to role of sense-maker of the learning process, and facilitator and moderator of new musical experiences. The dynamic relationship between the individual learner and the educational environment is articulated as an ecological responsibility.

Keywords: music education, musical affordances, musical instruments, ecological psychology, 4E cognition, cooperative inquiry

Preface

I finalise this thesis in strange times. A pandemic is sweeping across the planet and the joy of playing music together in good company seems distant. Working with this thesis has provided me the opportunity to relive the many musical meetings that constitute the empirical material. And I have been truly lucky. For not even a single day during the last five years have I thought of the PhD process as anything other than inspiring and joyful. It may seem strange (writing a doctoral dissertation is a substantial undertaking) but this has very little to do with my own disposition towards academic work. It is all rather due to the privilege of being surrounded with exceptional people. I would like to take the chance to direct my sincere gratitude to:

- My supervisors Eva Sæther and Göran Folkestad. The feeling of excitement that has characterized my time as a PhD student is essentially due to them. Both of them – in their own personal ways – have always delivered criticism, reflections, and commentaries that not only contributes with necessary feedback and guidance, but also leaves me with renewed inspiration. Two brilliant minds and pedagogues.

- The senior music scholars that have reviewed and discussed my work. They all contributed with substantial input: Håkan Lundström, Tellef Kvfte, Per Anders Nilsson, Erkki Houvinen, and Gary McPherson.

- Past and present PhD colleagues at the Malmö Academy of Music for inspiration, and interesting discussions: Adriana Di Lorenzo Tillborg, David Johnson, Camilla Jonasson, Halla Steinunn Stéfansdóttir, Lina van Dooren, Ida Knutsson, Johanna Antonsson, Sverker Zadig, Karl Asp, Lia Lonnert, and Pia Bygdeus.

- The PhD students in Gothenburg for interesting seminars and inspiring discussions: Niklas Rudbäck, Cecilia Jeppsson, Ingrid Hedin Wahlberg, Lena Ostendorf, and Christer Larsson. Thanks also to Carl Holmberg, Piteå, for reading and commenting on my 75% manuscript.

- Karin Johansson, Anna Houmann, Sven Bjerstedt, Anders Ljungar-Chapelon, and Ylva Hofvander Trulsson for stimulating conversations, both during seminars and in the corridors of the Music Academy.

- Åse Lugnér, chief librarian at the Malmö Academy of Music, for tracking down some of the sources that proved to be tricky to locate.

- Ann-Charlotte Carlén, previous Rector at Malmö Academy of Music, for a responsive leadership during my PhD years.
- Thomas O'Neill who helped to polish my English: simple-system flute player, ethnomusicologist and language editor in one package!
- Stefan Östersjö, now at Luleå University of Technology, for taking the time to discuss my project in detail.
- Ingar Brinck, professor in Theoretical Philosophy at Lund University, has been very generous with her time and expertise in discussing critical aspects of the theoretical framework. Furthermore, she included me in the ComCogLab group at Lund University, through which I have had the privilege to learn more about the interesting research within cognitive sciences, and also to present my project to the members of the group.
- Humanities Lab at Lund University, where Study B was conducted. I am both grateful for, and impressed by their service, professionalism, and knowledge. Study B turned out much more valuable than it otherwise would have been thanks to this excellent resource for a music researcher. A special thanks to research engineer Peter Roslund for technical assistance.
- My flute students: throughout the years, they have been essential partners in the never-ending exploration of the simple-system flute.
- My mother, Elisabeth Tullberg and my late father Johan Tullberg. I am grateful that they gave me the chance to discover music as a child and then supported my choice to follow this interest.
- My brother, Andreas Tullberg for inspiring me to pursue an academic path and for reading and commenting on one of the final drafts of the thesis.
- My partner in both life and music, Maria Bojlund, for love and support.
- My two daughters, Miranda and Nora, for being just as they are. Their first years in this world are deeply entangled with the writing of their dad's "flute book".
- Finally, I want to direct my thankfulness to the musicians that contributed to the present thesis as interviewees (Study A) and co-researchers (Study B). They have generously shared their wisdom about flutes and flute playing and I have done my very best to pass on this knowledge.

Lund, February 3, 2021

Chapter 1

Introduction

This is a thesis about the relationship between musicians and their instruments. It is a story about fingers, materials, and sounds; tradition, progression, and aesthetics; performances, rehearsals, and practice sessions. In short, this thesis aims to convey an insight into this fascinating and complex relationship. While focusing on the direct interaction between musician and instrument, this relationship is situated in – and inseparable from – cultural and historical contexts and grounded in the everyday activities of the musicians. Being a thesis written from the perspective of Music Education, it implicitly and explicitly focuses on how this relationship can be developed, deepened and enriched.

Many things have been said about this, almost iconic, relationship. One recurring idea is that of the musical instrument being an extension of the musician's body. It is a beautiful idea. In some cases, it is a description that is apt. But it is also a statement with romantic underpinnings, leading to a simplistic view of what it is to learn to play an instrument. Anyone who has strived to develop as a musician or taught students struggling to master their craft knows that, if this metaphor ever is relevant, such a relationship is a description of a state that is not easily achieved. No doubt, a musician is bound together with his or her instrument, but it is not a unity *tout court*. It is a relationship that needs qualification and exploration.

An insight that has come to me during my years as an instrumental teacher is that the ways students interact with their instrument is widely varied. For some the instrument is almost transparent, and for others it is a tool for thinking. For some, knowledge of music theory remains an abstraction, while concepts such as chords and tonality are mapped on to the instrument for others. The sound-producing actions taken seem to be constituted by diverse perceptual and cognitive processes. Working within music education, this naturally leads to questions on how this can be approached in teaching and learning.

Another insight that has bearing on the character of this thesis emerges from being involved in the revitalization of the simple-system flute in Swedish traditional music. Naturally, the instrument itself has a central place in this process, and discussions on the instrument's properties, appearance, and materials can be both lengthy and

opinionated. However, these kind of statements about the instrument have deeper resonance. This resonance tells of something more than a material reality, it conveys ideas about aesthetics, music history, influence of tradition, and contemporary performance practice. Even if these discussions may be accentuated when taking place inside a revitalization process, I have the same experience from discussions with musicians playing other instruments and in other genres. At its core, the phenomenon is the same: profound yet evasive aspects of music are grounded in the materiality of the instrument. These experiences have contributed to the idea of using the instrument as an entrance into the above-mentioned relationship.

From this follows that the instrument itself forms a point of departure for the study. A musical instrument is not merely a physical tool, but an object loaded with meaning, which both lies in the eye of the beholder and is inscribed in the identity of the instrument through its history and current usage. In order to address a such evasive themes and to reach a detailed level of description, I use a particular instrument as a case: the simple-system flute.

The simple-system flute is a type of flute that was developed around 200 years ago, during a period of intense development, sometimes referred to the era of "flute mania" (Powell, 2002, p. 144) or the "Golden Age of the Flute" (Bloom, 1985, p. 18). While it has originated in the context of Western art music, the instrument has found its way into various musics: traditional Irish music, Swedish traditional music, tango, Cuban music, Breton traditional music. Within Western art music, its position has shifted from being the main type of flute used by soloists and orchestral musicians, to a niche instrument in the context of Historical Informed Performance. Thus, the simple-system flute is both an historical and a contemporary instrument: it is treated both as a pristine artefact and as springboard for further development by highly accomplished makers, supplying simple-system flutes to a growing market of musicians within several genres and traditions. The identity of the instrument shifts depending on the context, and so does the ways it is approached by flute players.

The empirical material of the present thesis is generated through two studies. Five professional flute players and one flute maker, who work in different musical contexts contribute to the first study (Study A). The second study (Study B) is a cooperative inquiry which I undertook together with five other simple-system flute players. By using the same kind of instrument throughout both studies, the simple-system flute becomes the pervasive point of observation.

In order to inquiry into this complex and dynamic relationship, the researcher needs resilient and powerful analytical concepts. One such concept, and the one that forms the theoretical centrepiece of the present thesis is the concept of *affordances*, coined and developed by ecological psychologist James J. Gibson (1979/1986). Observing the world through the concept of affordances dissolves the dichotomy between the subject

and object. Instead, the reciprocal relationship between the two becomes the space for exploration and description. Following Gibson's ideas into more recent developments leads to the theoretical paradigm of 4E cognition, where cognition is understood as being embedded, embodied, extended, and enactive.

The themes explored, and the results put forth lead to a number of implications regarding musical learning and education. Learning to play an instrument becomes an endeavour of cultivating one's relationship to the chosen instrument. The present thesis offers an examination of the complexity and dynamics of this life-long process.

1.1 Aim and research questions

The aim of this thesis is to explore and understand the role of the musical instrument in musical practice[1] and learning. Specifically, I investigate approaches towards the simple-system flute in musical practices across European-based genres and musical traditions. As such, the simple-system flute is the locus point of the thesis and forms the case. The two studies conducted focus on the relationship between the flutist and the flute. In doing this, I apply the theoretical concept of affordances to the relationship between the musician and the musical instrument through the empirical studies. In order to achieve this aim, the following research questions will be addressed:

Study A: How do flutists talk about their approaches to, and the possibilities of, the simple-system flute?

Study B: What roles do the simple-system flute play in the musical practice of flutists?

On the basis of the results of Studies A and B, the aim is also to discuss (i) how these roles, approaches, and possibilities can be understood in terms of affordances, and (ii) what kind of perspective on learning and musical development that emerges from the answers to the above research questions.

[1] By *musical practice*, I refer to the actual playing of an instrument. It is thus a definition that excludes many of the other activities that may be involved in the life of a musician or music student, in contrast to Small's (1998) definition of *musicking*.

1.2 Plan of the thesis

The plan of the thesis is as follows: Chapter 2 introduces the simple-system flute and aspects of its development. Also, previous research relevant to the thesis is introduced through an overview of approaches taken in musical instrument research, as well as of research specifically focusing on the simple-system flute.

Chapter 3 outlines the theoretical framework used in the thesis. It gives a summary of Gibson's original ideas as well as a review of work applying the concept of affordances to the area of music research. Additionally, an overview of the emerging paradigm of 4E cognition is presented with an emphasis on the extended and enactive dimensions.

Chapter 4 explores the methodological considerations taken and the design of the study. It also introduces the participating musicians and their instruments, which are referred to throughout the subsequent chapters.

Chapter 5 is a descriptive presentation of the results from the qualitative interviews of Study A.

Chapters 6 presents the results from the cooperative inquiry of Study B.

In Chapter 7, I discuss the results from the two studies through the lens of the theoretical framework and the relevant previous research, including some thoughts on the pedagogical implications of the study.

Chapter 8 presents some possibilities for further research that have emerged as particularly promising through the work with the present thesis.

Chapter 2

Perspectives on musical instruments: Background and previous research

The first part of this chapter provides an overview of the historical circumstances that surrounds the emergence of the simple-system flute as well as an insight into the more recent developments that lead up to the production and the market of simple-system flutes today. Particular focus is given to aspects of instrument design. The second part of the chapter highlights previous research of relevance to the present study. After a review of projects in this area, I present research focusing on the simple-system flute specifically.

2.1 Contextualising the simple-system flute

In Europe today, "the flute" generally refers to Boehm's cylinder flute. This instrument was invented 1847, and although it has become the standard flute in most orchestras dedicated to Western art music, other kinds of transverse flutes are still being used. The simple-system flute is both a predecessor to Boehm's invention of 1847, and a modern-day instrument. The present study is focused on contemporary musical practice, but first I will position the simple-system flute in a historical context. Depending on the perspective of the writer, these flutes can go under several different names such as conical pre-Boehm flutes, old system flutes, keyed flutes, the romantic flute, the wooden flute or the Irish flute. A more technically accurate description of these instruments would be multiple keyed conical transverse flutes, as this would sum up central features: the keys, the conical bore, and of course the fact that it is a transverse flute. However, for the sake of brevity, I will use the commonly accepted term simple-system flute.

There are slight variations in how different authors define the simple-system flute. In his book on the early flute, Solum (1992/2002) defines simple-system flutes as "wooden flutes or ivory flutes of four to eight keys or more" (p. viii), while Brown

(2002) defines these flutes as having "between three and twelve or more separately mounted keys" (p. 20). Bloom (1985) refers to a "fully developed simple-system flute" where keys are present to secure the "chromatic ideal of one pitch/one hole" (p. 19). That would refer to a six-key flute (or an eight key, if the register extends down two extra semitones[2]). All of these definitions work for the flutes that are discussed in the present study. I do however favour Bloom's definition since it addresses an essential characteristic of this flute model: that it was designed to avoid the necessity for cross fingerings[3] in order to play a chromatic scale. To understand this confusion of names and definitions, and to get an idea of the origin of this instrument, it is necessary take a look at the technical development of the instrument and the musical contexts in which it took shape.

The development of the flute is well documented through a number of central surveys (Bate, 1969; Powell, 2002). Also, more practical guides provide insight to the technical details of the various flute models (Brown, 2002; Solum, 1992/2002). Furthermore, research projects aiming to forward the musical practice of the instrument also contain relevant historical information (e.g. Shaw, 2013). While I do not wish to convey a simplistic version of the fascinating history of flute development, it is far too complex to describe in full here, and the number of flute models that have fallen more or less in obscurity are too numerous to be included. Therefore, the following historical overview will focus on developmental aspects of the simple-system flute.

As mentioned above, the term simple-system flute is to be regarded as a technical term incorporating a hugely diverse array of keyed flutes. In his guide to the early flute, Solum (1992/2002) states that "the latter flute [the romantic flute] certainly requires a separate volume, so varied are its manifestations as an instrument, so numerous are the treatises which deal with it" (p. vii). The varied manifestations mentioned by Solum are partly due to this type of flute being a development of the earlier one-keyed flutes. That is, unlike Boehm's cylinder flute, there is no inventor and no patent of the fundamental principle of the simple-system flute. However, variations of these flutes go beyond the number of keys, as they are the result of "widely fluctuating tastes, both chronological and geographical [from which follows a] broad range of timbral choices" (Bloom, 1985, p. 18). Some of the complexity and diversity surrounding the development of the simple-system flute is captured in Bigio's (2006/2011) book, Readings in the History of the Flute. In this book, the reader is presented to various texts, such as essays and articles written primarily in London during the 19th century.

---

[2] In such case, the lowest note is C^1, which refers to the "middle C" on a piano (sometimes referred to as C^4). C^1-B^1 forms the first octave of the simple-system flute.

[3] Throughout the thesis, *fingering* refers to the finger combination used in order to produce a certain note/tone.

The flutes that preceded the simple-system flutes are significant in understanding its basic design. The one-keyed conical flutes emerged around 1670 (Solum, 1992/2002). Its predecessor, the Renaissance flute was cylindrical with six tone holes and one embouchure hole. The drastic new design of a conical bore and the E^{b} key allowed for a fully chromatic instrument. Covering all six tone holes and lifting one finger at a time, thus shortening the length of tube in resonance, produces the diatonic scale of D major. The notes of C, B^{b}, $G^{\#}$, F were produced by cross fingerings (also referred to as fork fingerings); the diatonic notes of D major were lowered a semitone by leaving the next finger hole open and then covering one or more holes below except for E^{b}, which was produced by operating the key with the right-hand little finger. The cross-fingered notes produce a different timbre, which in turn give each key a very different character. In sharp keys, the tonic and dominant notes were produced without cross fingering, providing an open and brilliant sound. The flat keys, on the other hand had an overall more veiled character (Brown, 2002; Ljungar-Chapelon, 2008; Shaw, 2013). This inequality between the tonalities heightened the effect of harmonic modulations.

The classical flute emerged gradually from the baroque flute during the second half of the 18th century, and the distinction between them is a modern construction. The development of the design followed from stylistic changes of the character of the music, allowing for a higher tessitura. As a consequence of the prioritised second and third octave, the volume of the lower register was limited (Solum, 1992/2002). During the classical era, flute makers in England started to add more keys (Brown, 2002). The B^{b}, $G^{\#}$ and F keys were first added during the 1750s (Powell, 2002). These keys enabled the flutist to produce these three notes without the use of cross fingerings, thus avoiding the timbral differences mentioned above. The addition of these keys resulted in a four-keyed flute, sometimes referred to as the standard classical flute (Solum, 1992/2002). Six-keyed flutes of this era also had keys for $C^{\#1}$ and C^{1}, extending the lower range of the flute from D^{1} to C^{1} (Solum, 1992/2002, Powell, 2002). Although flutes with multiple keys became increasingly popular, one-keyed flutes remained in production during the first half of the 19th century (Solum, 1992/2002). Two more keys were also added; the long F key and the key for C^{2}. F natural was already possible to produce through the use of the short F key. The short F key is however operated by the ring finger of the right hand, which is also used to play the note D. The long F key is operated by the little finger of the left hand, thus enabling a smoother transition between D and F in the first two octaves (Solum, 1992/2002). The key for C^{2} was added for the same reason as the B^{b}, $G^{\#}$ and the short F key – to avoid the need for cross fingerings in order to enable a more equal sound over all notes. It is important to note that, initially, these keys provided only an alternative way of producing already existing notes. The cross-fingered notes remained as a possibility, or even more viable alternative (Bloom, 1985; Brown, 2002).

Although the keys provided a possibility for a more homogenous sound by avoiding cross fingerings, another cause for inequality remained: the open finger holes. Boring a hole further up the instrument raises the pitch, while boring a hole further down, lowers it. This can be further attenuated by making the size of the hole smaller or wider. Since the holes are covered by the fingers, they must be placed within comfortable reach. From this follows that the hole sizes must be altered according to where they are positioned. The result is a series of finger holes that are uneven in size and hence the responding notes have uneven timbre[4].

Eventually, however, the process of integrating the keys as an inherent feature of the instrument design by altering the size and position of finger holes made the cross-fingered alternatives less useful and relevant (Brown, 2002). This gravitation towards large holes can be understood as a "trade-off between the ease of execution of the small hole flute with eight keys, and the enormity of (and beyond that, the 'reedy' quality of) the sound produced by the large hole flute" (Bloom, 1985, p. 20). The considerable impact that the hole sizes have on the playing characteristics contributed to manufacturers advertising flutes with both large and small holes (Waters, 2011). During the last decades of the 18th century, there were two different approaches towards the sound of the flute. An old style, producing a soft and delicate sound was contrasted with an emerging powerful sound. The differences between these two approaches became especially obvious in the low register of the flute (Powell, 2002). Related to this, was the existence of the travelling virtuosos[5], which made both musicians and audiences aware of the variety of playing styles associated with different regions and nations (Powell, 2002). The gravitation towards an increased sound volume was due to changing performance contexts with larger audiences and more virtuosic and dynamic playing styles. Other instruments, such as the violin, were also adapted to produce a larger sound, thus encouraging flute players to both adapt their playing technique and demand more dynamic possibilities of their flutes (Powell, 2002).

The flute making firm Rudall & Rose was formed in London 1822 and held a unique position, both when it came to their dominant position on the flute market in Britain, as well as the impact of their flutes on current makers of simple-system flutes[6]. Rudall & Rose's main competitors in the production of high-quality eight-keyed simple-system flutes in London were Monzani, Clementi & Co. and Thomas Prowse. The

[4] See Greene (2012) for a discussion on ways to address the weak E^1.

[5] Rice (1990) provides an insight to the fascinating life of one such traveling flute player, Friedrich Ludwig Dülon (1769-1826).

[6] The firm was later renamed *Rudall, Rose & Carte*, as Richard Carte became one of the owners of the firm. It was because of Carte's progressive ideas that the firm took up the production of Boehm's flutes (Bigio, 2011).

latter two makers produced models of the simple-system flute in collaboration with the virtuoso Charles Nicholson (1795-1837). These flutes featured a large embouchure hole and large finger holes. Other features of these flutes were the flattened area around the finger holes of the lower middle section of the flute. This design supported aspects of the playing style associated with Nicholson: the powerful sound and the glides[7] between notes (Bigio, 2011; Shaw, 2013). Apart for these technical features of the instrument, Nicholson described his powerful sound as a consequence of an embouchure consisting of pressure and tension (Powell, 2002). Nicholson's tone became a new reference point in the comparison between the competing flutists of the day (Powell, 2002). The Nicholson improved flute further popularised instruments with larger holes (Bate, 1969; Solum, 1992/2002; Shaw, 2013). Robert Sidney Pratten (1824-1868) was another English flute player who introduced "improved" flutes to the market (Bigio, 2011; Powell, 2002). The first of those models had a cylindrical bore and keys to aid the player in covering the large holes. To musicians within Irish traditional music today, however, "Pratten" usually refers to conical flutes with the standard six or eight keys, featuring a wide bore and large finger holes, which are based on flutes made by Boosey & Co. in collaboration with Robert Sidney Pratten (Bigio, 2011).

Waters (2011) points out that, in London, "the symbiotic relationship between maker/distributor and player becomes characteristic of nineteen-century production" (p. 70). Waters exemplifies:

> Ward made flutes for Monzani, Willis for Rudall, Ward for Drouet. Wylde made Ribas's Improved flutes for Pask and probably Scott's Improved flutes too. Prowse made Nicholson's Improved and Richardson's Improved flutes, Goodlad probably made flutes for Dressler, and in France Nonon manufactured flutes for Tulou. Later in the century Hudson made Siccama's Patent Diatonic Flute and contributed to R. S. Pratten's Perfected flute for Boosey. (Waters, 2011, p. 70)

At the Paris conservatory, a prominent institution for flute playing in Western art music, the one-keyed flute was replaced by simple-system flutes with four to ten keys when Devienne retired as the flute teacher in 1803. The simple-system flute was the primary flute at the institution until 1860, but this shifted when Tulou left the position as professor of flute to Dorus, who introduced the Boehm's cylinder flute at the conservatory (Ljungar-Chapelon, 2008). Tulou had been in opposition to new flute

[7] Glides refer to the sliding from one pitch to another though slowly covering or uncovering a finger hole (Shaw, 2013).

designs (i.e. Boehm's ring flute[8]) and argued that the flute should be able to produce "a mellow voice when playing piano, a vibrant and sonorous tone when playing forte" (Tulou cited in Powell, 2002, p. 158), timbral dimensions that he considered to be lost in the new inventions.

While English makers started to make flutes with larger holes the smaller holes remained the standard in France (Bate, 1969; Bloom, 1985; Solum, 1992/2002). In order to maintain the possibility to produce F^1 and F^2 through cross fingering, the finger holes needed to remain relatively small. Because of this, some flute players argued that the $F^{\#}$ was too flat. In order to keep the small holes, while at the same time facilitating a sharper $F^{\#}$, Tulou invented the $F^{\#}$ key. In his *Méthode de flute* he writes:

> I have added a little key whose function is to sharpen the F sharp and give it all the needed accuracy in pitch, especially when the phrase has to be played piano. Its fingering is easy; it's only a question of placing the little finger on that key instead of on the e-flat key. (Tulou, 1835/1995, p. 32, translated by Dockendorff Boland & Cannon)

The divide in taste between French and British flute players, audience and critics is evident in the story of Louis Drouet (1792-1873), a flutist, educated at the Paris Conservatory, who attempted to establish a flute factory in London. Although his flutes were of high quality, they adhered to the French ideal, and the business in London was not successful: "the French ideal being no more appreciated by the British public than was Nicholson's in France" (Bate, 1969, p. 153).

In Germany, the general opinion surrounding Boehm's cylinder flute was that of their being "excessively brilliant and monotonous" (Powell, 2002, p. 159), and many orchestras remained conservative regarding flute models. Interestingly, the perceived drawbacks of Boehm's cylinder flute included its loud tone that, according to German flute players at the time, resembled the sound of a trumpet (Powell, 2002). The demand for mechanical improvements were instead channelled towards the conical flute. The reform-flute, for example, originally designed by Schwendler in 1885, has extra trill keys and an intricate system of axels in order to improve the functionality of the many keys (Bate, 1969).

The sound produced by Nicholson and his flutes also influenced Theobald Boehm in his revolutionary flute designs of 1832 and 1847. As mentioned above, the latter of those models (the cylinder flute) is the main flute used in Western art music today. While its construction has undergone changes throughout the years, the overall design remains the same. This flute was first popular in France and, as mentioned above, became the chosen instrument at the Paris conservatory. Although it slowly gained in

[8] Boehm's ring flute was invented in 1832. It had a conical bore and featured a system of keys similar to the system used on the later cylinder flute (Ljungar-Chapelon, 2008).

popularity, some flute players of the late 19th century rejected Boehm's cylinder flute (Solum, 1992/2002). Both the simple-system flute and Boehm's cylinder flute (as well as other competing finger systems) remained in parallel use well into the 20th century (Powell, 2002; Bate, 1969).

The production of new one-keyed flutes, based on flutes from the Baroque period (although pioneered by Arnold Dolmetsch in late 19th century), is linked to the Early Music Revival and the flute maker Friedrich von Heune (1929-2016) in particular (Solum, 1992/2002). Contemporary production of simple-system flutes begun in the 1970s, as the result of the folk music wave and the success of bands such as the Chieftains (Powell, 2002). Current makers, such as Wilkes, Aebi, and Olwell mainly target the market of Irish traditional musicians, but also an increasing number of players of Breton traditional music. In order to meet the demand for flutes of lower cost, some flutes are produced in Pakistan, and others are produces out of various plastic materials.

2.1.1 The simple-system flute in detail

Simple-system flutes are predominantly made of wood, most commonly African blackwood (grenadilla), cocuswood, and boxwood. There are also historical examples of simple-system flutes made of ivory or glass (Bigio, 2011). The flute is constructed in three to four separate joinable sections, which are commonly referred to as joints (foot joint, head joint etc.). I will refer to the parts of the flute in line with Solum's (1992/2002) terminology: the head piece, the middle piece and the foot piece. Where the middle piece is divided into two segments, they are referred to as the upper middle piece and the lower middle piece. The section in between the head piece and the middle piece(s) containing the tuning slide, is referred to as the barrel. The flute is assembled through joints which are usually fitted with thread or cork.

The simple-system flute has a number of keys. As is obvious from the historical overview above, the number of keys may vary. However, the most common configuration is six (E^{b}, short F, long F, $G^{\#}$, B^{b} and C^{2}) or eight (C^{1}, $C^{\#1}$, E^{b}, short F, long F, $G^{\#}$, B^{b} and C^{2}). Beyond this there may exist double touches[9] for some keys, the most common being B^{b}. Sometimes the two F keys are configured as two touches, activating the same key and (un)covering the same hole, thus avoiding an extra hole in the body of the flute. The keys are either block-mounted or pin-mounted, that is, they are either supported by wooden blocks extending from the body of the flute, or by metal protrusions as typically found on clarinets.

The simple-system flute is a non-transposing instrument (i.e. a C-instrument) often labelled with reference to the note produced when all six finger holes are covered, that

[9] A *touch* refers to the part of the key that is being pushed by the fingers in order to open or close the key.

is, the lowest possible note without the use of keys. A concert pitch simple-system flute is therefore often referred to as D flute. On a few occasions in the present thesis, the interviewed musicians talk about flutes in other keys and are using this concept in their labelling. Therefore, a G flute is tuned a fourth above the concert pitch flute and the E^{b} flute is pitched a semi-tone above.

2.1.2 Fingering system and notation

In the present thesis, fingerings are described through a system of numbers and letters, designating specific fingering configurations. Some fingers may only cover holes or operate keys, while others may do both. On a standard eight-keyed simple-system flute, the possibilities for each finger are as follows:

Left hand:[10]
1a thumb operating (opening) the B^{b} key
2 index finger covering the first finger hole
3 middle finger covering the second finger hole
4 ring finger covering the third finger hole
5a little finger operating (opening) the $G^{\#}/A^{b}$ key
5b little finger operating (opening) the long F key

Right hand:
1 The thumb is used to hold the flute)
2 index finger covering the fourth finger hole
2a index finger operating (opening) the C^{2} key
3 middle finger covering the fifth finger hole
4 ring finger covering the sixth finger hole
4a ring finger operating (opening) the short F key
5a little finger operating (opening) the $E^{b}/D^{\#}$ key
5b little finger operating (closing) the $C^{\#1}$ key
5c little finger operating (closing) the C^{1} key

[10] Some flutes are setup in a reverse manner, on request from left-handed musicians. All interviewed musicians in the present study use regular flutes and left hand is synonym with upper hand, and – accordingly – right hand is synonym with lower hand throughout the text.

In the present study, the interviewed musicians refer to flutes that allows for actions beyond the ones listed above. These are:

Left hand:
1b thumb operating (opening) an additional $G^{\#}/A^{b}$ key

Right hand:
2b index finger operating (opening) an additional B^{b} key
5d little finger operating (closing) a low B key
5e little finger operating (opening) an $F^{\#}$ key

Numbers inside brackets indicate that the finger hole is partially covered. For example, producing F natural using this technique would be written: [234/2(3)]. Notes without indications of octave (i.e. $F^{\#}$ and not $F^{\#2}$) refer to the range of D^{1} to B^{2}. In this register, the fingering is, with a few exceptions, identical for both octaves. Below and above this register, the fingering is different and thus requires a specification of the octave.

2.2 The musical instrument in research

In the following section, I will highlight some areas of the diverse research that is centred on musical instruments. Being one of few tangible aspects of music, musical instruments have long been an area for research. Aho (2016) highlights two fundamentally different approaches taken in music instrument research: one treats musical instruments as sound-producing objects, and the other views musical instruments as transformers of movement, from physical to musical. In this chapter, I also use a third category, in which I review research that explores musical instruments as cultural artefacts and focuses on the social, aesthetic and cultural meanings bound up with, and associated with these objects. The three different approaches taken in research on musical instruments presented here all have their part to play in the endeavour to understand the roles of a musical instrument.

2.2.1 Musical instruments as sounding objects

The study of musical instrument as sounding objects is perhaps best illustrated by von Hornbostel[11] and Sachs' (1914/1961) classification system. This branch of research primarily concerns itself with technical aspects of sound production and divides instruments into categories: (i) idiophones (the resonance of the musical instrument itself is the source of the sound, such as xylophones or castanets), (ii) membranophones (a vibrating membrane is the source of the sound, such as a drum), (iii) chordophones (stringed instruments), and (iv) aerophones (wind instruments). The classification system includes subcategories, which make it possible to classify instruments with great detail and precision. To exemplify how the classification system works, we can follow the simple-system flute through the system of categories and sub-categories: 4: aerophones, 42: wind instruments proper, 421: edge instruments or flutes, 421.1: flutes without duct, 421.12: side-blown flutes, 421.121: single side-blown flutes, 421.121.1: open side-blown flutes, 421.121.12: with finger holes.

Related to a classification system based on the sound production such as von Hornbostel and Sachs' and within the research paradigm looking at musical instruments as sounding objects, is the scientific acoustics research on musical instruments. Although the design and construction of musical instruments through much of history has been an empirical process, acoustics research seeks to understand the workings of musical instruments through a theoretical approach. Besides providing information for instrument design, research can scientifically explain experienced phenomena. One example of such research explores the effect of timpani playing in close proximity to French horn players (Chen et al., 2013). It has been noted by horn players that the timpani, if placed close to each other in an orchestra, interfere with their playing. This is especially significant if the bell of the horn is facing the timpani. The explanation for this is that the horn's resonant capacity to amplify sound issuing from the instrument's mouthpiece, can also receive sound in the other direction works in both directions. The sound of the timpani is transferred in the direction from the bell to the mouth and can be experienced "like being hit in the mouth" (Buckle, 2008, cited in Chen et al., 2013, p. 472).

It is of interest to note that acoustics research on wind instruments to some degree is investigating related topics. Particular acoustic aspects of the air column have been

[11] There is an interesting link between von Hornbostel and Gibson, who coined the concept of affordances, the theoretical centrepiece of the present thesis. In the list of references of Gibsons's book *The senses considered as perceptual systems* (Gibson, 1966), Gibson includes an essay of von Hornbostel, *The unity of the senses* (von Hornbostel, 1938). Although von Hornbostel today is primarily remembered as an ethnomusicologist, he worked within gestalt psychology. This particular paper was translated from German to English by Elizabeth Koffka, wife to Kurt Koffka who was a senior colleague of Gibson at Smith college.

studied, the effect of the air column being bent or straight (Nederveen, 1998; Felix & Dalmont, 2012); the effect of holes perforating the bore (Benade, 1960; Keefe, 1982), and effect of differing construction materials (Backus, 1964; Coltman, 1971). Acoustics research that combine the air column of wind instruments with the body of the musician is able to measure the impact of the vocal tract on the sound produced, and researchers have been exploring clarinets (Benade, 1986; Backus, 1985), and saxophones (Scavone et al., 2008). Research on the simple-system flute, including acoustics research is presented section 2.3.

2.2.2 Musical instruments as transformers of movements

Aho's (2016) notion of the musical instrument as transducer of movements refers to Bielawski's (1979) definition of a musical instrument as "a transformer, transforming bodily gestures in physical time and space into musical gestures in musical time and space" (Kvifte, 2008a, p. 46). This approach to musical instruments includes mapping structures[12] and research on musical gestures. As noted by ethnomusicologist Baily in 1985, music research in the Western countries has traditionally been grounded in assumptions about the nature of music, regarding music as "primarily a sonic phenomenon; study of the motor control of musical performance may be interesting but is ultimately irrelevant to the central issue, which is the perception of musical sounds" (Baily, 1985, p. 238).

New ways of studying musical instruments, beyond von Hornbostel and Sachs' classification system mentioned above, have been fuelled by digital development, which repositions research questions related to the study of musical instruments. An instrument does not necessarily have a physical source of sound production through which it is possible to make a useful definition. Kvifte (2008a) takes this moving ground as a point of departure for a discussion on how to define a musical instrument. As he shows, there cannot be one single way to define what a musical instrument is, while still doing justice to its complex nature. Kvifte highlights a question of certain interest for the present study, namely how to define the divide between the musician's body and the musical instrument. The flute is clearly dependent on the musician's body not only to provide a stream of air, but also the cavity of the mouth and the shape of the lips subtly alter the flute's timbre[13]. In order to visualise the interaction between musician and musical instrument, Kvifte provides the following loop model (Figure 1):

[12] The term mapping commonly refers to the correspondence between control parameters and sound output of a musical instrument.

[13] See for example Ljungar-Chapelon's experiments of this parameter of sound production on the Boehm flute (Ljungar-Chapelon, 1990).

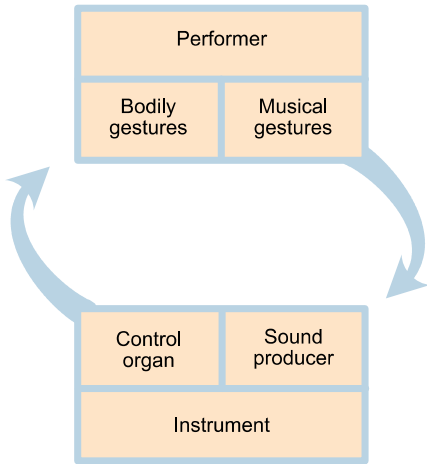


Figure 1
Kvifte's loop model (from Kvifte, 2008a, p. 53).

The interaction between musician and musical instrument can also be described through mapping systems. These systems are based on input (control actions) and output (sound). This is a perspective that has proven to be fruitful, especially in research on digital and electronic instruments (Goto & Suzuki, 2004; Hunt et al., 2003). In his article on complex mapping structures, Kvifte (2008b) makes a relevant remark: "what is aimed at here, however, is not a description from a performer's point of view. Rather, the aim is to contribute to an analytical framework that may be used to describe general properties of instrument control" (p. 355).

There are examples of first-person perspective research on interaction between musician and musical instrument inspired by phenomenology. Such examples include Edlund's (2003) study of the relevance of the physical act of fingering for the performing pianist. An example of how this theme can be studied in performance-based ethnomusicology is found in Aho's (2016) book, *The Tangible in Music*, where he takes his own practice of learning to play the kantele as a way to explore, as he finds it, three tangible aspects in music: the instrument, style and expression. Resonating with the present study is the fundamental idea that: "the musical instrument is […] invented twice, once by its maker, and then again by the person who plays it" (p. 16). That is, the musical instrument in itself is incomplete and presupposes the musician who handles it. This is more drastically put forth in the writings of Dogantan-Dack (2015): "Phenomenologically, the piano does not exist as a musical instrument prior to its emergence in the kinaesthetic-affective consciousness of the pianist, who constructs its

instrumental identity through embodied interactions with it" (p.178). The piano is the centre of her research project in which she explores the tactile aspects of music making. She effectively highlights the physical interaction with the musical instrument as a locus point in performance. Baily's (1985) research, building upon his experience from the stringed instruments, dutār and rubāb, was well ahead of its time, highlighting the relationship between the spatial layout of a musical instrument and the shape of the music associated with it. In similar vein, Sudnow's (1978) phenomenologically grounded monograph, *Ways of the hand*, explores his own path of becoming a jazz piano player. Through carefully crafted descriptions of this process, he provides a rich insight into musical learning through an embodied perspective. As the title implies, the locus point of the descriptions are Sudnow's hands and their progressively intricate ways of moving across the keyboard. Fundamental to the process are the genre of jazz and the emphasise on improvisation as well as the material conditions of the piano, supporting a visually guided approach to playing and learning.

In *Music at Hand*, De Sousa (2017) examines the use of musical instruments across different genres and time periods. He draws upon phenomenology, music theory, ecological psychology, and cognitive science to explain the interactions between musicians and musical instruments. Among De Sousa's valuable contributions to this field of research, his descriptions of spatial networks have been useful in the present thesis. As De Sousa (2017) shows, "[i]nstrumental space […] is not simply a homogeneous geometric field, but the correlate of a lived body, an affordance space, an enactive landscape. Here the player is both constrained and free, since the interface conditions performance without determining it" (p. 82). Another interesting aspect of the book is the account of jazz guitarist Kurt Rosenwinkel's strive for a new approach to his playing. In a process leading up to the album *The Next Step* (2001), Rosenwinkel found himself frustrated with his own playing. He was theoretically and conceptually aware of everything he did and felt that his music had become schematic. In order to approach his instrument anew he retuned the guitar so that he could not rely on familiar motor patterns. He lost his theoretical orientation and freed himself from a conceptual way of playing. By doing this, he experienced that he heard the music more directly.

The body of research presented in this section emphasise the physical interaction between musicians and their instruments. Following from this perspective on the musical instrument, is a growing interest in the gestures of the performing musician. One of the more ambitious research projects in this field is the Musical Gestures project, reported in the book *Musical Gestures – Sound, Movement, and Meaning* (Godøy and Leman, 2010). In this context, gestures are conceptualised as bridging the gap between body and mind, between human movement and music, thus emerging as an interesting object of study and analysis:

> The notion of gesture somehow blurs the distinction between movement and meaning. Movement denotes physical displacement of an object in space, whereas meaning denotes the mental activation of an experience. The notion of gesture somehow covers both aspects and therefore bypasses the Cartesian divide between matter and mind. In that sense, the notion of gesture provides a tool that allows a more straightforward crossing of the traditional boundary between the physical and the mental world. (Jensenius et al., 2010, p. 13)

Drawing upon their own previous research as well as work by other music researchers, Jensenius et al. (2010) outlines four categories (including subcategories) of gestures: (i) sound-producing gestures (excitation or modification), (ii) communicative gestures (performer-performer or performer-perceiver), (iii) sound-facilitating gestures (support, phrasing or entrained), and (iv) sound-accompanying gestures (sound-tracing or mimic). By this typology Jensenius et al. (2010) do not aim to devise a universal classification system, but to provide a ground of reference for further discussion.

I will now give an explanation on how this gestural typology may refer to flute playing. Sound-producing gesture (excitation) is the blowing of air onto the outer edge of the embouchure hole. It is sustained since the airstream must be continuous in order for the sound to carry on (oppose to instruments where the sound-producing gesture is instantaneous such as piano, where the resonance of the instrument (i.e. the vibrating strings) sustains the sound). In flute playing, sound-producing gestures (modifications) encompass a great variety of possible actions: manipulation of the embouchure (broadly speaking: lips, tongue, oral cavity etc), fingerings (grips, ornaments, slides etc), air management (controlling the volume, speed, and pressure of the airstream). Communicative gestures (both towards co-performers and the audience) includes all conscious and subconscious body movements that would not be exhibited if the flutist was playing by themselves. This could be for example nodding, the blinking of an eye, or an exaggerated breathing movement in order to synchronise phrasing. Sound-facilitating gestures are involved in sound production, although not in a direct sense (such as the sound-producing gestures). This category includes the movements of the body and flute that are necessary for the execution of the sound-producing gestures. The character of these gestures can vary a lot between flutists. For example, where one flutist may have a gestural pattern that seems more or less limited to breathing and fingering, another flutist may be (in a more obvious way) integrating the whole body in the music making. Except for these supporting movements, sound-facilitating gestures can be closely tied to phrasing that follows the melodic pattern. The entrained gestures refer to movements that are the result of, and/or the cause of, rhythmic synchronisation with the music. These are often an integrated part of the movement pattern of performers of Swedish traditional music, a central genre of the present thesis.

An obvious example is when continuous foot tapping is used as an aid to keep the tempo.

Sound-accompanying gestures (e.g. dancing) are separated from sound-producing and sound-facilitating gestures. Dancing and playing for dancing are often considered to be central parts of the practice of a musician working within the context of Swedish traditional music. Many musicians do have some experience of the dances connected to the repertoire, and also the experience of playing for dance, a context that can an differ from the performance at regular concerts.

It should be noted that the categories are not discrete: "Musical gestures are characterized by a multi-functional nature through which multiple meanings are generated" (Jensenius et al., 2010, p. 28). For example, the phrasing gesture is usually not just sound-facilitating, but also communicative – as it articulates the musicians understanding of the musical phrase, for the audience or co-performer to perceive.

With a deeper understanding of the nature of musical gestures, this can form the basis for artistic research projects. An example of this is found in Peter Spissky's (2017) PhD project, where he investigates the role of physical movements in interpretation of Baroque violin music. Regarding flute playing, the category of sound-producing gestures, needs to include movements internal to the body of the player. Gomes dos Santos Junior's (2017) dissertation project is an example of how an inquiry to these actions, hidden from sight, can be performed through technological aid. His thesis also includes a review of how these topics (such as breathing, articulation, vibration) have been approached in flute treatises aiming to describe actions that cannot be seen.

2.2.3 Musical instruments as cultural artefacts

Viewing musical instruments as cultural artefacts is an aspect of research beyond the scope of musical gestures, as well as von Hornbostel and Sach's organology and acoustics research as presented above. As such, it was a way to expand the relevance of research on musical instruments from something that mostly happened within the domains of museums and laboratories respectively. Artefacts in this sense should not be understood as a historical and passive. Rather the contrary.

Studying the Zorn auditions[14], taking place within Swedish folk music, Eriksson (2017) states that the musical instruments themselves are "key actors" and that they are "by no means passive artefacts [but] powerful mobilising forces and are celebrated as parts of traditions, connected to particular bodily skills, sounds, repertoires and knowledge sets" (p. 147). That the understanding of a musical instrument is culturally

[14] The Zorn auditions takes place once a year and is the opportunity for folk musicians to perform in front of a jury with the hopes of achieving the title *Riksspelman.*

situated becomes ever so clear when Kvifte (2008a) addresses the, sometimes confused, relationship between name and artefact. One example of this is the instrument names fiddle/violin. While the physical appearance of these instruments is the same, their identities are different. He contrasts this with the Hungarian taragot, which although being transformed from a double reed instrument into a larger single reed instrument, remained to be identified as the same instrument. This connection between a musical instrument and its cultural context has proven to be a fruitful analytical lens for ethnomusicological studies with an interest in the social and cultural connotations of musical instruments. One of the reasons for this is that, for an ethnomusicologist, playing an instrument can be a way to take part in social contexts that otherwise would be hard to access (Bates, 2012). Dawe (2001) points out that there are many layers of meaning to an instrument which are not necessarily connected to its physical manifestation: "as much as they are locked in museum display cases and held in local traditions; they are increasingly polyvalent and polysemic without necessarily being polymorphic and polyphonic" (p. 222). In an article on the mijwiz, an eastern Mediterranean wind instrument, ethnomusicologist Racy (1994) argues for a perspective on musical instruments as "interactive entities" (p. 38). According to Racy, musical instruments are situated in dialectical relationships with their surroundings. Taken together, aspects such as the construction, instrument-specific playing techniques, and symbolic connotations, create an understanding of the musical instrument as "one specific acoustical aesthetic complex" (Racy, 1994, p. 51). Related research includes Qureshi's (1997) exploration of the Indian sarangi and the "web of meanings emanating from the sound" (p. 1). Being an ethnomusicologist and performer of the Sarangi, Qureshi explores the strong relationship between sound, aesthetics and the political connotations surrounding the instrument. Similarly, Ronström's (1989) review of the revival of the bagpipe in Sweden places this particular instrument in the centre of the contemporary political and social climate of Sweden: "In the process of reviving the bagpipe in Sweden parts of a historical and cultural heritage have been transformed and used in contemporary society for many different purposes" (p. 105). In this way he highlights the meanings of the instrument as it stretches beyond the physical object itself. Considering the social aspects of musical instruments, Bates (2012), through his own research on Turkish saz, explains: "there is a difference between musical instruments being incidental to, or constitutive of, social interaction" (p. 373). This, according to Bates (2012) enables an ethnomusicologist to put the musical instrument in the centre of the analysis, what he refers to as "thinking through instrument" (p. 368).

Wettermark (2016) highlights the distinction between the instrument and the sound of the instrument in his research on the Vietnamese shawn, kèn. Wettermark shows that the sound, carrying strong associations of funerals and sorrow, overshadows both

the physical instrument and the musician. The physical object is rather anonymous, in that it lacks the ornamentation otherwise present on Vietnamese musical instruments. Rather "it's meanings […] lie not in the physicality of a handcrafted wooden object, but in their impact on the sensory environment of their audience" (p. 3). The sound is the key to understanding the instrument and its position in the Vietnamese society.

2.3 The simple-system flute in previous research

Although there is a rather extensive body of research focusing on one-keyed transverse flutes, research on the simple-system flute is limited. In this section I will highlight some examples of such existing research that is of interest to the present study.

Ljungar-Chapelon's (2008) dissertation focuses of the French tradition of flute playing within Western art music. The thesis consists of two parts, the first of which is a historical survey covering the period from the 18th century to the present day. This timespan covers the period when the simple-system flute was most frequently used, and the survey includes historical information of value for further research on this type of flute. However, as Ljungar-Chapelon points out, the most interesting periods regarding flute playing in France are 1690-1730 and 1860-1930, hence highlighting parts of the history where one-keyed flutes and Boehm's cylinder flutes were primarily used. The second part of Ljungar-Chapelon (2008) is a set of interviews with flutists Peter Lloyd and Alain Marion. The focus of the thesis is aesthetics, playing technique and teaching methods. Among the results presented, Ljungar-Chapelon shows that one of the central aspects of this pedagogical tradition is the endeavour to make the student become his or her own teacher, and thus enabling a successive development as a musician. Ljungar-Chapelon refers to this as the automeieutic process.

Interestingly, the simple-system flute as used in Irish traditional music occurs in a number of computer-based research projects. One of those projects focuses on the development of the computer software MATT (Machine learning for Articulating Traditional Tunes), which was designed to simulate the creative process of interpretation of Irish traditional tunes. Based on analysis of the playing of two Irish traditional flute players, Catherine McEvoy and Eamon Cotter, MATT generated versions of traditional tunes, incorporating interpretational practices such as ornamentation and melodic variations (Duggan et al., 2006). In his PhD project, Ali-MacLachlan's (2019) developed methods for data analysis of Irish traditional flute playing. More precisely, Ali-MacLachlan investigates how individual playing styles can be conceptualised through a series of detectable stylistic parameters (such as ornaments)

and how the system in reverse can identify individual players by an automatic analysis of recordings.

Bania (2008) offers a thorough review of original sources regarding the use of vibrato and articulation. Since her period of interest includes the 19th century, the thesis covers practices described by, and associated with, flute players using the simple-system flute. Being a flutist specialised in Historically Informed Performance, Bania also experiments with the techniques described. Thus, her interpretation of her sources is directly informed by her experience as a practitioner. Furthermore, Bania combines the written text with a music recording, demonstrating the application of the techniques investigated.

Shaw's (2013) PhD project also consists of two parts: the first is a written text that examines Charles Nicholson's practice, focusing on three areas associated with his playing: tone-colour, vibration and the glide. The research is informed by Shaw's use of an original Nicholson's improved flute, which also is used in the recorded recital forming the second part of the thesis. Shaw's work effectively highlights the interplay between instrument design and aesthetic visions (the aspects of flute playing that Nicholson is famous for are facilitated by the altered design featured on the Nicholson improved flute).

An article by Balosso-Bardin et al. (2017) on Boehm's 1832 flute model is not strictly research on the simple-system flute, as this flute combined the conical bore of the simple-system flute with Boehm's new key system. However, Boehm's intention to improve the flute must be understood against the backdrop of rapid technical and musical development, that the simple-system flute was part of. This transition flute, as the authors of the article refer to it, was never patented and standardised (as Boehm's later cylinder flute). Several different makers and firms manufactured it and the various manifestations are many. Balasso-Bardin et al. measures the geometrical and acoustic properties of four transition flutes and compares the results with measurements from a modern Boehm flute. These measurements are then the starting point for the making of a new transition flute. The process is guided by the interpretation of Boehm's own writings regarding the intention of his invention. Among the interesting results from the study are the measurements regarding intonation. The passive resonance of each note (i.e. the pitch of an artificially produced note) was measured. These results were then used in order to calculate to what extent the musician needed to adjust the intonation (by changing the configuration of the lips to alter the direction, speed, or volume of air). On all flutes, the musician has to control and adjust the blowing technique according to the passive resonance and the desired pitch. The extent and predictability of these adjustments varied between the different flutes. In this regard, the modern Boehm flute was significantly more predictable than the transition flutes.

Lochridge (2004) provides an interesting insight into the material culture of Irish traditional flute playing. As she explains: "this thesis is about the search – individual *and* large-scale collective search – for good instruments which members of the flute community engaged in for generations" (p. 13). Focus is given to the relationship between flute maker Patrick Olwell and the musicians playing his instruments. A circular relationship is manifest in the interviews where "the performance of the maker is very much tied up with the performance of the musician, and vice versa" (p. 103). To Olwell, the sound produced by the musicians he admires is a source for inspiration, leading to improvements in his design, in turn facilitating yet new possibilities for the musicians playing his instruments. She notes that, for flute makers such as Olwell, the existing flutes of the 19th century provided the guidance in their apprenticeship that otherwise would be provided by a master craftsman. The musicians and makers featured in Lochridge's study confirm that the making of simple-system flutes has improved since it reappeared in the 1970s. As one of the pioneering flute makers, Terry McGee has stated that "in seventy-four if you made a flute at all you were a hero, but nowadays if you make a flute it has to be very good otherwise it's a heap of trash" (cited in Lochridge, 2004, p. 113).

2.4 Summary

This chapter has provided an overview of the historical background of the simple-system flute, as well as developments taking place during the last decades which lead up to the production and market of simple-system flutes today. The first part of the chapter ended with some details regarding the construction of the flute, aiming to guide the understanding of the discussions regarding the instrument, descriptions of which constitutes a substantial part of the two result chapters.

The second part of the chapter covered research on musical instruments, broadly categorised into three different approaches, (i) musical instruments as sounding objects, (ii) musical instruments as transformers of movements, and (iii) musical instruments as cultural artefacts. Although the present thesis is mainly centred around the second of the three categories, all three approaches provide essential perspectives in the strive of arriving at a fruitful understanding of the relationship between musicians and their musical instruments.

The last part of the chapter highlighted research directly involving the simple-system flute or with close relevance to this particular instrument.

In the next chapter, I present the theoretical framework, which draws from ecological psychology and 4E cognitive science.

Chapter 3

Affordances of musical instruments: A theoretical framework

In this chapter, I will present the theoretical framework of the present thesis. The aim to explore the relationship between the musician and the musical instrument, calls for a theoretical approach that elevates the musical instrument from being previously seen as an inanimate piece of wood to an object that is involved in a multifaceted and reciprocal relationship with a musician. Gibson's theory of *affordances* presents one way of pursuing such a study and forms the core of the following chapter. The first part of this chapter outlines the theory of affordances, including an overview of research applying the theory to music studies.

The second part outlines the fundamental principles of *4E cognition*. To use a theoretically idiomatic expression: The concept of affordances has become embedded in this new emergent theoretical landscape. Here cognition is understood as (i) embodied, (ii) embedded, (iii) extended, and (iv) enactive.

In the third part, I present how learning can be conceptualised and studied within the theoretical framework outlined here.

The purpose of the present chapter is to provide a theoretical foundation for the study and to portray a selection of, perhaps surprisingly, diverse theoretical understandings. I will then return to the theoretical framework in Chapter 7, to see what theoretical insights might be drawn from the empirical results of the two studies.

3.1 Affordances and music

The concept of affordances was formulated within ecological psychology. Throughout his career, J. J. Gibson worked out a new understanding of perception[15]. Instead of being – as more traditional research on the matter – driven by the *how* question, that is the information processing capacities of the subject, Gibson sought to answer the *what* question, what information is perceived by the subject (Shaw & McIntyre, 1974). *Affordances* – a key concept in this theory of perception – was most fully articulated by Gibson in his last book, *The ecological approach to visual perception* (Gibson, 1979/1986).

Gibson's scholarly undertaking can be understood as a reaction against a predominant view of perception as "a *three-term relation* among a subject, an object, and something internal to the subject that stands in for the object (e.g., a representation)" (Dotov et al., 2012, p. 29, italics in original). One example of such a third part is the image projected on the retina. This optical information needs to be matched against previous acquired knowledge of the subject, which presupposes an internal process of making sense of this information (Dotov et al., 2012). Instead of the three-term relation relying on some form of mental representation, Gibson argued for an understanding of perception as a non-dualistic and *direct relationship* between subject and the surrounding environment. It is within this theoretical paradigm that he introduces the concept of affordances (1979/1986). In its essence, affordances can be described as opportunities for action that are perceived by a subject, situated in a reciprocal relationship with the environment. As Gibson (1979/1986), stated, "the affordances of the environment are what it offers the animal[16], what it provides or furnishes, either for good or ill. […] It implies the complementarity of the animal and the environment." (p. 127).

The idea of affordances is resilient enough to be adapted into different research areas while it keeps its power to explain, otherwise potentially obscure, relationships. But however widespread and useful, the concept of affordances has been debated since it first was introduced. One central and recurring topic of controversy is whether affordances are to be understood as relational or dispositional (Chemero, 2003; Magri, 2019).

[15] Gibson did not develop his ideas in isolation. Throughout the literature, the connections to the philosopher Merleau-Ponty's phenomenology of perception is often highlighted. For a review of the intellectual legacy and scholars that inspired Gibson, I recommend Harry Heft's book *Ecological Psychology in Context* (Heft, 2005).

[16] Gibson includes humans in animals.

The dispositional interpretation of affordances holds that affordances are properties of the environment that may be perceived as opportunities for action if they relate to disposition (for example scale or movement behaviour) of the animal. In a musical example, this understanding of affordances is articulated in formulations such as: "Whether one has the adequate effectivities or chooses to attend to them or not, the instrument does come with a set of carefully designed affordances which guide exploration and constrain action" (Windsor & de Bézenac, 2012, p. 8). In other words, affordances are "out there" in the world, available for discovery by humans and animals.

The relational interpretation on the other hand – to which the present thesis is aligned – views affordances as properties of relations existing between the subject and the environment:

> Affordances cannot be properties, or even features, of the environment alone […] affordances are features of whole situations. Animals are, of course, usually crucial parts of these whole situations, so perceiving something about the whole situation cannot always be just perceiving something about the environment, divorced from the animal. (Chimero, 2003, p. 185)

The environment includes other persons as well as the objects therein. This means that affordances exist both in relation to the environment and in relation to objects. While the use of an object generally cannot be isolated from the context in which the action takes place, it is worth to notice that the present thesis primarily focuses on affordances of objects, and furthermore, affordances of a certain kind of object – musical instruments.

I would like to recall the question Kvifte (2008a) raised, namely how to draw a distinction between the musician and the musical instrument (see 1.4.2). Another way to pose the question, and I think a more interesting way is to ask is in what ways are the musician and the musical instrument merged together. Affordances provide a way to dissolve this dichotomy of subject and object. Regarding the use of tools, Gibson (1979/1986) writes:

> When in use, a tool is a sort of extension of the hand, almost an attachment to it or a part of the user's own body, and thus is no longer a part of the environment of the user. But when not in use, the tool is simply a detached object of the environment, graspable and portable, to be sure, but nevertheless external to the observer. […] More generally it suggests that the absolute duality of "objective" and "subjective" is false. When we consider the affordances of things, we escape this philosophical dichotomy. (p. 35)

That is, something happens when a tool is in the hands of the user. Similarly, the nature of a musical instrument shifts when it is in the hands of the musician: the two become

bound together through the relationships and the properties of these relationships in terms of affordances.

A musical example can serve to illustrate the point that affordances are not properties of the object alone but exist in the relationship between the object and the subject: a guitar may afford the beginner an opportunity to strum few chords, while it may afford a trained guitarist an opportunity to perform a Villa-Lobos piece.

The subject's perception is not passive; on the contrary, perception is oriented towards action and the exploration of the surrounding environment. As Gibson (1979/1986) showed, when a subject moves around in the environment, the changing position is perceived through the optical flow. This optical flow continuously informs the subject of its position, guiding forward the movement. Action and perception are happening simultaneously and follows from each other. And naturally, in a study on musical practice, senses other than the visual need to be taken into consideration.

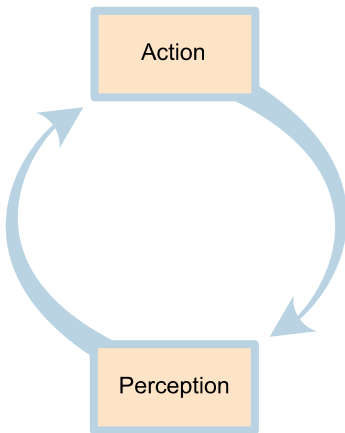


Figure 2
The reciprocal and continuous relationship between action and perception, described by Gibson (1979/1986), and in the present thesis referred to as the perception-action loop.

The inherent perceptual directness of affordances means, according to Michaels and Carello (1981), that "humans do not perceive chairs, pencils, and doughnuts, they perceive places to sit, object with which to write, and things to eat" (p. 42). They continue by stating that "to detect affordances is, quite simply, to detect meaning" (p. 42). This intimate relationship between perception and action, underpinning the concept of affordances, has been referred to in slightly different ways: "perception-action interrelationship" (Michaels & Carello, 1981, p 48); "perceiving-acting cycle" (Shaw, 2001, p. 296); "action/perception loop" (Östersjö, 2010, p. 78); and

"perception-action coupling" (Warren, 1990, p. 33). In the present thesis, I refer to this reciprocal and continuous relationship as perception-action loop (Figure 2). Windsor (2016) applies ecological psychology to the study of musical gestures, (2.2.2) and adds, to the above perception-action loop, the notion of *traces*, generated by the actions taken (Figure 3). Windsor (2016) explains:

> Actions here might be movements that create sound, or incidental movements that accompany sound production: the events they generate, whether sounding or not, are accessible to the musician because they provide information for the musician's perceptual systems to pick up. This information guides further actions, not only though providing feedback on the success of previous actions, but also guiding information further gathering movements. (p. 61)

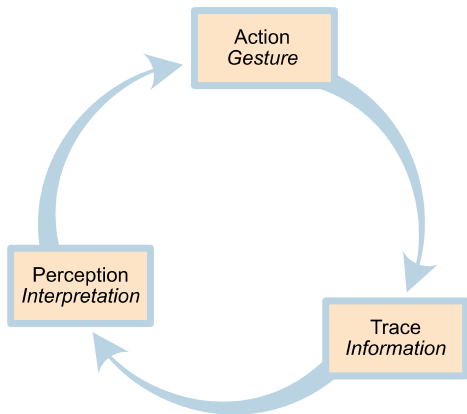


Figure 3
The perception-action loop, including Windsor's addition of trace. From Windsor, 2016, p. 61.

While the diagram in Figure 3 represent the flow of action and perception of a single musician, Windsor (2016) continues to describe how the visual and auditory trace is available for a listener or co-performer. The musician themselves, will naturally have access to information that a listener cannot see, hear, or feel. But as Windsor points out: "in many ways the listener/observer can observe and listen to the body of the performer in much more detail and freedom, unconstrained by technical limitations and from a distant vantage point" (Windsor, 2016, p. 61).

Folkestad (1996) introduced the theory of affordances in a musical context through his study on computer-based creative music making. Depending on the background, the participants of the study showed significantly different approaches towards the

computer as a compositional tool. Participants with experience of playing an instrument proved to be less interested in exploring the affordances of the computer, while participants without experience of musical instruments were more likely to fully utilise the possibilities of the computer as a compositional tool. In Folkestad (2004), the affordances of composition are summarized as follows: "The creative music making takes place in a process of interaction between the participants' musical experience and competence, their cultural practice, the tools, the instruments, and the instructions – altogether forming the *affordances* in the creative situation" (pp. 87-88, cited in Folkestad, 2012, italics in original). Folkestad draws an interesting parallel between the ability to perceive and make use of affordances and the, otherwise evasive term *creativity*:

> This implies a definition of creativity, or rather to act creatively, as the ability to perceive new affordances, or old affordances anew, and to elaborate these affordances in each situation. Thus, the meaning of creativity involves a relation to the surrounding in which the human being continuously seeks new angles of approach, and practices the ability to perceive new affordances. (Folkestad, 1996, p. 46)

The above quote presents a way to discuss one aspect of musical creativity which has significant relevance to the present study. To investigate how musicians perceive their musical instruments and how they use this perception to interact with the repertoire highlights the importance of these relationships in music making.

In *Ways of listening*, Clarke (2005) explores auditory perception from the perspective of Gibson's ecological approach. Through a series of case studies, he examines how the perception of music is dependent on acoustics, musical parameters and the social context in which the music is performed. The affordances of music offer various actions such as "dancing, singing (and singing along), playing (and playing along), working, persuading, drinking and eating, doing aerobics, taking drugs, playing air guitar, traveling" (p. 204). Clarke is, however, especially interested in how music affords meaning to the listener. Even if the listener is seemingly passive, the interpretive act itself constitutes the action in the perception-action loop. In examples including Jimi Hendrix performance of Star Spangled Banner at the Woodstock festival 1969, Clarke argues that the perceivable sound actually conveys the intended meaning of the performance. Or rather, the sound affords the intended musical meaning if the listener possesses the cultural references to interpret the sounds in such way. This further challenge the notion of perceiving music on separate structural levels such as rhythm, pulse, timbre, and, on top of it all, musical meaning and cultural references. He argues that "people seem to be aware of supposedly 'high-level' features much more directly and immediately than the lower-level features that a standard information processing account suggests they need to process first" (Clarke, 2005, p. 16). Through Clarke's

book, Gibson's ecological psychology became more widely known within music research. In a recent article Clarke (2020) explores how the notion of creativity can be reassessed through the perspective of ecological theory, in which affordances are found embedded in reciprocal relationships between a musician and materiality (such as instruments), between musicians, as well as between the musician and the surrounding environment.

DeNora (2000) also refers to affordances in her book *Music in everyday life*, in which she effectively merges perspectives from sociology and psychology with ethnomusicology. Through ethnographic case studies – music therapy, karaoke sessions, an aerobics class and the background music in stores – she examines the multiple functions that music has in people's daily life. DeNora (2000) refers to the affordances of music in an encompassing way: "music's affordances – moods, messages, energy levels, situations – are constituted from within the circumstances of use" (pp. 43-44). However, this interpretation of affordances has been criticised of meaning little more than "the colloquial concept of *to evoke*, or *to elicit*" (Menin & Schiavio, 2012, p. 206, italics in original). As a reaction against what can be thought of as a watered-down version of affordances, Menin and Schiavio (2012) argues instead for an understanding of musical affordances more closely connected to the interaction with physical material, such as musical instruments:

> A skilled guitarist might be unable to say where to put her/his finger to perform a solo, but s/he can use the motor knowledge of the fingers to reconstruct the actual set of notes played, by just putting the hand on the strings. We believe that this sensory-motor process not only represents the basis of musical understanding, but it can also shed light on the notion of musical affordance, relying on a sub-cognitive, pre-linguistic, intrinsically motor form of intentionality. (p. 210)

In line with this argument, Huron and Berec (2009) draw parallels between the notion of idiomatic qualities and musical affordances:

> A stretched-membrane drum, for example, affords a number of sonic possibilities. The drum may be struck with a hand or with a stick; it may be struck by a single hand, by alternating hands, by drumming the fingers, etc. The drumhead may be depressed with one hand (modifying the tension) while striking with the other hand; the side of the drum may be struck, and so on. (p. 104)

In Östersjö (2010), the collaborative processes between composer and musician are examined through his own artistic practice as a classical guitarist. Based on the analysis of a series of collaborations with different composers, Östersjö divides the interpretational act in two phases; (i) an analytic phase, and (ii) a practical phase. In the latter phase, Östersjö uses the concept of affordances to discuss the possibilities of

certain tunings on the guitar. The affordances of these different tunings are explored by improvising on the musical instrument, searching for ideas to be used in the compositional process, through an act of *thinking-through-practice*, a term resonating with the close connection between perception and action as presented above. In subsequent studies, Östersjö has returned to the theory of affordances to discuss the influences of the properties of musical instruments in various collaborative projects (Östersjö, 2013; Gorton & Östersjö, 2016). Coessens and Östersjö (2014) articulate a way to understand the concept of affordances in the context of musician/musical instrument as follows: "an instrument affords different musical possibilities to different performers; hence, the affordances of an instrument are as dependent on the individual performer as on the acoustic properties of the instrument" (p. 337). In a recent book, *Listening to the other*, Östersjö (2020) addresses fundamental issues of the nature of listening as embodied, social, and bound up with the musical instruments. The ecological perspective (including the concept of affordances) is here combined with phenomenological ideas.

Nilsson's (2011) dissertation applies the theory of affordances on the design of – and interaction with – digital instruments. He discerns between these two acts as *design time* and *play time*. Design time refers to the construction of the digital instrument, and thereby the articulation of an aesthetic idea, whereas play time is the actual performance guided by both the preconceived possibilities of the instrument and the embodied knowledge of the performer. The instrument is a framework for this musical thinking and action. Paraphrasing Merleau-Ponty, Nilsson (2011) is stating that "my instrument is my viewpoint on the music world, and at the same time, it is one of the objects in that world. It is my being-in-the-music-world" (pp. 143-144). As presented above, the act of moving around in the environment is a vital part of perception according to Gibson. This locomotive aspect in Gibson's framework can be seen as corresponding to a musician reacting to perceived musical events in real time. In his doctoral thesis on improvisation with digital instruments, Nilsson (2011) coins the term *emergent affordances*:

> One thing that has struck me in numerous improvisations over the years is a musician's ability to discover and take advantage of new things that may emerge during an improvisation. I call these new and unknown occurrences emergent affordances, and by this I mean the opportunity to make use of and exploit perceived qualitative changes in texture. (p. 255)

Nilsson's (2011) idea of emergent affordances applies the concept of affordances to the relation between interacting musicians. While this aspect of musical collaboration may be highly distinguishable in the context of free improvisation, it is also difficult to imagine any situation of live music performance where emergent affordances have no

relevance at all. It is also important to notice that this collaborative music making is not only dependent on auditory perception, as described by Windsor and de Bézenac (2012): "The behaviours of interacting musicians are simultaneously motivated and constrained by the collectively produced actions and resulting sounds: what is seen, heard and felt affords particular kinds of subsequent behaviour" (p. 10).

Nijs, Lesaffre and Leman (2013) combine the concept of affordances with a wider theoretical framework in order to study what is generally thought of as being the optimal relationship between the musician and the musical instrument:

> A symbiosis between musician and musical instrument results from a growing integration of instrumental and interpretative movements into a coherent whole that is compatible with the body of the musician and with the movement repertoire of daily life. Such integration leads to the transparency of the musical instrument that just like "natural" body parts disappears from consciousness. (p. 1)

In order to theoretically frame the understanding of this state of interaction, Nijs, Lesaffre and Leman (2013) combine ecological psychology (affordances), activity theory, and research on flow and presence.

Love (2017) studies the practice of improvising jazz musicians during a series of recording sessions. Through focusing on the "errors" made, defined as "a note or segment of several notes [...] inappropriate in its context" (p. 36), he examines how the musicians perceive the referent, or the conceptual framework, of the solo. By looking at the referent through the theoretical lens of Gibson's theories, it is clear that affordances furnish the basis for different actions depending on the perception and skills of the musicians.

On a fundamental level, studying affordances in a musical context prompts the researcher to take a stand in the debate on whether the concept of affordances carries meaning with regards to the interaction with manmade tools in complex cultural settings. Since Gibson's own concern was to explore seemingly basic behaviour of animals, including humans, this is a question of interpretation and extension of his original ideas. The difference between discussing whether water affords drinking (for humans) or landing (for insects), and discussing the playing of musical instruments may at first seem too wide to be examined by the same concept in a meaningful way. The affordances that are associated with playing musical instruments challenge the idea of perception as direct, since it could be argued that elaborate action in a cultural context is consciously constructed from the basis of the subject's knowledge, hence, falling back on the view of perception as a three-term relationship as mentioned above. One way of theoretically approaching these complex matters is through the research paradigm of 4E cognition.

3.2 4E cognition

Gibson (1979/1986) argued for the reciprocal nature of the relationship between the subject and the object/environment and that this relationship provides the affordances and the possibilities for action. In the following section, I will widen the scope from perception to cognition. Or rather, I will follow Gibson's ideas into recent developments in cognitive research. Resonating with the approach to perception taken by Gibson, 4E cognition (4EC) rejects the idea of cognition as isolated to the brain and acknowledges (at least) four interweaved dimensions of cognition: (i) embodied, (ii) embedded, (iii) enactive, and (iv) extended. 4EC is not to be understood as a unified research program, but rather as wide umbrella term including multiple disciplines, perspectives and methodologies. Whereas the term is recent, the ideas contributing to and forming the perspectives of 4EC can be traced throughout history (Newen et al., 2018). Among these ideas are Gibson's (1979/1986).

Since the concept of affordances is central to the present thesis, embracing ideas from the 4EC paradigm calls for a consideration of the relationship between perception (which was Gibson's area of focus) and cognition. Traditional cognitivism relies on a sequential model with distinctions drawn between input (perception), internal cognitive processes, and output (behaviour) (Aizawa, 2018). 4EC stands in contrast to this view. While definitions of cognitive processes within 4EC are still fluid and evasive, one shared concern among researchers in this field is to approach behaviour and cognition as inseparable, in the same way as Gibson's understanding of perception is inseparable from action.

Two articles from the 1990's sat to motion a debate about the nature of cognition and are still widely referred to throughout the 4EC literature. They serve as examples of empirical and philosophical work that highlights the problems inherent in traditional views on cognition.

Kirsh and Maglio (1994) introduced the term *epistemic action* through a study on people playing the video game, *Tetris*. In their experiment, Kirsh and Maglio (1994) revealed that the actions performed by the players were so much a part of the cognitive process that it could not be satisfactorily explained by a traditional (sequential) model. The actions performed were not outcomes of a finalised working plan, but instead a way to "think" in action. In order to act as fast as possible (which is a necessity in the game of Tetris), the cognitive process was distributed to the actions performed on the gaming device. About these actions, Kirsh and Maglio (1994) state the following: "The best way to interpret the actions is not as moves intended to improve board position, but rather as moves that simplify the player's problem-solving task" (p. 514).

Some years later, Clark and Chalmers (1998) published the essay *The extended mind*, which they opened with the question: "Where does the mind stop and the rest of the

world begin?" (p. 7). In their case, they use a thought experiment with two individuals, Inga and Otto. Each on their own, they navigate through the streets of New York in order to get to the Museum of Modern Art. While Inga simply remembers the way, Otto suffers from dementia and relies on his notebook to find his way. Thus, Otto's memory of the way to MOMA is argued to be extended since the process cannot be fully explained as isolated to the brain but incorporates the notebook as one constitutive part. This scenario animates the essay and grounds the questions about the nature of cognition raised by the authors. Throughout the text, they argue for an *active externalism* where the mind is not separated from the world by the boundaries of the body, but instead entwined with the surrounding environment. As part of their argument they refer to the work of Kirsch and Maglio (1994) and to the term epistemic action: "Epistemic action, we suggest, demands spread of *epistemic credit*" (Clark & Chalmers, 1998, p. 8, italics in original). They go on by formulating the *parity principle* (PP):

> If, as we confront some task, a part of the world functions as a process which, *were it done in the head*, we would have no hesitation in recognizing as part of the cognitive process, then that part of the world *is* (so we claim) part of the cognitive process. Cognitive processes ain't (all) in the head! (Clark & Chalmers, 1998, p. 8, italics in original)

If traditional cognitive science can be said to unpack the processes of interacting with the world in discrete processes of perception, cognition, and behaviour, then the work of 4EC researchers can be put forward as being about repacking these processes, and hence reframing the research questions. Noë (2012) puts it well when he addresses the prevailing problematic distinction between perception and cognition:

> I have been urging that we embrace a different idea according to which perception is itself a kind of thoughtful exploration of the world and thought is, at least in a wide range of cases (much wider than we might have thought), a kind of extended perception. (Noë, 2012, P. 45)

De Sousa (2017), in his book on musical instruments, writes in a similar vein:

> [C]onsider one more dichotomy: cognition and perception. For proponents of grounded cognition, there can be no clean break between the two. […] On the one hand, higher-level cognition engages the brain's sensorimotor systems, and it is affected by bodily activity. On the other, when an animal perceives a predator – even when a bacterium prefers one form of sugar to another – its behavior is already imbued with a kind of sense-making that, for some thinkers, represents a minimal form of cognition. This is not to ignore useful distinctions between cognition and perception but to emphasize, once again, how they are entwined. It suggests that the essence of cognition is nothing

> "cognitive", meaning that thinking is just not about calculation or symbolic logic but is, more generally, about making sense of the world. Moreover, this implies that it is possible to think with one's body. (De Sousa, 2017, p. 28)

With a focus on musical practice, it would be counter-intuitive to put forward an understanding that insists on the divide between cognition and perception.

The four dimensions of 4E cognition overlap, intersects, and reflect each other. While musical practice necessarily is both (i) embodied and (ii) embedded, I mainly draw upon theories from the perspectives of the (iii) extended and the (iv) enactive dimensions.

3.2.1 The extended dimension of cognition

Since this thesis focuses on the relationship between the musician and the musical instrument in the practice of music making, the extended dimension of cognition is central to the questions asked. Although not explicitly stated as concerning extended cognition, some of the research mentioned in 2.2.2 could be described as studying the relationship between the musician and the musical instrument in such way. Sudnow (1978), Aho (2016) and Baily (1985) all provide thorough accounts of the musical processes as tightly bound to the interaction with the material. Were the material different (i.e. another musical instrument), both the musical result and the process of creation would take different shapes. For example, this is the basis for the creative path taken by Kurt Rosenwinkel, reported by De Sousa (2017). Kvifte's (2008) question of where the musician's body stops and where the instrument begins highlights the relevance of the extended dimension in a musical context, and his model (Figure. 1) outlines the feedback system through which the musician and the instrument is bound together. The instant response given by the musical instrument resonates with the notion of epistemic action coined by Kirsch and Maglio's (1994). Also, language, as a tool for thinking, can be argued to be a result of the extended mind (Clark, 2008). Language can thus be seen "as a form of mind-transforming cognitive scaffolding: a persisting, though never stationary, symbolic edifice whose critical role in promoting thought and reason remains surprisingly ill understood" (Clark, 2008, p.45). Furthermore, Clark goes on to point out that: "Experts […] are doubly expert. They are expert at the task in hand but also experts at using well-chosen linguistic prompts and reminders to maintain performance in the face of adversity" (Clark, 2008, p. 49). Although language surely plays a crucial role in organizing the activity in the mind of the expert, it is fair to question this doubleness on a communicational level: not all brilliant musicians may be experts in verbalising their expertise through useful instructions.

What has become referred to as the *parity principle* (PP) is central to the argument for the extended mind theory and described in the above block citation from Clark and Chalmers (1998). Kiverstein further (2018) clarifies:

> The parity principle says that if we count a process as cognitive when it takes place inside the head, we should also count it as cognitive when it extends into the world. The cognitive process ought to be counted as a cognitive regardless of where (inside the head of out in the world) it takes place. (Kiverstein, 2018, p. 25)

Even though this might seem uncontroversial, it still has raised some debate among researchers within the 4EC paradigm. The topic of debate is whether the internal and the extended cognitive processes are equal, that is, whether "the contribution of the external elements is only causal, and not cognitive" (Kiverstein, 2018, p. 31). In other words, does the musical instrument work as a tool, supporting the intracranial cognitive processes or is it to be understood as an integral part of an extended cognition? This question, regarding the function of external objects in cognition is still debated among academics. As Malafouris (2018) states, although cognitive processes have been examined through the extended perspective, understandings of the role of the object is still underdeveloped: "Many years have passed since Andy Clark and David Chalmers introduced Inga and Otto to the world […]. We have learned a great deal about 'parity' but nothing really about the notebook" (Malafouris, 2018). Malafouris has a point here. While 4EC research concerns a wide spectrum of relationships between cognition and the surrounding world there has not been so much work on the interplay between objects and the individual.

3.2.1.1 The coupling constitution fallacy

Just as Gibson's ecological psychology was a reaction against traditional theory of perception, the idea of extended cognition is controversial. It is not my aim here to give voice to the full chorus of criticism, however some of the arguments raised against the theory of extended cognition have spurred a fruitful debate. Perhaps the most substantial critique has been articulated by Adams and Aizawa (2010) in their book *The bounds of cognition*. The first sentence of the book sets the tone:

> This book came about adventitiously. Some time in early summer of 1998 or so, Fred [Adams] came across a paper by Andy Clark and David Chalmers, advancing what seemed to us to be the outrageous hypothesis that, at least at times, cognitive processes extend into the tools people use. (Adams & Aizawa, 2010, p. vi)

One of the main points of criticism raised in the book is labelled the *coupling constitution fallacy*. In their review of the extended mind literature, they discern one

argument – or move – that is articulated in various ways by different authors. Adams and Aizawa (2010) clarify:

> The basic problem with all of these moves is that none of them provides a plausible argument for going from the causation claim to the extended cognition claim. […] It simply does not follow from the fact that *X* is in some way causally connected to a cognitive process that *X* is thereby a part of that process. (p. 91)

Passionately, Adams and Aizawa (2010) argue against the extended mind hypothesis throughout the book, which raises fundamental questions against the extended mind project. At the centre of this debate lies the above question of what constitutes a cognitive process and how the coupling between subject and environment is to be understood. Underlying this is an interpretation of Clark and Chalmers (1998) original work. The parity principle – as stated in this essay (Clark & Chalmers, 1998) – allows for the understanding that the extended part of the cognition needs to be equal and identical to the biological (inner) equivalent.

In the unfolding debate between Clark and Adams and Aizawa, Clark (2008) clarifies that the point he and Chalmers sought to make was that while the functions of the two parts are the same (Ottos notebook serves the function of memory of MOMAs location, just as Ingas biological memory does) they do not have to be equal in other terms. That would, according to Clark (2008) be: "to open the door to the highly chauvinistic thought that only systems whose fine-grained causal profile fully matches that of the brain can be cognitive systems at all" (p. 115). Clark also points out that, while inner and extended cognition may be different, also inner cognitive processes may show significant varieties: "In the light of all this, my own suspicion is that the differences between external-looping (putatively cognitive) processes and purely inner ones will be no greater than those between the inner ones themselves" (Clark, 2008, p. 96).

3.2.1.2 Three waves of externalism

Clark's (2008) response towards the above criticism brings forth the clarification that inner (biological) and outer parts of the coupled cognitive system (i.e. Otto's notebook) do not have to be equal although they contribute with the same function. In the light of this clarification, however, the word *parity* in parity principle may seem to be misleading as it bears connotation of equality. Ryan and Schiavio (2019) address this in their review of research inspired by Clark & Chalmers (1998). They describe, what they see as a second wave of externalism, which replaces parity, in parity principle (PP), with *complementarity*, forming instead the *complementarity principle* (CP).

The second wave openly accept that the external processes may differ from fully internal ones, even though the basic function may be the same. That is, to distribute parts of the memory by the aid of external sources (i.e. noting instructions of direction

in a notebook) may change the nature of the memory process, but it is still to be counted as a cognitive process.

Ryan and Schiavio (2019) further outline a third wave, which in turn replaces complimentary with *dynamic* (DP). By doing this, they wish to emphasize the fluent and changing character of the cognitive coupling between the subject and the surrounding environment:

> the dynamics cannot be addressed in terms of parity. The judgment process is not extended simply because it mirrors a similar sort of internal process. Likewise, in contrast to a purely complementarity-based approach, it [DP] also focusses on how various engagements with the external world continuously reshape the contours of relevant mental processes and their properties. (Schiavio & Ryan, 2018, p. 10)

Ryan and Schiavio (2019) also suggest that agency may then be understood as distributed and decentralized:

> For instance, while my thirst may drive my desire to drink, there is something equally important about how a bottle of water solicits my response to take it and drink. Such distribution, in turn, is further augmented in the case of group activities, where the solicitations can come from others. (Ryan & Schiavio, 2019, p. 11)

While articulating a third wave of externalism, they move from the parity principle to the dynamic principle. But they also note that any "overly clean distinction between different waves is more of an abstraction than a strict division among theories, since all proponents are ultimately arguing in defence of the same core claim that the mind is not localized inside the head" (Ryan & Schiavio, 2019, p. 9). In fact, I think that the wave metaphor runs the risk of overshadowing the continuous way in which this theoretical field has evolved since Clark and Chalmers' (1998) now classic essay. But while keeping this in mind, the wave metaphor is useful as a way to update the debate, where some of the matters initially raised against extended cognition are to be considered as no longer pertinent. Either you accept or refute the fundamental ontological claims made by the proponents of extended cognition. The questions have been answered and the divide between the opinions is more fundamental than the bounds of well-reasoned debate allow for. For me, the ideas put forth by Clark and Chalmers (1998) and further developed by others (Clark, 2008; Ryan & Schiavio, 2019) make sense and have explanatory power. However, from the horizon of the third wave, many new questions may be raised and empirical research can shed light and move this theoretical paradigm further. As summarised inthe concluding words from Ryan and Schiavio (2019):

> Concerning practicing musicians, an extended mind orientation might contribute to better understand their continuous negotiation between internal and external factors, as well as how emotional, social, and cultural dynamics, shape performance at different levels and timescales (p. 15).

The dynamic principle of the third wave accordingly opens up for a discussion on learning which not only takes into account the distributed aspect of musical practice (that is involving its materiality) but also its changing, fluent and progressive nature.

3.2.2 The enactive dimension of cognition

The enactive dimension of cognition in particular raises questions regarding the divide between cognition and behaviour, that is fundamental to traditional cognitivism (Aizawa, 2018). As such, it explores the perception-action loop found in Gibson's (1979/1986) work, and foundational to the individual's exploration of affordances. The various interpretations of the enactive approach address the continuous engagement of the subject in the world at different time scales and levels of detail – from the everyday interaction with the surrounding environment, to a broader perspective of the life-mind continuity (Gonzalez-Grandón & Froese, 2018). Thus, the enactive perspective can be used to shed light on both the individual's engagement with objects and environment, here understood in terms of the musician/musical instrument coupling, and the continuous and dynamic influence that a subject and the contingent environment pose on each other. In the context of the present thesis, the latter is understood as the cultural, social, educational, and artistic contexts in which the musician is situated.

3.2.2.1 The theory of sensorimotor contingencies

One articulation of the enactive approach is the theory of sensorimotor contingencies, first formulated by O'Reagan and Noë (2001) and is more fully explored the work of Alva Noë. His book *Action in Perception* (Noë, 2004) is devoted to the inseparable relationship between action and perception. Taking Gibson's work and the phenomenological tradition as a point of departure, Noë (2004) steps inside the perception-action loop to explore how the perceptual system works from the enactive perspective. The content that is acted upon is the flow of information that unfolds through the loop: the sensorimotor contingencies. The perceptual system is dispositioned to keep retrieving relevant information, which presupposes action. The competence of acting, based on the sensorimotor contingencies, is labelled *sensorimotor skills*, "skills that grow from the association of particular sensations with particular

action" (Shapiro, 2011, p. 218). Noë (2004) offers an abundance of examples from everyday life to support the ideas.

In the article leading up the above-mentioned book (Noë, 2004), O'Reagan and Noë (2001) note that, although an individual may act upon sensorimotor contingencies, it is not necessarily the case that this individual is aware of his or her reactions. O'Reagan and Noë (2001) exemplify this with a person driving a car while talking to a friend sitting in the passenger seat. It is possible for the driver to aptly respond to the events unfolding in front of the car, while being focused on the conversation. However, this may change:

> If you should turn your attention to the color of the car ahead of you, and think about it, or discuss it with your friend, or use the knowledge of the car's color to influence decisions you are making, then, we would say, you are aware of it. (O'Reagan and Noë, 2001, p. 944)

Attention can thus be directed consciously, or certain events or objects can be brought into presence if they are meaningful to the individual. In this way, the perceptual system can be understood as scanning the surrounding environment. However, the sensorimotor skills are not merely situated in the present now and only relevant to the unfolding events, but are also the basis for comprehension of the world. In this way, it is transportable and an individual can refer to it even when he or she is away from the actual objects and events. The sensorimotor skills are therefor also to be considered as sensorimotor *knowledge*:

> A […] reason to refer to sensorimotor skills as constituting a kind of knowledge is that […] there is no sharp line where your perceptual awareness of something stops and your mere *thought* awareness of it starts. I can think of the Eiffel Tower right now, but not perceive it. […] But I am visually aware […] of occluded portions of the scene around me, even though they are, strictly speaking, out of view. By calling sensorimotor skill "knowledge", I am signaling the [SIC] that we should be open to the possibility that thought and experience are, in important ways, continuous. (Noë, 2004, p. 118, italics in original)

Crucially, sensorimotor knowledge is not propositional. In particular, it is not knowledge of propositions describing the sensory effects of possible or actual movements (although it can be the basis of such knowledge). Rather, sensorimotor knowledge is part of the domain of experiential knowing (Heron, 1996). Just as it is possible to have an awareness of an object not present, it is also part of one's sensorimotor knowledge to have an awareness of occluded aspects of objects present. Even if only one side of the tomato is visible, it is possible to have an awareness of the other side of the tomato as well as its taste:

> When you look at a tomato, what you see is not part of *it* (the facing surface), but it. […] You visually experience parts of the tomato that, strictly speaking, you do not see, because you understand, implicitly, that your sensory relation to those parts is mediated by familiar patterns of sensorimotor dependence. (Noë, 2004, p. 76-77, italics in original).

Even if I don't hold the flute in my hands, I have an experience of its weight and its sound. When I look at a trombone (an instrument I have never played), this experience would be mediated by less substantive patterns of sensorimotor dependences. I would not know what to expect if I picked it up and blew into it. If I pick up the flute in front of me, I can of course be surprised if it is cracked or a key is stuck, but I have more expectations of how the experience will unfold, and in most cases, these expectations are reliable.

O'Reagan and Noë (2001) stresses that sensorimotor skills are tied to a present moment. As perceptual conditions change, so does the capabilities to act accordingly. For example, the body changes as we age, or if a new pair of glasses are bought, the visual perception must adapt. This fact also highlights the different nature of sensorimotor mastery to propositional knowledge.

Noë (2004), inspired by Gibson (1979/1986), explains how the enactive approach highlights certain aspects of the concept of affordances:

> Affordances are animal-relative, depending, for example, on the size and shape of the animal. It is worth noting that they are also skill-relative. To give an example, a good hitter in baseball is someone for whom a thrown pitch affords certain possibilities of movement. The excellence of a hitter does not consist primarily in having excellent vision. But it may very well consist in the mastery of sensorimotor skills, the possession of which enables a situation to afford an opportunity for action not otherwise available. […] To experience a property is, among other things, to grasp its sensorimotor profile. It is to experience the object as determining possibilities of and for movement. (p. 106)

Accordingly, the enactive view stresses the point of action, and (of special interest for the field of music) skilled action developed in relation to specific tasks. As such, embedded in the detection of affordances lies a dimension of intentionality.

Although *Action in Perception* (Noë, 2004) elevates perception to more than sensory stimulation, he does not address cognition to any depth. However, Noë continues to explore the ideas in *Varieties of presence* (Noë, 2012), which I quoted in 3.2. In this book, the perceptual experience, and the enactment of it, emerges as a form of cognition. The book consists of a number of essays, animated by the idea "that presence is achieved, and that its varieties correspond to the variety of ways we skilfully achieve access to the world" (Noë, 2012, p. xi). The essays combine research of ecological psychology with phenomenologically informed observations.

In 2017, Di Paolo et al. published the book, *Sensorimotor life: an enactive proposal*, which provides a substantial input to the theory of sensorimotor contingencies. Their work builds upon the research mentioned above (O'Reagan & Noë, 2001; Noë, 2004) and drawing upon dynamical systems theory, they suggest a mathematical approach inspired by Piaget's theory of equilibrium. In their review of the previous work, the authors highlight that the writings on sensorimotor contingencies are ambiguous and allow for different interpretations. Of interest to the present thesis, and also the interpretation that is most thoroughly developed in their book, is what they label, *sensorimotor schemes*. These schemes are in essence "organizations of sensorimotor coordination patterns" (Di Paolo et al., 2017, p. 82). They are not only habits of motor behaviour but are fundamental to our (embodied) perception. When a human confronts a task, much of the movements are coordinated and already part of the motor repertoire as sensorimotor schemes. These habitual ways of enacting the world are combined in parallel or in sequence, and further refined through coupling with the environment, but it is never necessary to construct "from scratch every single muscle activity and the specific movement of each joint. On the contrary, we are equipped with a rich repertoire of ready-made, highly organized ways of engaging the world" (Di Paolo et al., 2017, p. 82).

One reason for the focus on sensorimotor schemes (and not the other possible interpretations presented) is the normative claims underlying much of the examples given in the literature, in particular the article by O'Reagan and Noë (2001). Di Paolo et al (2017) states:

> The explanatory value of the sensorimotor approach is, however, often expressed in normative terms, such as "being attuned to SMCs," possessing "knowledge," or "skillful mastery" of the laws of SMCs, things that can happen in better or in worse ways, appropriately or inappropriately". (p. 58)

Such a subjective and normative perspective is also necessary in a discussion on learning. The outcomes of the actions taken are often not neutral but either positive or negative with regards to the intention of the agent. A learning process presupposes that the actions can be improved according to a desired result.

3.2.2.2 The theory of sensorimotor contingencies and listening

While Di Paolo et al. (2017) expanded the theory of sensorimotor contingencies from a primary focus (although not exclusively) on visual perception (Noë, 2004) to tactility and motor behaviour, Froese and González-Grandón (2019) make yet another move in their article: *How passive is passive listening?* In this piece, the authors provide a foundation for a theory of sensorimotor contingencies with a focus on auditory perception.

One point of departure in their article is findings within neuroimaging, showing that activity in the brain usually associated with motor action occurs even when the subject is physically motionless, commonly referred to as "passive listening". Throughout their article the authors provide evidence that listening is rarely passive. Just as with vision and tactile modalities, auditory perceptual awareness is dependent on engagement from the agent. However, this brain activity is based on a history of bodily sensorimotor engagement with relations to sound. One basic example is movements of the head, which in turn affects the angle from which the sound waves reach the ear. Having two ears allows for a rich perceptual experience of spatiality of sound. But auditory sensorimotor know-how is also more complex and overlap with other modalities, such as vision: "I hear the car as present outside of my window because I implicitly know how the acoustic intensity in my ears would systematically change if I were to move to move my head with respect to the window" (Froese & González-Grandón, 2019, p. 627).

Auditory experience, like their counterparts of other modalities, has properties of *corporality* and *alerting capacity*. While corporality refers to the above-mentioned exploratory relation between body movements and changes in the auditory stream, alerting capacity refers to when sounds causes spontaneous movements, such as a sudden sound causing the subject to turn the head.

Froese and González-Grandón (2019) highlight another aspect of the complexity of auditory perception. First, they remind the reader of the difference between visual awareness and the visual field: "it is important to keep in mind that accessing detail with the eyes is not sufficient in itself for visual awareness, which additionally requires attention" (p. 623). With regards to auditory perception, this is known as inattentional deafness. But there are also important differences between vision and audition in this case. While there are anatomical limitations regarding what the eye can focus on, this is not the case with audition: "Both the attended and unattended acoustic stimuli are always directly present to the ears. Instead the failure of auditory perception during inattentional deafness, at least when induced by conditions of high visual load, has been associated with reduced sensory processing of auditory stimuli" (Froese & González-Grandón, 2019, p. 625).

Froese and González-Grandón (2019) turn to music when they exemplify how to understand auditory perceptual experience. In the following citation, the authors have in mind Noë's (2004) example of the tomato, mentioned above:

> Just like vision presents us with integrated objects even though they are necessarily visually occluded by themselves (e.g. by the tomato's front side) and possibly also by other objects (e.g. another tomato partially placed in front of it), audition also presents us with integrated objects (e.g. hearing a word) even though the sequence of sounds is not all co-present at once and even though parts of the sequence can be acoustically

> occluded by other sounds (e.g. noise). […] We implicitly experience a familiar melody in its entirety even if only a short fragment of it is currently acoustically perceived. (Froese & González-Grandón, 2019, p. 626)

The case of music and musicians is especially interesting, since the theory of sensorimotor contingencies is cantered around the notion of sensorimotor mastery. When elaborating on this theme, Froese and González-Grandón (2019) again turns to a review of neuroimaging research, in which findings consistently show patterns of connection between motor system activation in the brain and hearing sounds. When comparing musicians (taken to embody highly developed sensorimotor expertise) to non-musicians, evidence of this connection is obvious. This holds true not only regarding response to auditory stimulation in general, but also in more specific cases of repertoire that the musician has performed, in which case the connection is stronger even if the musician is listening "passively" during the experiment.

In their article, Froese and González-Grandón (2019) also comment on the methods used in the referenced neuroimaging research, which implicitly underestimates the role of the body in auditory perception: They conclude by stating that: "there is more to the body than just the brain: we have highlighted that there is an opportunity to develop sensorimotor theory into new directions in terms of the still relatively poorly understood active processes of the peripheral auditory system" (p. 644). Since the theory of sensorimotor contingencies holds that perception is ecologically situated, laboratory research comes with obvious limitations. As Froese and González-Grandón (2019) shows, even with this disclaimer such research provides support for further development of the theory.

3.3 4E cognition and affordances

Although not labelled as such, the four E's are all present in Gibson's (1979/1986) work. As such, they underpin the concept of affordances. The four E's presuppose each other but depending on which of them are in the forefront of the analytical perspective, different aspects of affordances are highlighted.

Affordances are embodied. Fundamental to Gibson's work, is the revolt against a brain-centred understanding of human life, in favour of an embodied approach. Although Gibson's work primarily focuses on perception, his thinking is based in wider concerns. As he asks in the preface: "Why must we seek explanation in *either* Body or Mind? It is a false dichotomy" (1979/1986, p. xii, italics in original).

Affordances are embedded. The first three chapters in Gibson's book *The Ecological Approach to Visual Perception* (1979/1986) are devoted to outline an understanding of

the environment as fundamental for the life of humans and animals. Daily life as well as developmental processes are always embedded in a reciprocal relationship between animal and environment.

Affordances are extended. Gibson's words about the use of objects are echoed in the writing of Clark and Chalmers (1998), advancing the theory of the extended mind. In Gibson's (1979/1986) words: "[The] capacity to attach something to the body suggests that the boundary between the animal and the environment is not fixed at the surface of the skin but can shift" (p. 35).

Affordances are enactive. As mentioned above, the perception-action loop is central to Gibson's (1979/1986) work. He states: "*Direct perception* is the activity of getting information from the ambient array of light. I call this a process of *information pickup* that involves the exploratory activity of looking around, getting around, and looking at things" (p. 139, italics in original).

Each of the four E's offers thorough ground for further exploration and analysis of affordances in musical practice (Figure 4).

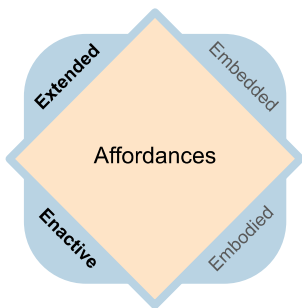


Figure 4
The concept of affordances can be seen as a prism at which analytical perspective can be directed in order to highlight its embodied, embedded, enactive, and/or extended nature. The figure shows the theoretical perspective of the present thesis, emphasising the extended and enactive dimensions.

Newen et al. (2018) explain the role of affordances in the emerging theories of 4EC:

> Cognition is affordance-based, where affordances are always relational (between the cognizing subject or some form of life and the possibilities offered by some entity or complex of entities), and where entity may be some physical part of the environment, another person who can provide information or opportunity, a social or cultural structure, or even something more abstract, such as a concept that, with some manipulation, offers a solution to a problem. (p. 9)

As stated by Newen et al. (2018), advancing the ideas of 4EC is not done through a priori models but through empirical research. Since the theoretical ground is moving, "the answers to these questions have the potential to loop back into theory and to challenge already formulated principles" (p. 13).

Also, the 4EC approach to cognition allows for more distinct parallels between different forms of activities (Gonzalez-Grandón & Froese, 2018). The parallels and differences between activities such as sport and music will stand out as a relief of finer resolution against a resilient framework that considers the four E's. It should be noted that throughout the 4EC literature, the definition of what cognition is and is not, remains fluent and even blurred. This is one of the aspects driving the criticism from more traditional cognitivists (Aizawa, 2018). As I see it, this unfixed definition of what constitutes cognition is one of the bases for the experimental perspective of the 4EC project, and one that can be addressed meaningfully through empirical research.

3.4 Affordances, 4E cognition and musical learning

Although learning is implicitly embedded throughout the theoretical work presented in this chapter, I will now highlight perspectives that I see as meaningful for explaining and discussing musical learning.

The adaption and development of perception is a key feature in Gibson's (1979/1986) work; the subject is constantly exposed to the environment and the existence is in itself seen as a learning process. As the child explores the world, motor skills and perception develop. But this continuous process is not isolated to childhood, but is lifelong and includes changes to perception and motor skills that comes with the aging of the body.

While Gibson's work does not go into depth on learning, it is explored by his wife Eleanor J. Gibson (1991). The two of them worked together in many publications and she continued to work on perceptual learning (including research on affordances) after Gibson's death in 1979. Eleanor J. Gibson was particularly interested in the perception of infants and children:

> We learn to perceive affordances of events, objects, and places (layouts) in the course of development. For example, a child may learn that a slope of more than 10° cannot be safely descended upright and on foot but can be negotiated by sitting and sliding. (E. J. Gibson, 2000, p. 295)

Learning processes, such as learning to play a musical instrument, may be more conscious and deliberate than the first steps of a toddler. Since perception is connected

to action through the perception-action loop mentioned above, a person can learn to perform increasingly difficult tasks through challenging his or her perception. Since theories of perceptual learning are by default mainly concerned with exploration and development, the social dimension is almost non-existent. Gibson (1979/1986) himself comments on interaction between humans: "the affordances of human behaviour are staggering. No more of that will be considered at this stage except to point out that speech, pictures, and writing still have to be perceived" (p. 129).

As described above, the 4EC approach might be seen as situating the concept of affordances in its four-dimensional understanding of cognition. At the same time the distinction between perception and cognition is less sharp and of less relevance than in traditional cognitivism. The musical instrument appears as a part of the cognitive system, an extension thereof. The dynamic principle (Ryan & Schiavio, 2019) is not isolated to the perspective of extended cognition but is fundamental to all the theories presented here. There is an obvious overlap with Schiavio and Ryan's third wave metaphor and for example, Noë and O'Reagan's (2001) statement that the mastery of sensorimotor contingencies is dependent on aspects such as bodily disposition and skill.

As Bielawski's (1979) idea of the musical instrument being a transformer argues, music is created by the gestures (see 2.2.2). The character and quality of the gestures stands in relation to the musical outcome. Particularly the categories of sound-producing and sound-facilitating gestures of the above typology of gestures, include epistemic action (Kirsh & Maglio, 1994), which is at the heart of deliberate musical exercise. The musician plays and responds to the outcome, and intuitively or consciously calibrates the gesture in order to reach a desired result. The acquired technical skills allow for a broader range of affordances to be perceived and acted upon.

Among the most explicit theories of learning, embraced by, and developed within the 4EC paradigm is the idea of *self-organization* (or autopoiesis). This concept is adapted from biological sciences as a perspective on what constitutes life. Instead of viewing living beings as entities, they are understood as self-generating processes, which are, although taking place in the organism, dynamically coupled to the surrounding world. Although the term has an interesting history of use[17], for purposes of the present thesis I turn to the application of the concept in recent research in music education (van der Schyff et al. 2016; van der Schyff, 2019; Walton et al. 2015; Schiavio & van der Schyff, 2018).

In this context, self-organization refers to the bio-cognitive processes of the learner as he or she develops in continuity with the surrounding world. The theoretical

[17] This concept was outlined by Chilean biologists Humberto Maturana and Francisco Varela and has later been adapted to cognitive research and philosophy of mind. It is through this move that the concept now finds its way into music research (see Schiavio and van der Schyff (2018) for a summary of this development).

framework developed around the sensorimotor schemes, mentioned above (Di Paolo et at, 2017) describes self-organization with a focus on (but not exclusively) a motor level, while Silverman (2020) addresses the sense-making processes involved in the strive for a meaningful life of music making. Learning cannot be accomplished if the learning ecology of the agent – including the learners cultural and historical background, musical taste, identity, relational dynamics, way of moving, and emotional life – is not able to self-organise in response to the challenge. As put by Schiavio and van der Schyff (2018):

> [the] metabolic and emotional responses to the learning process are determined by such relationships, for it is only through the unification of these components into various self-organized configurations that [the learner] can generate new musical understandings and possibilities (i.e., skills) that may be re-used, adapted, and further developed. (p. 8)

Schiavio and van der Schyff (2018) further state that: "(i) learning is a modification of the entire brain-body-world system and that, as such, (ii) learning is a self-generating process that is not able to be captured or modified by considering it in terms of an 'inside/outside' duality" (p. 8). Thus, self-organization involves the surrounding world and for a musician, the interaction with the instrument becomes tightly bound up to the cognitive processes, as explored by theories of extended cognition. Opportunities for action in terms of affordances are results of this sense-making process, involving the whole brain-body-instrument-world system.

In some aspects, the perspective on musical learning as processes of self-organization stands in conflict with a more traditional view of education, as one-directional knowledge transmission, flowing from the master to the apprentice (McPherson et al., 2017). In their research on the current state of transformation of higher music education, Georgii-Hemming et al. (2020), argues:

> Before the twenty-first century, instrumental musicians and composers' higher education was framed by fairly stable conceptions of craftsmanship and artistic skill, and by straight-forward connections with the professional field. Today, however, the future is unclear. (p. 1)

The pedagogical implications of the enactive approach, in a broad perspective, are discussed by van der Schyff et al. (2016), with the learning environment – and especially music teacher education – as the point of focus. Through this perspective, "living organisms (people) may be understood to participate in (musical) learning processes through circular and contingent patterns of action and perception that continuously shape and renew the coupling's (organism-environment; musician-ensemble; student-teacher-educational ecology) own structural networks" (p. 91).

Considering the ontological implications for music education of such a perspective, their aim is to "critically decenter traditional Western academic approaches to music education – which, it is argued, often tend to rely on reductive, disembodied and depersonalized assumptions about the nature of communication, learning, knowledge, aesthetics, and what musical experience entails" (van der Schyff et al., 2016, p. 83). The authors draw a parallel between how higher music education in the Western world commonly is organised and traditional cognitivist approaches to learning.

Furthermore, they urge practitioners in the field to "develop more adaptive, cooperative, communal, and 'life-based' perspectives that embrace possibility, creativity, and the unique sets of relationships that develop in the pedagogical environment" (van der Schyff et al., 2016, p. 84). According to van det Schyff et al. (2016), teachers in higher music education need to be active in examining their own practice as well as the institutional frames in which they operate. Especially, they need to question what is taken for granted and to open up for philosophical questions regarding music making. They point at the many opportunities that the multi-cultural societies of today do offer.

In the same vein, van der Schyff (2019) explores education of free improvisation and the problems of assessment that arise in a traditional view on music and musical learning. He argues that the enactive approach to cognition can offer a perspective that sees improvisation skill as a disposition rooted in life experience and hence treated as more profound to the individual musician than otherwise may be the case.

As Schiavio and van der Schyff (2018) suggests, there may be a resonance between the enactive perspective on learning and to the notions of formal and informal learning environments. Although the terminology of formal and informal education is problematic and descriptions thereof may concern various aspects of education, such as the situation, learning style, ownership, or intentionality (Folkestad, 2006), Schiavio and van der Schyff (2018) specifically refer to the prescriptive degree of the instructions given.

Jorgensen (1997) provides a broad categorisation of educational milieus, spanning from the most formalised and structured to the least: schooling, training, eduction, socialisation, and enculturation. Although it may seem consistent to think that processes of self-organization are better supported by less formal learning environments, it is not necessarily so. Even institutionalised education allows for elements of informal learning (Folkestad, 2006).

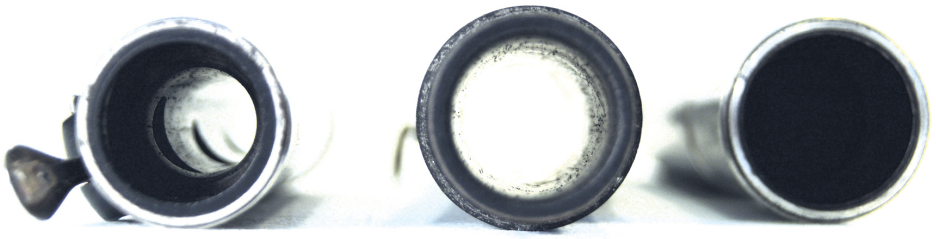
3.5 Summary

In this chapter, I have given an account of the theory of affordances as it was originally formulated by Gibson (1979/1986). Some examples of research applying affordances to a musical context have been presented and the theoretical consequences of the various approaches have been explored. Furthermore, some terms have been introduced; *thinking-through-practice*, *emergent affordances*, and *perception-action loop*. These are, although not used by Gibson himself, seen as idiomatic to his ideas.

The notion of *epistemic action* (Kirsch & Maglio, 1994) provides an overlap between perception (and action) and cognition, through the theory of the *extended mind* (Clark & Chalmers, 1998). From this follows an overview of the 4EC paradigm within cognitive research, with an emphasis on the enactive and the extended perspectives.

Finally, I addressed the process of musical learning seen through the theoretical framework. In this section I outlined the theory of self-organization as a perspective on learning.

In the next chapter, I will present the methodology and design of the two studies, including the connection to the theoretical framework.



Chapter 4

Means of inquiry: Methodology, design and analysis

In the previous chapter, I presented the theoretical framework underpinning this doctoral dissertation. In this chapter, I will outline how the empirical research has been carried out, and how the chosen methods relate to the theory. The chapter is divided into two parts. The first part (4.1-4.3) outlines the methods used: qualitative interviews and cooperative inquiry. The second part describes the designs of the two studies: Study A (4.4) and Study B (4.5). 4.6 presents the analytic processes.

4.1 Methodological considerations

Embedded in the research questions lies an assumption that the musical instrument actually does have a fundamental role to play in the musical processes examined, otherwise it would be futile to use the instrument as a focus for the study. That means that the instrument is a central tool in the research process and in the analysis of the empirical data. From the theoretical framework presented in Chapter 3 follows that the methods used should allow the researcher to get as comprehensive descriptions as possible regarding the relationship between the musician and the musical instrument. Gaining understanding from what the musicians participating in both studies tell and show me as a researcher about their relationship with their instrument requires a hermeneutically inspired approach. Formulated by Friedrich Schleiermacher (1768–1834), hermeneutics is the art of interpretation, originally aimed at understanding biblical texts. Wilhelm Dilthey (1833–1911) expanded this area of focus to include "human life itself, conceived as an ongoing process of interpretation" (Brinkmann et al., 2015, p. 21).

Affordances, central to the theoretical framework of the present study, resonates with fundamental hermeneutical principles, which could be formulated as: "we always see things as something, human behaviour as meaningful acts, letters in a book as

conveying some meaningful narrative" (Brinkmann et al., 2015, p. 21). The hermeneutic aim to understand requires the crucial need to acknowledge the subjective position of the researcher, as the pre-understanding becomes an unavoidable point of departure for the interpretation. The fundamental principle of this interpretive process is the hermeneutic circle (sometimes referred to as the hermeneutic spiral), which illustrates a dialogue between the expectations from the interpreter and the meaning of the text (Laverty, 2003). Thus, my own background as a flute player becomes a vital consideration and a central tool. I elaborate on the implications of this position in section 4.6.3. The hermeneutic circle aims at reaching a meaning that makes sense and is free from internal contradictions (Kvale & Brinkmann, 2009). However, hermeneutics is not a recipe of methods, but "an explication of general principles found useful in a long tradition of interpreting texts" (Kvale & Brinkmann, 2009b, p. 211). Although not considered a method, it is an approach to research framing the choice of methods and informing the design of the study.

This chapter also includes an outline of an extended epistemology as a foundation of cooperative inquiry. The arguments for the extended epistemology, and for cooperative inquiry as method for investigation thereof, presents a view of human knowing which closely resembles the ideas of Gibson (1979/1986). While writing about experiential knowing – one of the four kinds of knowing embedded in the epistemology – Heron and Reason (2008) could in fact be writing about affordances: "It is knowing through the immediacy of perceiving, through empathy and resonance. Its product is the quality of the relationship" (p. 3). Heron (1996) furthermore draws upon MacMurray stating that: "the self is an agent and exists only as an agent" (MacMurray, 1957 in Heron 1996, p. 105). This resonates with the inseparable connection between action and perception, foundational for Gibson, as well as the researchers developing his ideas. Hence, experiential knowing could be described as the ability to recognise affordances in a given moment.

4.2 The qualitative interview

The empirical data of Study A is the result of six semi-structured interviews. According to Kvale and Brinkman (2009), these interviews can be conducted either as an inquiry into a hypothesis, or as an open exploration around chosen themes, which is the case in Study A. The experience explored in the interviews can be shared through thorough descriptions and it is the researchers challenge to grasp the meaning of these descriptions (rather than mere collect statements of facts) (Kvale & Brinkman, 2009).

In order to facilitate as comprehensive descriptions as possible, I was inspired by Houmann (2010; 2015) and her use of three-dimensional objects as a focal point for interviews exploring the phenomenological life-world of her informants. Prior to the interviews, the informants in her study had created models from various objects such as cans, paper cups, pens, and post-it notes, in order to "describe the work of the multifaceted music teacher" (Houmann, 2015, p. 127).

> The models came to provide a life-world in a concrete form, which simultaneously offered the possibility to create a distance, making the familiar unfamiliar and holding the key to the life-world "in the hand" during the interviews. As a researcher, I had the opportunity to open up the life-world of the informants through these models. (Houmann, 2010, p. 209, my translation)

In Study A, the models mentioned above are replaced by musical instruments. The presence of the flutes during the interviews in Study A was of importance since the interviewed musicians are first and foremost practitioners in the field of music. Rather than creating a distance as in Houmann's (2010) research, the flutes created a sense of familiarity in the interview situation, a bridge to the professional life of the interviewees.

In order to frame the interviewees way of talking about and demonstrating their practice, inspiration can be drawn from Schön's (1983) seminal book, *The Reflective Practitioner*. In his work, Schön critiques the technical-rational paradigm, which is the dominant way of thinking about knowledge at the universities in the Western world[18]. He argues that this "heritage of positivism" (p. 31) has led to a crisis regarding the status of professional and practical knowledge. In the technical-rational way of thinking, practical knowledge is seen as a mode of problem solving. However, Schön points out that the technical-rational paradigm omits the phase of problem setting, which in fact is a prerequisite for problem solving: "Problem setting is a process in which, interactively, we name the things to which we will attend and frame the context in which we will attend to them" (Schön, 1983, p. 40). In this way, Schön highlights the process of problem setting as an inherent part of practical knowledge. This has a bearing on the interviews in Study A, since what the interviewed musicians state as technical solutions to a particular musical challenge, must be understood based on how they (intuitively or consciously) already have framed the problem. In other words, when the musicians for example talk about articulation and air management, the statements reflect requirements relevant to their musical context.

[18] The critique Schön advances has close similarities with the critique towards the organization of higher music education put forth by van der Schyff et al. (2016), summarized in 3.4, as well as Heron's (1996) arguments for embracing the extended four-folded epistemology.

Schön (1983) further makes a distinction between *reflection-in-action* and *reflection-on-action*. The former is the way we reflect upon what we do as it happens (for example, what Östersjö (2008) refers to as *thinking-through-practice*, mentioned in 3.1), while the latter refers to the reflection that takes place after the event. These two modes of reflection are relevant with regard to the interviews of the present study. The statements made during the interviews span both of these modes of reflection. Statements belonging to the latter category are often related to teaching practice (such as private lessons, workshops and university courses). These statements are concrete in terms of technical instructions and are easily verbalised for the interviewed musician. Statements derived from reflection-in-action are combined with the playing of the flute. The act of playing works as a reminder of what the musician is actually doing, which they then can put into words. On some occasions, the playing constitutes the answer itself and has been transcribed and included in the presentation of the results in Chapters 5 and 6.

In a similar way, Johansson (2008) incorporates the musical instruments in her interviews. The musicians in her study make four different kinds of statements: (i) verbal statements, (ii) verbal statements illustrated by playing, (iii) musical statements accompanied by talking, (iv) musical statements. These various forms of statement enabled her to study "both what was said about music in words, and what was expressed in music through playing" (p. 71). The statements interpreted in the present study consist of all of these four categories. Furthermore, the fact that I played the flute during the interviews possibly helped to facilitate the musical statements. For example, on some occasions, I repeated what the interviewed musician demonstrated, or we played together in order to attempt some techniques discussed. This approach is similar to how Sæther (2015) uses the fiddle in order to deepen her relationships with the children participating in the El Sistema project that she follows as a researcher.

4.3 Cooperative inquiry

Cooperative inquiry is one branch of qualitative action-oriented and participatory research approaches that "sometimes overlap and sometimes emphasize different aspects of the action-research movement" (Reason, 2002, p.1). One argument for using this specific branch of action research is that the underlying epistemological assumptions are clearly articulated and integrated in the guidelines for the application of the method. Also, these assumptions are well attuned to the epistemological implications following the work of Gibson (1979/1986). The "primacy of the practical"

(Heron, 1996, p. 34) is a recurring phrase, which aptly describes the prioritised concern.

Heron (1996) put forth a political and transformative agenda, and an interest in widening the scope of academic research. Although stated slightly different throughout the literature, the pitch for cooperative inquiry is summarised as: "research *with* people not *on* them or *about* them" (p. 19, italics in original). The members of the inquiry group are thus taken as co-researchers and they are foundational in both deciding on the topics inquired and the manners to do so. Cooperative inquiry can be applied due to a number of purposes, including (i) development of professional practice, (ii) liberation of disadvantaged groups, (iii) exploration of human experience, (iv) institutional change and development, and (v) development of theory (Oates, 2002). Although the present thesis cannot be said to contribute to the liberation of disadvantaged groups, the four other purposes mentioned are of relevance.

4.3.1 Epistemological foundations of cooperative inquiry

Before going into the practical procedures of cooperative inquiry, I will here outline the epistemological foundations which underpin the methodology. Central to the paradigm of participatory action research is a turn away from the Cartesian divide between mind and body (Reason & Bradbury, 2011), bringing forth the relationship between reflection and action. This is in line with the argument for a widening of traditional academic interest towards an emphasis of the practical.

Heron (1996) outlines a number of epistemological layers which are potentially addressed during a study based on cooperative inquiry – experiential, presentational, propositional and practical. Taken together, these can be labelled a "fourfold 'extended' epistemology" (Reason, 2002, p.170). While these four kinds of knowing are interwoven in everyday life, it makes sense to separate them in order to design, conduct and analyse a research process. Having the fourfold perspective of knowing in mind directs attention and informs how the inquiry is set up.

Experiential knowing is knowing through experience with people, objects, phenomena or situations. This is knowing that is almost impossible to put into words. Take for example the colour blue, it might be instantly recognized but still very hard to describe or define.

Presentational knowing is a way of transferring the experiential knowing into symbolic presentations – may it be gestures, sound, or images – without relying on formalised labels or concepts. Heron and Reason (2008) also includes storytelling as a product of presentational knowing although a concern regarding verbal statements must be addressed here. Language is not only a means with which to convey experience, it also works in the other direction: it can inform the way we conceptualise our

experiences and perceptions. This resonates with the view put forth by Clark (2008), when he describes language "as a form of mind-transforming cognitive scaffolding" (p. 45) (see 3.2.1).

Propositional knowing is knowing through concepts and theories, sometimes referred to as textbook knowledge. It can be formulated in spoken word or written text, as statements and propositions, and spans from generally accepted facts to our own articulated beliefs through which we make sense of the world around us. Although the cooperative inquiry as method seeks to emphasise other forms of knowing, propositional knowing is so much part of our being that it is to some degree filtering our perceptions. Propositional knowing allows for precision and abstraction (and, accordingly, transferability). It also has its given place in the sessions of an inquiry. Concepts and terminology constitute an essential part of dialogue, especially when inquiring into professional work. A cooperative inquiry is also a space where propositional knowing can be tested and evaluated.

Practical knowing is the ability to engage in practice through the exercising of skill. Practical knowing builds on, and includes, the other forms of knowing. This can be formulated as "action in the world, guided by propositional categories, inspired by presentational forms and rooted in and continually refreshed through experiential encounter" (Heron & Reason, 2008, p. 379). Practical knowing is evaluated and sustained collectively through a community of practice (Reason, 2002). Heron (1996) describes these epistemological layers as hierarchically ordered (Figure 5). Clark's (2008) claim that experts are "doubly experts" (p. 49) resonates with Heron's epistemological perspective since the practical knowing integrates propositional and presentational knowing, both of which are partly language-based.

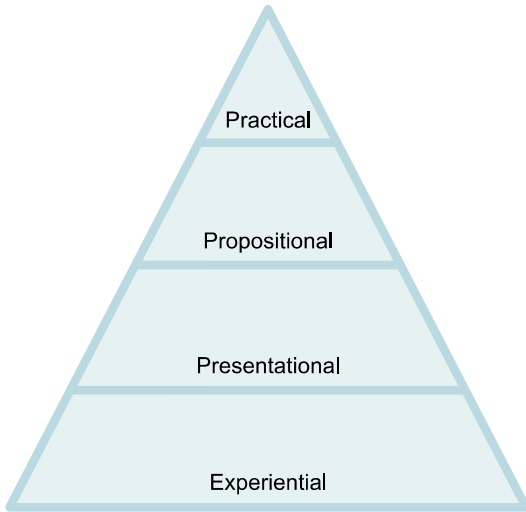


Figure 5
The four layers of the extended epistemology (Heron, 1996, p. 53).

Exploring the different forms of knowing requires the participants to deepen their attunement to the situations at hand. As formulated by Heron (1996): "Perception and memory are born together: to perceive is to remember, at least for a bit. The critical bridge between the two is noticing" (p. 116). As such, taking part in a cooperative inquiry can be an exercise of the skill of achieving access to the world that Noë (2012) explored in *Varieties of Presence* (see 3.2.2.1)

4.3.2 The extended epistemology in a musical example

In order to show how the four kinds of knowing can be discerned in musical context, I will provide an example from my own life. At the time of writing this chapter, I was in Cairo, Egypt, performing with my traditional music ensemble, Jidder. Except for myself, playing the flute, the band consists of a fiddle player and mandola player. One evening of the tour was scheduled for a collaborative session with Egyptian musicians, affiliated with Makan Egyptian Centre for Culture and Arts. Arriving to the venue, we realised that we were supposed to perform together in the concert the day after. The four hours that the rehearsal lasted formed a rather steep learning curve for the members of Jidder, trying to grasp the music that was presented and to do something meaningful in it together with the other musicians. Since I had the categories of knowing on top of my head, I closely observed and took notes regarding the musical process that we

engaged in. Even though we had no spoken language in common with the other musicians, we rather quickly understood the form of the collaboration: they played tunes and songs that they shared between each other, and we tried to contribute to their music.

Experiential knowing. To me the music was unfamiliar, and I noticed how I searched for a structure. First, I was occupied with discerning the tonality carried by the ostinato of the tanbura, and then I recognised fragments of melodies, recurring passages and (for me) surprising melodic paths. At this stage, there was no verbal communication between the members of Jidder. While I (and surely the others as well) could perceive characteristics and patterns in the music, there would be no point of trying to verbalise them, since this awareness was too intuitive and tied up with the exact moment of perception. I relied on my flute to orient in the sound. It was my tool to sense what was in my hands and what in the music that necessitated any changes of my habitual way of playing the flute. The intonation of the tanbura was perceived through my flute, grasping the sounds through alternative fingerings and adjusted embouchure.

Presentational knowing. Musical and physical gestures became the main source of communication since the verbal communication was limited by the language barrier. The Egyptian flute player in particular showed us some melodic themes and, with a nod, he could guide us through the music. One of the percussionists directed her attention towards us on certain occasions, raising her frame drum high, before she marked the transition into a new part of the music, both by letting her instrument fall downwards and through the stronger emphasis with which she let her hand meet the skin of the drum. The singer and tambura player – the leading musician at this particular time – made no apparent signal to us, whether gestural or musical. At one occasion the fiddle player of Jidder turned towards me and asked: "Where is the third?", referring to the intonation of (what we perceived to be) the third step of the scale. My way of answering was to play the note (A^b) adjusting the pitch through the embouchure, altering both the speed of air and the angle with which the airstream meets the edge of the embouchure hole. My way of perceiving the note was through the embodied act of playing. The fiddler responded through her embodied understanding of the sound, altering the position of her fourth finger. To verbalise this correspondence between us would be to take a detour, only to end up with an even more vague translation from our experiential knowing.

Propositional knowing. A bit later in the process, the verbal communication between us had a potential of explaining what we perceived. Filled with musical terminologies in our attempts to decipher the music: tonalities, rhythmical metres, measures, and intonation. This was meaningful to us as a means to form a platform for a deeper musical engagement.

Practical knowing. Ultimately, the expectation was for us to act and to contribute in a meaningful way to the music. At the concert the following day, Jidder played the first set while the second set consisted of the music that we had prepared during the rehearsal. This joint performance was what mattered in the larger picture. The performance was filmed, both by the audience and by staff of the venue. Having the four-folded epistemology in mind, I could use the pause between the tunes to reflect on how the different modes of knowing intersected with each other throughout the process and how, in the words of Heron (1996), "practice consummates the prior forms of knowing on which it is grounded" (p. 34).

The above example is not taken from an everyday experience, but from a rather unique situation. The fact that the music was unfamiliar to me and my fellow musicians and that we had not met the Egyptian musicians (or their instruments) before made for a situation in which I could not rely on professional routine or any given familiar paths for music making. Taken together with the lack of common language, the music making was not over-shadowed by propositional statements, which would have served to abstract the music making process. Therefore it can be seen as a musical situation where the awareness of the extended epistemology became heightened. However, all the dimensions put forth above exist in some form through all music making, whether we are aware of it or not. As shown in the narrative, much of these epistemological processes are hidden for an external observer and accessible only for someone with the contextual understanding (propositional knowing); the initiated practician (presentational); and the individual (experiential knowing). Thus, investigating such forms of knowing demands some form participatory research. In order to directly access the domain of experiential knowing must involve the researcher themselves.

4.3.3 Procedures of the inquiry

The circling movement between action and reflection is a characteristic of participatory research methods in general. Reason (2002) outlines four phases as part of the cooperative inquiry process, and how these phases relate to the four kinds of knowing:

Phase I consists of forming the group, planning and agreeing on topic and procedure. This phase is mainly undertaken in the propositional mode of knowing with elements of presentational knowing in communication between the participants.

In Phase II, the co-researchers engage in the action agreed upon. This phase is mainly concerned with practical knowing and attention is paid towards the procedures and outcomes of individual and joint action: "In particular, they are careful to notice the subtleties of experience" (p. 171).

Phase III is a phase of immersion. It is at the centre of the inquiry method and may be unpredictable. While this phase mainly concerns experiential knowing, the insights

may be more profound if they are expressed through presentational forms of knowing. The immersion may also result in members losing the "awareness of that they are part of an inquiry group: there may be a practical crisis, they may become enthralled, they may simply forget" (p. 171).

In *Phase IV* the group reassembles and returns to the outset of the process (formed in phase I). These questions may now be reformulated or changed. In this phase, the propositional mode of knowing re-enters.

It is possible for an inquiry to go through the above cycle any number of times. Reason (2002) also points out that a cycle is rarely as straightforward as the model suggests: "there are usually minicycles within major cycles" (p. 172). Furthermore, the cycle may also start at any of the phases.

The initiator of a cooperative inquiry takes the role of one co-researcher along with the other members of the group. The facilitator, who may or may not be the initiator, is responsible for the process. Depending on the kind of topic investigated, the role of the facilitator may acquire different sets of interpersonal skills. It is of importance to ensure that all members of the group are engaged in the inquiry. This may include certain procedures such as dividing time equally and minimising the hierarchies within the group in order to have all perspectives represented. Inquiries of more sensitive character may require psychological skills from the facilitator.

A cooperative inquiry can according to Heron (1996) be either *informative* or *transformative* or a combination of both. An informative inquiry will primarily seek descriptions about a practice in order to gain a deeper understanding of it. This will result in propositions about the practice. A transformative study will instead seek to change a practice and the outcome will, therefore, be primarily practical while the propositional outcome will be secondary. Heron (1996) advocates for a transformative approach even while descriptions are the main focus: "You get richer descriptions of a domain if your primary intent is to be practical and transformative within it, than you do if you pursue descriptions directly" (p. 48). This is due to what Heron (1996) terms the *action paradox* (p. 114). In general, seeking to improve a chosen skill puts in relief the changing reality that follows from this advancement. I see a parallel to Gibson's (1979/1986) ideas in that humans must act in order to perceive, and when senses develop over time according to our needs and interests, also the reality around us appears in new shape.

4.3.4 Outcomes of a cooperative inquiry

The outcomes of a cooperative inquiry may take different forms, with varying emphasis of the different kinds of knowing included in the extended epistemology. Although

Heron (1996) argues for an emphasis on practical outcomes, he also acknowledges the importance of propositional outcomes:

> Going for practical outcomes of an inquiry and going for propositional outcomes are complementary approaches, and while the deeper way, the route of primacy, is to choose practical outcomes supported by propositional ones, there is clearly a case for pursuing propositional outcomes supported by practical ones. (p. 34).

The present dissertation is a manifestation of propositional knowing. It is a result of inquiry into all four forms of epistemological knowing by the members of the inquiry group, and hopefully it can serve as a tool for developing both propositional and practical knowing for readers.

4.4 Design of Study A

Informed by the theoretical underpinnings of the chosen methodological path, I will here present the design and procedure of Study A. The following experience that occurred during a tour of Brittany in 2015 provided initial inspiration for the interview concept used in this study.

During a collaboration with my trio, Nos Honks, and guitar player Gilles Le Bigot and flute player Jean-Michel Veillon (one of the interviewed musicians in the present study), I had the pleasure to discuss flutes and flute playing with Veillon. Veillon is a seminal and highly influential flute player in Breton traditional music and during one of these informal conversations, we started to talk about Veillon's career and which flutes he had used during certain periods and on certain recordings. This topic opened up themes such as aesthetic preferences, the intimate relationship between musician and musical instrument, availability of new and old flutes, commercialism, international connections, and negotiations with instrument makers concerning aesthetic visions (personal conversation with Veillon, April 2015). Using the flute(s) as a point of departure and as a constant point of reference, the conversation became a life-story focusing on the heart and soul of Veillon's musical career. Without the intention of doing so, this private conversation proved to be a pilot interview.

This experience gave me the initial idea to use the flute as a tool in the interview situation. To have the instrument at hand during the interviews also enabled the interviewed musicians to make statements through more than verbal means. At several occasions, the interviewed musicians took up the instruments and showed me fingerings, examples of postures, melodic phrases, and other aspects of their musical practice.

In order to facilitate such a variety of statements, I asked the interviewed musicians to bring their flutes to the interviews. I also brought my own flute and played one or two tunes in order to demonstrate my own musical practice and this was also a way to present the background of the study. Hardly surprising, the interviewed musicians shared the curiosity directed at the musical instrument, a fascination that underlies both studies of the thesis.

4.4.1 The interviewees

The flutists in Study A are: Jean-Michel Veillon (FR), Conal O'Grada (IR), Anna Roussel (FR/SWE), Andreas Ralsgård (SWE), Lisa Beznosiuk (GB), and Stéphane Morvan (FR). The interviewed flutists all contribute with their experiences as situated in different musical contexts: Veillon in Breton traditional music; O'Grada in Irish traditional music; Beznosiuk in Historically Informed Performance (19th century) of Western art music; Ralsgård in Swedish traditional music. Roussel transitioned early in her career from Breton to Swedish traditional music and this change of musical context brings yet another perspective. Morvan offers a flute makers perspective on the contemporary design and making of simple-system flutes. They were asked to be part of the present study since they have been involved in the processes of establishing the simple-system flute in their respective genre or tradition. Whether it has meant newly introducing the instrument in a genre where it had not been present before, or whether it has been a process of revitalising the instrumental tradition within a genre, varies between these musicians. But for all of them, stylistic development and careful aesthetic consideration have been part of their career as musicians.

The following section provides short biographical introductions to the interviewed musicians. It also presents the flutes that are discussed in Chapter 5. In order for the reader to be able to follow the different flutes as they appear throughout the text, they are provided with a code[19]. Except for these reoccurring flutes there are also flutes mentioned in the text that are not as frequently referred to.

4.4.1.1 Interviewee 1: Andreas Ralsgård

(b. 1973)

Born in Skåne, the southernmost region of Sweden, Ralsgård was educated as a saxophonist at Ingesund School of Music in western Sweden. As a flute player, he has worked with both Swedish and Irish traditional music. He currently teaches at Landskrona Municipal Cultural School (Landskrona kulturskola) and Skurup's folk

[19] Reading the thesis as a PDF allows the reader to use the search function in order to follow a certain flute through Chapter 5.

high school (Skurups folkhögskola). He has released recordings with Swedish traditional music with his ensembles Mats Berglund trio and Ralsgård & Tullberg. Andreas Ralsgård has been friend and colleague of mine for fifteen years and we have collaborated intensely over the years, primarily through our duo.

The interview with Ralsgård was conducted in his home in Smörhålan, Sweden on February 23, 2017. The flutes that Ralsgård mainly refers to are two modified German flutes, one modern Rudall & Rose type flute made by Francois Baubet, and one 19th-century flute made by Swedish maker Iacob Valentin Wahl.

FL RA 1: Modified German flute. (Figure 6)
FL RA 2: Modified German flute with foot piece by Tim Adams, Sweden. (Figure 7)
FL RA 3: A Rudall & Rose type[20] flute made by Francois Baubet. (Figure 8)
FL RA 4: A flute made by Iacob Valentin Wahl. Wahl was based in Landskrona in Sweden. His workshop produced flutes as well as other wind instruments. (Figure 9)

Figure 6
FL RA 1

Figure 7
FL RA 2

[20] "Rudall & Rose flutes" refer to the original instruments while "Rudall & Rose type flutes" refer to flutes made by other makers based on those flutes.

Figure 8
FL RA 3

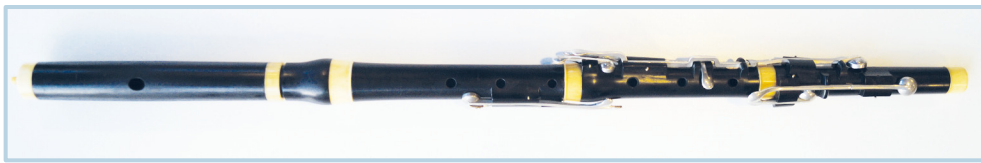


Figure 9
FL RA 4

4.4.1.2 Interviewee 2: Lisa Beznosiuk

(b. 1956)

Beznosiuk found her passion for early music during her studies at the Guildhall School of Music in London. Her teacher, Stephen Preston, introduced her to the one-keyed baroque traverso as well as the simple-system flute and she is now one of the world's leading performers on early flutes. As a soloist and orchestral principal, she has performed and recorded a wide range of 18th and 19th century repertoire on a variety of historical flutes from her own collection, with many well-known ensembles. She is also a passionate and dedicated teacher, being professor of early flutes at Royal Academy of Music, Royal College of Music, Guildhall School of Music & Drama, Royal Northern College of Music and University of Birmingham.

The interview with Beznosiuk was conducted at her home, in London, on March 3, 2017. Although Beznosiuk has a rather extensive selection of flutes, the ones mostly referred to in the next chapter are an original Rudall & Rose flute and an original Thibouville flute.

FL BE 1: Flute made by Rudall & Rose in London, England c. 1840. (Figure 10)
FL BE 2: Flute made by Martin Thibouville in France c. 1840. (Figure 11)

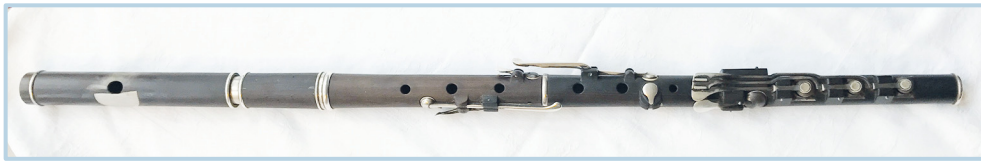


Figure 10
FL BE 1

Figure 11
FL BE 2

4.4.1.3 Interviewee 3: Anna Roussel

(b. 1983)

Roussel was born in Brittany, France. After studying classical music on the Boehm flute during high school, she took up the simple-system flute due to her interest in Breton traditional music. She worked as a flute teacher in Brittany before she moved to Sweden in order to pursue an education in Swedish traditional music. After one year at Bollnäs Folk High School (Bollnäs folkhögskola), she studied at The Royal College of Music, Stockholm in Sweden where she stayed for three years, gaining a Bachelor's degree in Swedish traditional music. During these years, she adapted her playing technique from Breton flute playing to Swedish traditional music under the guidance of teachers playing Boehm flute and saxophone. After completing her Bachelor's degree, she stayed in Sweden and worked with traditional music in various ensembles. She released a CD with each of the two bands Skaran (with a cellist and a nyckelharpa[21] player) and Nos Honks (with myself and saxophone player Jonas Knutsson). She moved back to Brittany in 2014.

The interview with Roussel was conducted in her home in Belz, Brittany, on March 24, 2017. In the interviews, Roussel mainly refers to her Rudall & Rose type flute made by Stéphane Morvan. Also, her Geert Lejeune flute is mentioned.

[21] Nyckelharpa is a keyed violin common in Swedish traditional music.

FL RO 1: Rudall & Rose type flute made by Morvan in 2005. (Figure 12)
FL RO 2: E^{b} flute made by Geert Lejeune, Belgium. (Figure 13)

Figure 12
FL RO 1

Figure 13
FL RO 2

4.4.1.4 Interviewee 4: Stéphane Morvan

(b. 1970)

In his youth, Morvan played Breton traditional music on bombard and binioù[22]. Eventually he became interested in Irish traditional music. While working as a freelance musician in those genres, he started to experiment with flute making. For a long time, he made flutes only for himself, but in 2005 he started to work professionally as a flute maker. The interview focused on his work as a flute maker and the connection between the development of his instrument design and his aesthetic vision. The close collaboration with Breton flute players has been, and still is, vital to his progressive approach.

Since I was fortunate to meet Morvan at his home, I was given a tour in the workshop where he could show me the tools and material used in the making. By explaining the use of the equipment, he took me through the basic principles of his work. The interview afterwards was conducted with the help of Anna Roussel, taking the role of interpreter. I either asked questions in English directly to Morvan, upon which he

[22] Bombard is a double-reed shawn instrument with conical core and Binioù is a small high-pitched bagpipe. These two instruments are often played together in Breton traditional music and are associated with loud volume.

answered in French, or I asked Roussel to translate both the questions and the answers. She did not translate what was said word by word, but inevitably she used her background and pre-understanding of the issues discussed to translate the meaning of Morvan's answers, sometimes in a concise manner. The audio/video recording of the interview and the transcription thereof was sent to her in order to adjust some of her translations.

The interview with Morvan was conducted in his workshop and home in Elliant, Brittany, on March 25, 2017. Below is a picture of Morvan's second model, which is referred to in the next chapter. Roussel plays a flute of his first model (FL RO 1), and Veillon plays a flute of his third model (FL VE 4).

> FL MO 1: Morvan's flute based on a Boosey & Co.'s 19th century Pratten model. This flute is referred to in the text as his second model. (Figure 14)

Figure 14
FL MO 1

4.4.1.5 Interviewee 5: Jean-Michel Veillon

(b. 1959)

Veillon was born in Eastern Brittany. As a child he was a bombard player and dancer of Breton dances. He started to play the flute after hearing the playing of Michael Tubridy on recordings of the Chieftains. He strongly influenced the emerging flute playing in Breton traditional music during the 1980s and 1990s through his work with ensembles such as Kornog, Den, Barzaz and Pennoù Skoulm, as well as through his solo recordings.

I collaborated with Veillon in 2014/2015 when my trio, Nos Honks (in which Roussel is part) toured Sweden and Brittany together. The tours were preceded by a number of rehearsals in order to work on a joint repertoire to be performed in the upcoming concerts. This collaboration was also the context for the conversation that functioned as a pilot interview described above. When I interviewed him in 2017, I knew Veillon and was familiar with some aspects of his playing.

The interview with Veillon was conducted in his home in Kerhuel in Pédernec, Brittany. March 26, 2017. In Chapter 5, Veillon refers to his first flute, a one-keyed

flute from the 19th century. His second flute was made by Bruce Du Ve in the 1970s. Veillon also refers to a Rudall & Rose type flute made by British maker Chris Wilkes in the 1990s, and his recent flute, made by Morvan.

FL VE 1: One-keyed flute, made by Jean Daniel Holtzapffel in 19th-century Paris. (Figure 15)
FL VE 2: Flute made in 1970s by Bruce Du Ve (Ireland) with one key added. New head piece made by Colin (Hammy) Hamilton. (No picture)
FL VE 3: Rudall & Rose type flute made by Chris Wilkes, 1990s. (Figure 16)
FL VE 4: Flute made by Stéphane Morvan. Referred to as his third model. (Figure 17)

Figure 15
FL VE 1

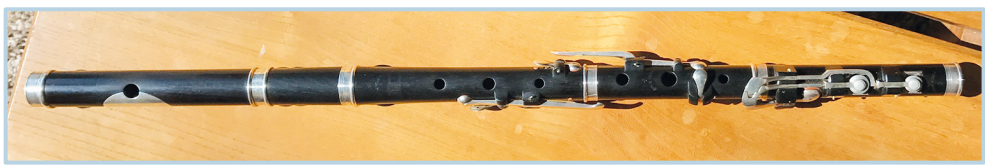


Figure 16
FL VE 3

Figure 17
FL VE 4

4.4.1.6 Interviewee 6: Conal O'Grada

(b. 1961)

Born in Cork, there were very few flute players around when O'Grada first took up the flute and he was encouraged and inspired by musicians on other instruments. He established himself as a distinct voice on the Irish traditional music scene and through his rhythmic style he inspired many flute players to develop this aspect of the music. Today, he teaches flute at University College of Cork. He also teaches privately as well as at a primary school. Beyond this, he also offers individual tuition via Skype. He has released two solo recordings as well as two recordings with his band Raw Bar Collective.

The interview with O'Grada was conducted at the Ionad Culturtha Arts Centre, Ballyvourney, October 2, 2017. O'Grada refers to two flutes – his original Rudall & Rose, as well as his present flute made by Hamilton.

> FL OG 1: Rudall & Rose flute with a Fentum head piece (both made in 19th century London). (No picture)
> FL OG 2: Flute made by Hammy Hamilton 2011. (Figure 18)

Figure 18
FL OG 2

As is shown in the presentation of the interviewees, the choice of flute players participating in the study can be described as a result of "strategic sampling". The purpose of this sampling is to give an insight into a variety of different genres, traditions, musical backgrounds and professional lives, and how these conditions may be reflected in the musicians' approaches towards their chosen instruments.

4.5 Design of Study B

Study B is a cooperative inquiry. As Heron (1996) clearly states, he is not advocating for the creation of a "new orthodoxy" (p. 6), and he discerns that his book is *one* account of the cooperative inquiry process and not *the* account. Consequently, it is up to each inquiry group to tailor the method in a way that makes sense with regards to the

purposes and aims of the process at hand. As I see it, it is also the responsibility of the facilitator to report back about the learnings from the inquiry, in order to contribute to the growing number of accounts from complete inquiries.

The Simple-System Flute Study Group was formed by members of a wider informal community of flute players. Having met more or less regularly over the last ten years, I sent out invitations to members that I thought might have an interest in taking part in a more structured and intense process. Several were interested, but there were apparent practical hinders: We were to meet at ten occasions during the course of four months, at least two hours at a time, and it would demand some effort from the participants, also in the time between the sessions. Unfortunately, none of the invited female flute players were able to take part in the study. It should be noted here that the small simple-system flute community in Sweden consists primarily of males. This is in sharp contrast to the picture regarding Boehm-flute players, whom are mostly, especially in the younger generations, female. This is not unique to Sweden but part of a recurring pattern of relations between musical instruments and gender, where the flute today in the West (in this context meaning Boehm's cylinder flute) is associated with the feminine side of the spectrum (Zervoudakes & Tanur, 1994; Abeles, 2009; Hallam et al., 2008; Harrison & O'Neill, 2000; Cramer et al., 2002). Had the gender distribution of simple-system flute players in Sweden been different, the representation of gender in the cooperative inquiry group could have been different.

Five flute players (excluding myself) were assigned to the study and we could schedule our first initiating meeting. The group consisted both of professional musicians and teachers, students in higher music education and amateur flutists who mainly play the flute when occasions arises such as jam sessions, festivals and smaller get-togethers. Thus, different kinds of skills and approaches where represented in the group.

In order to create a relaxed and open atmosphere, the initial session took place in my personal workspace. Over coffee and tea, we discussed what we would like to focus on and, after having filled the large whiteboard with ideas, we agreed to have everyone be responsible for at least one thing that they would like to share, develop, practice or examine. We would then be open to see what happened and make further plans along the way. Thus, the Simple-System Flute Study Group was formed. Henceforth the members of the inquiry group (including myself) will be referred to as participants.

Except for the initial meeting, all sessions took place in the music studio at the Humanities Lab at Lund University. With the help of the research engineer the sessions were documented by five video cameras. Three cameras (A, B and C) captured two participants each, while a fourth camera (D) captured the whole group. The 360° camera (E) was placed in the middle of the circle. Since each session lasted for two

hours, the documented material, all cameras included, amounts to 90 hours (the initial session was not filmed).

One of my initial concerns was how this physical framing of the sessions would impact the process. However, as soon as we settled in, I realised that this would be no problem. I can distinguish two reasons for this. Firstly, all of the participants knew each other well and thus they were comfortable in each other's company. As a group, we brought with us, our own already established, atmosphere. Secondly, we are all musicians, well acquainted with the situation of being in a recording studio and with recording devices in general. As it turned out, all of us used recording devices as part of our respective practice routines. What, for another group may be an intimidating framing, turned out to be a comfortable setting for us as. As part of the process, we also created a private Facebook-group for our internal communication. Here, we shared material relevant to what we were working on: videos of exercises, tunes, slides from presentations etc. The nature of this material will be more fully described in Chapter 6.

The action and reflection phases merged, and the sessions contained of both long episodes of joint reflection upon themes that surfaced, as well as longer periods of actions, resembling more a rehearsal with six musicians trying to make as good music as possible. The balance between action and reflection came spontaneously and questions were raised by all participants. Often, the reflection turned into impromptu experiments, which in turn took the reflection to another plateau. The pattern of reflection and action lies close to how a rehearsal in the genre (Swedish traditional music) may progress: evaluating, planning, and testing until a satisfactory arrangement or manifestation of the music is agreed upon. The main difference is perhaps that in the inquiry session, a finalised musical result seemed to be of secondary interest to the participants. The development of new skills and the findings of new insights appeared to be the prioritised activity.

4.5.1 Overview of the sessions

In order for the reader to get an overview of the content and the progression of the cooperative inquiry, I here present a short summary for each session. This short narrative aims at describing the backdrop against which the thematical analysis should be understood. The statements (both musical and verbal) were always made in the context of a wider process. The names of the participants have been changed. I elaborate on the reasons for this in 4.6.2 below.

Session #1, 1 March 2019

Present: Viktor, Anton, Rikard, Bill, Oscar, and Teo

In this initial session, the six participants (including myself) came together in order to plan the study. As the organiser, I had coordinated our calendars and decided upon ten dates where as many of us as possible would be able to attend. I had also booked the studio at Humanities Lab at Lund University, where the following nine meetings were to take place. Other than that, the agenda and focus was up to the group to decide. We used the white board to jot down the ideas that surfaced during the brainstorm and together we came up with an explorative agenda, examining the practice of flute playing from different perspectives. As stated earlier, we decided that all of us would be responsible for at least one activity, which could be limited to a single session or could be an ongoing project throughout the study. Everyone was more interested in entering into an open process, focusing on reflection and improvement of skills, rather than aiming for a finalized musical product.

Session #2, 8 March 2019

Present: Viktor, Rikard, Bill, Oscar, and Teo

This session started with Rikard's chosen activity, which was a traditional Swedish tune (henceforth Tune A). Except for the melody he had prepared two harmonies, of which he taught us one. Whereas a common way of providing harmony in the conventions of the genre is linear and more or less parallel to the melody in thirds and sixths, Rikard's harmony was constructed in a contrapuntal manner. He taught us the harmony by ear, which is the way we usually work. Some passages, such as a broken A7 chord, prompted us to try out various fingerings and reflect of how we think of intonation and what we listen for while playing in a group of musicians.

The second half of the session was dedicated to Bill's prepared activity – a presentation he called "Grips and Lips". At the time of the study, one of his concerns as flute player was to improve his balancing of the flute and his embouchure. In the presentation he showed us instructions from 19th-century flute tutors as well as pictures of contemporary (simple-system) flute players, in particular Nicholson's *A school for the flute* (Nicholson, 1836). He also gave us an "embouchure quiz" in which he showed us close-up pictures of flute players lips at the moment of playing. Together, the group found the answer to all of the pictures. The diversity of ideas around the topic "Grips and Lips" lead to reflections about our own ways of holding and balancing our flutes, as well as our individual embouchures. We also compared the sizes of our hands and bodily features, such as to what extent we were able to bend our thumbs backwards. The session gave us things to think about, and also a framework of references regarding basic flute playing techniques.

Session #3, 15 March 2019

Present: Viktor, Anton, Bill, Oscar, and Teo
We started off repeating Tune A and the harmonies that we learned the previous week. Then we moved on to Oscar's chosen activity. Over the years, Oscar has thought much about breathing. Having a background as a brass player, he attended workshops and sought for information regarding breathing and breath support. Especially inspired by the pedagogical legacy of tuba player Arnold Jacobs (Frederiksen, 1996), Oscar applied the exercises he found helpful for the flute. The exercises we did during the session aimed at exploring the elasticity of the lungs, and how this can be used in order to breathe. After having located the neutral position of the lungs, we explored how the muscular effort increased as we filled our lungs. This led us to discussions and experiments on air management, breathing patterns and sound production in general.

Session #4, 22 March 2019

Present: Viktor, Anton, Rikard, Bill, Oscar, and Teo
The session started with repetition of the breathing exercises of Session #3. Then Rikard taught us the second harmony to Tune A. In line with the first harmony that he taught us in Session #2, this too was devised with contrapuntal inspiration.

Then we moved on to the chosen activity of Viktor. The time of the study coincided with a, for Viktor, growing interest in Bulgarian traditional music. As part of his studies at the music academy he took lessons from an accordion player, focusing on Bulgarian music. He shared with us his experience of entering a new musical world and taught us the first parts of a tune. Special focus was directed to the ornamentation, which relied on automatized and fast finger movements. The tune (henceforth Tune B), called Krivo Horo, is in the metre of 11/16 and made up of six parts. For the rest of the participants, the music was new and unfamiliar.

We discussed the learning experience, our different ways of memorising the music and how we experienced the new movements involved in executing the ornamentation. Also, we reflected on our experience of teaching in general and the implications of teaching music from a tradition other than our own.

Session #5, 29 March 2019

Present: Viktor, Anton, Bill, Oscar, and Teo
Session #5 started with the repetition of the first parts of Tune B, which led us to continue the reflection on memorization. At this occasion we discussed inner visualisation, and how we experienced the tactile dimension of music making, especially while learning new music.

As Anton's chosen activity, he presented a document of practice that he had compiled for one of his students. It was a collection of exercises that Anton shaped

himself and learned from flute teachers he had during his years as student. The document contained exercises for improved embouchure, finger technique and breathing. During the presentation, we tried out the exercises and discussed our habits of practising and other useful exercises that we used. Furthermore, the presentation led to a continuation of the discussion on teaching experiences from Session #4.

Session #6, 5 April 2019

Present: Viktor, Rikard, Bill, Oscar, and Teo
The session started with a repetition of Tune B. After that we repeated Tune A and the two harmonies. This prompted a round of reflections regarding listening. Since the three lines (melody and two harmonies) are more melodically and rhythmically independent than usual (with regards to the conventions in Swedish traditional music) we talked about how we perceived the music. If we listened to each part, particularly the part that we played our selves at the moment, or if we perceived the three parts as one united body of sound.

The reflections about listening in Session #2 prompted me to compose a piece where we could all have a separate part (henceforth Tune C). These parts consisted of a melody and five eight bar harmonies. The music was inspired by the harmonic progression "La Folia". In between Session #5 and Session #6, I had recorded a video in which I played through the different parts. I posted the video on our Facebook-group, so that all participants could learn "their" part. When we met, we could play the parts through and experiment with an open musical form.

Session #7, 26 April 2019

Present: Viktor, Anton, Rikard, Bill, Oscar, and Teo
The session started with us playing Tune A with the harmonies. We played it through a couple of times and agreed that it sounded better this time. This was due to the fact that we had become familiar with how the three lines intersected so that we were able to listen and anticipate what was to come from the others. In this way we were able to balance the volume in a more dynamic way, highlighting certain passages of our own lines, and giving space for others where we felt it would be appropriate. Without articulating it, we had a more or less communal idea of the dynamic shapes.

We then continued with Anton's document with technical exercises and the discussion that this document spurred. Towards the end, we continued working on Tune B.

Session #8, 3 May 2019

Present: Viktor, Anton, Rikard, Bill, Oscar, and Teo
We started the session by playing Tune A, which by now had become our warm-up tune. Since this tune was entangled by reflection on listening, it had now become a method for adjusting our listening to each other. A way to "tune in" with the rest of the group. We continued the discussion about dynamics from Session #7.

This led us to further experiment with listening while playing Tune C. We tried different patterns of looking/listening and following each other. This led to reflections on our different playing habits. Some of us prefer to play with closed eyes, while others listening is closely tied to the visual. Based on what surfaced during the reflections, we sat up new experiments, trying to challenge our habitual behaviours regarding perception and attention.

We then continued with a new piece of music, Tune D. This tune was composed by me and uploaded to the Facebook-group as plain sheet music (without symbols and marks to guide the interpretation) and a generated MIDI file. The idea was to provide musical directives as neutral as possible in order to spur a discussion about interpretation. Attached to the MIDI file/sheet music was an instruction for the participants to learn the tune and give it a musical shape. Then they were asked to record a version and bring it to the session. During the session, we listened to each recording and everyone could tell us of their experience of learning the tune and explain what they chose to do with the tune and why.

We finished the session by repeating Tune B.

Session #9, 10 May 2019

Present: Anton, Rikard, Bill, Oscar, and Teo
We started again by playing Tune A. Then we continued with new piece of music, Tune E. This was also an experimental tune, like Tune D, and the instructions were the same. As in Session #8, everyone played their recording and talked about their process.

Session #10, 24 May 2019

Present: Viktor, Anton, Rikard, Bill, Oscar, and Teo
This last session started with learning the final parts of Tune B. After that we continued with tune, a piece of music composed by Rikard, with the same frame as Tune D and E. Tune F was uploaded in the Facebook-group as sheet music, without any MIDI file. This time the time signature gave rise to different interpretations due to the asymmetrical character of some Swedish traditional music. Since both Tune E and Tune F were transposed as part of some interpretation processes, we came to discuss how tonalities are, to some degree, attached to timbre. Discussing this, we also agreed

that this relation (tonality/timbre) appeared differently on different flutes, since they are idiosyncratic instruments. This led us to an experiment of flute-swap in which we passed around our flutes and played Tune E once or twice, before passing around the flutes again. When all of us had tried each flute, we presented our impressions of everyone's instrument. This provided detailed descriptions of aspects such as hole sizes, key mechanisms and responsiveness. We also shared our experiences of coming back to our own flutes again, after having tried the others.

The activities

The above description presents a condensed account of the inquiry sessions. The activities that constitute the sessions are of two kinds either continuous (tunes that we work upon throughout the course of multiple sessions) or cohesive (taking place during a part of a session, like a workshop or presentation). But although some activities appear to be limited to one session, they did in fact impact the whole process, since these activities highlighted topics that were merged together during reflection phases in later sessions. The following activities are referred to in the presentation of the results in Chapter 6.

Continuous activities

Tune A: A traditional Swedish tune (polska) after[23] Johan Jacob Bruun[24] This tune was taught by Rikard who also composed and taught a second and a third voice (see Figure 43 for transcription).
Tune B: Krivo Horo, a traditional Bulgarian tune that was taught by Viktor, following a presentation on his experiences of learning Bulgarian music with a special focus on the ornamentation (see Appendix 4 for transcription).
Tune C: A tune composed in order to investigate, through practice, questions regarding listening that emerged through the study (see Figure 36 for transcription). The parts were recorded in a video clip and shared through the Facebook-group.

Cohesive activities

Tune D: A "lab-tune" composed by Teo in order to spur a conversation regarding interpretation of traditional music (see Figure 37 for transcription).
Tune E: Another lab-tune composed by Teo (see Figure 39 for transcription).
Tune F: A lab-tune composed by Rikard. (see Figure 42 for transcription).

[23] "After" in this context is part of the terminology of Swedish traditional music. When a tune is "after" someone, it means that it is associated with that person's repertoire. In many cases (including this) the tune was once transcribed by a music collector having the person in question as his or her source.

[24] Flute player, 1818-1889

Grips and Lips: Bill's presentation on issues of balance, embouchure and posture, drawing upon historical sources, modern research as well as examples of contemporary flutists in various traditions.
Breathing workshop: Oscar's workshop on breathing based of his own practice and experiences from playing the trumpet.
The practice guide: Anton's chosen activity was a presentation and a discussion based on a collection of exercises and advice that he compiled for his students. This activity led us to try out several technical exercises. As part of the Anton's presentation, the group played Tune G in an exercise of transposition.
Swapping flutes: During Session 10, the group decided to try out each other's flutes, and to share some thoughts about them, and about what is valued in simple-system flutes in general.

4.6 Analytical concerns

In this final section of the methodology chapter, I explain the analytical procedures and address concerns regarding anonymity of the involved musicians. Finally, I declare and reflect upon my own position as musician-researcher.

4.6.1 Analysis

The analysis was done in three separate phases: (i) Study A was first conducted, analysed and published as a licentiate thesis (Tullberg, 2018a). (ii) Study B was then conducted and analysed, after which I went back to the (iii) analysis of Study A to see whether new patterns of meaning unfolded.

The six interviews of Study A generated a vast amount of empirical data of audio/video recordings. The duration of the interviews varied between approximately 60 minutes to 180 minutes. All interviews were audio/video documented using a Zoom Qn4 recorder. Transcriptions of interviews one to four were conducted using Quicktime and word, while transcriptions of interviews five and six were done in NVivo (version 11.0.0). The analysis of all data was conducted using NVivo.

The main corpus of empirical data from Study B consists of the video material from the documented sessions. The video from camera D was imported into NVivo (12.15.0) where the transcription and initial coding were done.

As presented in 4.1, the qualitative research approach and, consequently, the analytic process of the present study is inspired by the hermeneutic tradition, where the interpreter is co-creating the meaning from the horizon of his or her understanding

(Kvale & Brinkmann, 2009). I see the analytic process as focused around some fundamental phases. As recommended by Silverman (2014), I began the analysis by focusing on a small amount of data. This "intense analysis [...] provide[s] a good initial grasp of the phenomena" (p. 114). The initial data of Study A consisted of the transcription of the first interview (Ralsgård) and the analysis provided an idea of what themes potentially could become central to the study. Having identified such themes, I realised that there were segments of the interview that would benefit from further questions. While maintaining the open attitude, this initial transcription and analysis provided some guidance in the conducting of the following interviews, and thus commencing the extended analysis (Silverman, 2014). The same holds true for the analytical process of Study B, where the first video documented session (Session 2) was used to find a way to approach the material. Consequently, there are two initial phases, for Study A and B respectively taking place two years apart.

After the first reading (or watching/listening) of the material, I searched for units of general meaning. These units can be defined as "those words, phrases, non-verbal or para-linguistic communications which express a unique and coherent meaning (irrespective of the research question) clearly differentiated from that which precedes and follows" (Hycner, 1985, p. 282). Following the recommendations of Kvale and Brinkman (2009), the units of general meaning that emerged were summarised into a few words or a sentence. Through similarities found among these units of meaning, they could be combined into clusters of meaning, from which themes emerged. Underpinning this procedure was the pendulum movement between the parts and the whole of the hermeneutic circle. This was of essence in order to put the discrete statements into context and to gradually expand the horizon of my understanding.

The computer program NVivo is designed with the qualitative researcher in mind. It facilitates a structuring of the analytic process, through in-built tools for coding. It also allows for a close relation between the transcribed text and the video recording. This makes it easy for the researcher to reference the video segment of a certain statement. Frequently during the analysis, I required audio/visual support for the interpretation. This is of course especially true regarding statements directly involving interaction with the flutes, such as playing, demonstrating fingerings, and pointing at certain physical features of the instrument. In the analysis of Study B, the video material of the other cameras was used when I found it necessary to view a certain sequence from another angle. Most often, this concerned a demonstration of a flute or to get a better view on a fingering used.

Even though there is a theoretical framework informing the perspective of the analysis, the themes and patterns emerging did not resonate against fixed categories of affordances. Rather, the results from this analysis will be reviewed from the theoretical

landscape presented in Chapter 3. Thus, I worked with an inductive approach in order to further deepen the theoretical understanding of musical affordances.

Drafts of the results chapters were sent to the involved musicians for them to read and comment upon. This was done in order to verify that my quotations and interpretations of their statements were correct, in the sense that their intention behind the statements was conveyed. This procedure also gave the interviewed and participating musicians the possibility to clarify their statements and to add further comments.

4.6.2 The question of anonymity

I have chosen, with consent from the interviewees, to use the true names of the interviewed musicians in Study A. The reason for this is two-fold. First, all of the interviewees are high-profile professional musicians in their respective field. They all have unique and individual background stories that would be hard to anonymise. De-contextualising their statements in such way would also compromise a crucial aspect of the study since these backgrounds are vital to understand their approach to the instruments. Second, using the proper names also allows the reader to locate recordings, books, interviews and other sources, adding to the information conveyed here.

However, by choosing to use their names, I have taken some things into consideration that would otherwise be irrelevant. A few statements regarding flutes, flute players and makers were clearly made to me in person and intended to be off the record. Some of these statements would have been of interest to add to the results, but they would have exposed the interviewed musicians in ways that would break the trust between researcher and interviewee. Although these statements would support my theoretical discussion in Chapter 7, they would not alter or contradict the arguments presented.

For Study B, the situation is different. In the cooperative inquiry, the participating musicians probed deep into their experience of playing music and shared their thoughts generously. One of the conditions for creating a safe and open environment was the anonymity of the participants. Furthermore, the results presented in Chapter 6 are not as reliant on on the individual profiles of the musicians, and using the true names would not add value in the same way as in Study A.

4.6.3 My position as a researcher

My close relationship to some of the musicians in Study A, as well as my previous and ongoing relationship with the participants of Study B, has been clarified above. For the sake of transparency, there might be good reasons to discuss the implications of this

involvement, from a methodological point of view. However, there are other (perhaps more fundamental) principles regarding the researcher's role in all qualitative research, and especially in hermeneutical inspired approaches that makes it necessary to explicitly address my position towards the subject of study. My background as a flute player and flute teacher informs my preunderstanding and thus, my point of departure in the analysis. Being a flute player specialised on the simple-system flute allowed the interviewed musicians to make detailed descriptions regarding playing technique. We also had a shared knowledge about the simple-system flute in terms of history of development and different models.

My specialisation in Swedish traditional music, and a rather extensive background also in Irish traditional music, positioned me closer to some of the interviewed musicians than others. This preunderstanding is an interpretational point of departure that undoubtedly forms the understanding of the empirical material. A researcher with different background would certainly interpret the statements differently, according to his or her preunderstanding. That said, adopting a hermeneutically inspired research approach simultaneously acknowledges the existence of "a legitimate plurality of interpretations" (Kvale & Brinkmann, 2009b, p. 213). The fact that I knew, and had collaborated with, some of the musicians of both studies demanded that I was careful, both during the interviews and the inquiry sessions, as well as in the analysis. I had my own idea about the musicians' approach towards their instruments but strived to put that aside. I asked questions although I thought I knew the answer and had them demonstrate what they said through their flutes although I know their playing fairly well. Through these procedures I quickly became aware that, although I had a previous experience of making music with all of them, I knew very little about the processes that constituted their playing.

In the following two chapters, I present the results of the interviews conducted in Study A, and the cooperative inquiry of Study B respectively.

Chapter 5

Results of Study A: In safe hands

In this chapter, I present the results from the analysis of the interviews with the musicians in Study A, in order to answer the first research question: *How do flutists talk about their approaches to, and the possibilities of, the simple-system flute?* I will first (5.1) address the issue of finding a satisfactory instrument, as this is a foundational condition in the discussion of its affordances.

As will soon be obvious, the availability of simple-system flutes has increased significantly since the 1960s. Where the interviewed musicians are based, also impacts the availability of flutes. In 5.2, I present what the interviewed musicians say about various historical and contemporary flute models and makers, whereas 5.3 explores issues of playing technique such as air management, articulation, and fingering. The reasons behind, and the different approaches towards the modification of their instruments are presented in 5.4, while other issues, such as cracks and maintenance problems are dealt with in 5.5. Perception of interpretative possibilities in the musical material are presented in 5.6, followed by the recurring question of how much sound can be attributed to the player and how much can be attributed to their flute (5.7). Finally, thoughts on the theme of utilising exploration, as a learning strategy emerging in the interviews, are presented in 5.8.

The musicians are not representatives of anyone but themselves. At the same time, what they say about their flutes and what they demonstrate musically during the interviews is framed by the musical context in which they work and their background. In this way, a wider context is visible through their individual statements. The aim of this chapter is to provide an insight of the topics that were brought up and stressed by the musicians themselves, rather than to provide an exhaustive description of all aspects of the interviewed musicians' flute playing.

The character of the statements is subjective, in the sense that they convey the experience of the interviewed musicians. They are expert musical practitioners with limited knowledge (which they acknowledged themselves) about the scientific principles of the instrument. Stéphane Morvan is an exception since he researched these matters as part of his professional development as a flute maker. During the interviews, all of them comment on this subjective nature of their perspective – none of them

claims to express an objective truth regarding flutes and flute playing. However, their statements are no less precise and "true" to their experience as professional musicians. It is my intention to present these statements in a manner that makes sense, while still providing an insight to the subjective nature of the relationship between the musician and the musical instrument. Following from this, I have used the words of the interviewed musicians themselves as much as possible. This is the story they tell, in words and through their flutes.

5.1 Finding a flute

The interviewed musicians have different stories regarding the process of acquiring flutes. Topics such as aesthetic preferences, availability of flutes, the emergence of modern-day makers, and the second-hand market of original 19th and early 20th century flutes are entwined in these stories. As is obvious from the accounts of these musicians, much has changed during the time span covered by their careers. Also, where the interviewed musicians have been based, and what international connections they have manage to establish had an impact on the possibility of acquiring quality flutes.

5.1.1 Original flutes

Before the prevalence of contemporary makers, original flutes, mainly from the 19th century and early 20th century were the only simple-system flutes available, and instruments in good condition were rare. When Veillon aquired his first flute, these instruments were scarce, as was information about them. He received his first flute (FL VE 1) as a teenager, from a school friend. He was thrilled, not knowing that in fact it was a one-keyed flute suited for the old fingering system, and not the kind of flute that he had heard on the Chieftains LPs.

> I was amazed. An instrument for me! You know you have to consider [that] at that time it's not like now when you have young people getting instruments – not at all the situation then. So, to get this instrument, I was ahhh! And I had some information from people – no internet of course – saying you have to oil it. Oil it? I didn't know what to do. I remember having bought a bottle of linseed oil, which is not very good for that by the way. And I started to take care of it more. (Veillon)

As mentioned in 2.1, simple-system flutes remained in production in Germany well into the beginning of the 20th century. They were mass-produced and the manufacturers targeted amateur musicians. When O'Grada started to play the flute in the late 1960s, there were not many flute players in Cork, and not many flutes available. The lack of living flute makers meant that there were few good quality flutes available. The flutes that were available were mostly low-quality, mass-produced, German-made models which O'Grada jokingly refers to as "sticks".

As described in Chapter 2, 19th-century London had a thriving flute-making industry. One of the most successful flute-making firms of that era was Rudall & Rose. Of limited availability in 20th-century Ireland, Rudall & Rose flutes were rare treasures for flute players there. Despite the lack of quality flutes in Ireland at the time, O'Grada was lucky to come across an original Rudall & Rose with a head piece made by Fentum (FL OG 1):

> To tell you exactly there was this English man who used to buy flutes in England in second-hand shops and bring them over here. So, he brought a lot of Rudall & Roses over. A lot of people would get flutes from him. And then people started making them. (O'Grada)

Consequently, due to one individual, there was a slight increase in availability of high-quality flutes from the 19th-century London.

As will be further explored in 5.4, Ralsgård decided to acquire German flutes due to his interest in Swedish traditional music. This was around the year 2000, and German flutes were easy to find at flea markets and through internet sites. Furthermore, friends that knew he had an interest in this type of flute gifted him complete or incomplete instruments (FL RA 1 and FL RA 2). Flutes were cheap and available, but Ralsgård needed to restore and modify them himself. In addition to the import of German simple-system flutes, there were a number of flute makers in Sweden during the 19th century, although original flutes from Sweden are quite rare today. A number of years ago, however, an instrument collector offered Ralsgård a 19th-century flute which had been made in Landskrona (Sweden) by Iacob Valentin Wahl. Ralsgård bought the flute and had it restored by a professional woodwind repairer (FL RA 4).

5.1.2 Simple-system flutes by modern day makers

As presented in Chapter 2, some pioneering flute makers started to make simple-system flutes during the 1970s in order to meet the increasing demand for quality flutes for

Irish traditional musicians. Before that, however, flute makers had started to make one-keyed flutes as part of the revival of early classical music.

Playing both one-keyed transverse flutes and simple-system flutes, Beznosiuk first comments on the increasing number of modern-day makers who specialise in the production of high-quality copies of Baroque and Classical flutes. Starting with copies of one-keyed flutes, some makers also progressed into making copies of multiple-keyed classical flutes. On the question of whether the availability of flutes has increased during Beznosiuk's career, she answers:

> Yes, I think it has. Particularly with baroque and classical flutes. Instrument making has developed and improved a great deal. When I started my career, there were few flute-makers making copies of classical keyed flutes, for example those by Heinrich Grenser[25], and none making copies of later 19th century flutes. So, I was obliged to buy and play originals. I imagine that the Irish players also generally played on original flutes until there were good copies available from makers such as Chris Wilkes. (Beznosiuk)

Although Beznosiuk has had the opportunity to acquire high-quality original flutes, she very much appreciates the availability, quality and reliability of modern flutes.

> These flutes [keyed classical flutes] work brilliantly now. In the earlier part of my career I would often struggle when having to play on original flutes with their old springs, pads and idiosyncrasies. Nowadays, with the rise in popularity and interest in period performance there is a healthy market for excellent copies of historical instruments by contemporary makers. And for this reason, I have often found myself in a situation where my flutes aren't as good as those of my students. (Beznosiuk)

More specifically, Beznosiuk refers to the mechanics on recently produced flutes as superior (i.e. their keys and springs). Beznosiuk perceives the situation as slightly different with regard to the simple-system flutes. According to her, contemporary makers of flutes based on models by Rudall & Rose modify the original design to meet the demands of the market for traditional Irish music. The result is an instrument that is not necessarily suitable for Classical orchestral musicians who are required to use all the keys and play in tune with a consistent sound through a three-octave register. She

[25] Heinrich Grenser (1764-1813) was a flute maker based in Dresden, Germany.

is also very satisfied with her original Rudall & Rose and has not considered the option of buying a modern version:

> Maybe [if] one of those [modern] makers [targeting the market of Irish traditional flute players] would make a true copy of that [referring to the original Rudall & Rose flute that she holds in her hands]. But I don't know if they would. (Beznosiuk)

O'Grada's friend, Colin (Hammy) Hamilton, was one of the pioneers to take up the making of simple-system flutes, at the end of the 1970s: "It meant that we could get whole flutes, recent flutes, which is a big change I suppose. The old flutes were poor flutes: German flutes, and you know, cheap flutes, bad flutes." Being satisfied with his own original Rudall & Rose flute (FL OG 1), he continued to play that instrument for thirty-five years. He did not switch to a modern-made flute until his original flute started to crack during his travels: "I needed a flute that I could rely on to travel with." He continues to state that, today the making of flutes is not just taking place in Ireland: "Now there are several makers. Lots of great makers actually, all over Europe."

Through the 1970s folk music revival, connections between Ireland and Brittany became stronger. Veillon made his first trip to Ireland in 1976 and purchased a flute from a flute maker named Bruce Du Ve, who by then had begun making keyless flutes for Irish traditional musicians. When Veillon toured Northern Ireland with his band *Galorn* a few years later, he met Hamilton, who later made a new head piece to go with the Du Ve flute (FL VE 2).

As previously discussed, Ralsgård, being based in Sweden, had limited possibilities to acquire high-quality simple-system flutes that were in playable condition. There were not many flute players in the folk music community in Sweden by the end of 1980s and the early 1990s, and therefore very few simple-system flutes available and even fewer for sale. In the struggle of getting hold of an instrument, Ralsgård travelled to Ireland and purchased his first simple-system flute; a Pakistani-made flute without keys. Not satisfied with this flute, he decided two years later, to buy a keyless flute made by Ireland's Desi Seery. After having discovered the traditional flute history of Sweden, he later travelled back to Ireland together with a friend and brought home more flutes. At that time there were a number of well-established makers of simple-system flutes, and good instruments were available in music shops.

5.1.3 Flute makers in Brittany

As the simple-system flute became more established in Breton traditional music, the end of the 1980s saw the first flute makers in Brittany. Among them was Gilles Léhart who was a *bombard* and *binioù* maker. Veillon played several of Léhart's flutes, especially the models made in keys other than D major. Although Veillon himself continued to play flutes by makers from abroad as well, he recognises the flute makers in Brittany as an essential part of the process of establishing the simple-system flute in Breton traditional music:

> I wanted more makers in Brittany. I thought it would be good for flute players here. You know, when people say that I am responsible for flute playing here, it is a serious reduction of reality. It is because of the flute makers […] without these people, no instruments [would be readily available]. (Veillon)

Veillon also appreciated the opportunity to collaborate more closely with makers in Brittany, and eventually settled mainly for the flutes of Stéphane Morvan, with whom he has collaborated closely.

Born in early 1980s, Roussel became interested in flute playing in Breton traditional music by the time that several makers in Brittany had begun the commercial manufacture of simple-system flutes. Thus, it was easy for her to order her first flute from Gilles Léhart. Léhart even offered keyless flutes, which could be sent back in order to add keys at a later stage. This meant that the beginner could buy a keyless flute comparatively cheap and then progress to a flute with keys without having to adjust their playing technique to another flute. When Roussel first received her flute, her hands were too small to easily cover the holes properly. The flute stayed unused in a box for a couple of months before she decided to give it another try. This was the start of a process of adjusting her technique and posture in order to find a position where her fingers could cover the holes. She describes it as a rather painful and frustrating process. As a teacher, Roussel also taught children from the age of six on smaller flutes (in G) that are produced by makers in Brittany for children with hands too small to cover the open holes of a full-size flute. Roussel herself ordered a flute from Stéphane Morvan in 2005, which she still plays (FL RO 1).

5.1.4 Collaborations with flute makers

The emergence of modern-day makers of simple-system flutes provides an opportunity for collaborative processes, which necessitates negotiations between makers and musicians. This is a theme that is reflected in the interviews in different ways.

O'Grada is a friend and a neighbour of flute maker Colin "Hammy" Hamilton. O'Grada plays one of Hamilton's flutes himself and is sometimes asked for his opinions on Hamilton's work: "Hammy wants me to drive a new model sometimes." However, he estimates his influence upon the end result as "very marginal", since he generally finds the flutes very good.

Of the interviewed musicians, Veillon is the one that has been most involved in collaborations with flute makers. During his career he has been met with varying interest from different makers. He gives an example of when he approached a maker with the idea of trying out new things regarding the design of the instrument:

> He wasn't clearly saying no, but he would start long technical explanations, basically saying no. He was convinced that it was the way it had to be done. He didn't want to lose time experimenting. Many flute makers, once they have their model and know that it works, they don't want to change things – which I understand. (Veillon)

The idea to have a progressive relationship with makers lead Veillon to a long-term collaboration with Morvan. Morvan, he explains, was (and still is) open to experiments and since the two of them live close to each other, it is possible to frequently meet in person.

During the interview, Morvan explains that he used to be open to customisation on individual basis, adapting each flute according to requests from his customers. Gradually, he has moved away from that practice in order to realise his own vision. This has evolved together with a few flute players, among whom Veillon is one. Morvan is confident in his own vision and knows that his flute model is a great choice for some musicians, while others may be better off trying something else. He has initiated a collaboration with a jeweller, who makes the keys for his flutes, and once that division of labour is established it will likely be possible to customise the appearance of the flute's keys.

The situation is different for Ralsgård. Experimenting with his instruments (see 5.4), he has sought to collaborate with makers and woodwind repairers in Sweden. There is one Sweden-based maker of keyless, Irish flutes who has made a new foot piece upon Ralsgård's request. Repairers of other woodwind instruments have helped Ralgård with modifications of the keys according to his own specifications. In general, Ralsgård considers the lack of interest and competence regarding simple-system flutes among woodwind makers and repairers in Sweden to be a limiting factor for further development.

5.2 Flute models

In Chapter 2, I outlined the historical context of the simple-system flute. The musicians in the study refer to historical flute models, either as original flutes or modern instruments based on those models. Historical models and makers are mentioned either in geographical terms (London, Germany, Vienna, and France) or in terms of makers (Rudall & Rose, Boosey & co., Thibouville, and Meyer). Rudall & Rose and Pratten, also appear as design concepts discussed in distinction to each other.

5.2.1 Historical connection

Beznosiuk specialises in the repertoire of Western art music of the 18th and 19th century, and has educated herself on the historical context of this repertoire. Preparing a performance, she undertakes further research on the background of a particular piece and has an extensive selection of flutes and parameters that will inform her choice for the performance. These include: (i) where the composer was working, (ii) if there were particular flutists that the composer would have in mind during the composition process, (iii) time and place for the original performance, and (iv) later performances of the same piece. While she is historically oriented, she also has a pragmatic approach to the findings of her research:

> A date can make a difference. It's not that I want to play exactly the same flute as the original player. But I want to find out if it is possible. And if it is possible, I'll try to do it. (Beznosiuk)

Regarding what is possible or not, she continues to explain:

> The biggest argument for me is that I have to play in a concert with a conductor who is used to the reliability and power of modern instruments. And then there are live recordings, TV and radio. There are certain standards of expectation. We can't just say, "it wouldn't have sounded very good" or, "you wouldn't have been able to hear the flute". That's another aspect of the challenge. How pure and "authentic" is it wise to be?[26] (Beznosiuk)

[26] The word *authentic* is accompanied by the gesture of quotation marks.

She concludes: "That's one of the advantages of living in this century – having a choice." Her choice of instrument is hence a consideration of both the historical context as well as the contemporary performance context.

5.2.2 Rudall & Rose and Pratten

Rudall & Rose flutes are talked about in two ways during the interview: (i) as the original, 19th-century flutes made by the London-based flute making firm, and (ii) as an instrument design concept associated with certain qualities. Beznosiuk plays an original Rudall & Rose flute (FL BE 1). She considers her Rudall & Rose flute to be a very flexible instrument:

> You could do anything with this flute, they [Rudall & Rose flutes] are such good instruments. And I think it's this flexibility which makes the Rudall & Roses so special. It's remarkable. I can play it in Berlioz, that quintessentially French composer, and can make it sound 'French'. It's also clear and powerful in a Brahms Symphony. At the same time, all the Irish players I have ever shown it to covet it because of its clear, reedy bottom register. They just want to take it straight to the pub. Though they probably wouldn't be interested in playing chromatic repertoire in the upper registers. It's just remarkable. It can do a lot of things. (Beznosiuk)

As mentioned above, she considers the contemporary Rudall & Rose type flutes as being only loosely based on the originals (in contrast to the modern copies of Baroque and Classical flutes). As mentioned above, she argues that the majority of the contemporary makers of simple-system flutes aim towards the market of Irish traditional flute players thus striving to adapt the original model to other musical demands. This resembles the story of how Morvan developed the design of his Rudall & Rose model, the first flute he made. Morvan based this Rudall & Rose model on a flute by Fentum[27] (Roussel plays on a flute of this model of Morvan, FL RO 1). During the process of designing his Rudall & Rose flute, Morvan felt the need to deviate from the measures of the original flute and he modified the intonation of some notes (he perceived A and B to be too sharp and $F^{\#}$ too flat).

Rudall & Rose, as a concept, is most clearly articulated in the interviews with Veillon and Morvan. Both of them attribute certain qualities to Rudall & Rose (and Rudall & Rose type) flutes, often contrasted with Pratten (and Pratten type) flutes. Veillon

[27] Fentum flutes were made in London during the same era as Rudall and Roses.

describes the Rudall & Rose flutes in the following way: "There's kind of a halo around the Rudall [& Rose], but you have to control it to be in tune. You know what I mean, it's delicate. So you cannot just blow, you have to be careful." Ralsgård adds to the same idea: "There's a delicacy in the Rudall & Rose flutes that the Pratten doesn't have – complexity of sound." Roussel also compares the two concepts in a similar way: "I like the finesse that my [Rudall & Rose] flute (FL RO 1) has that the Prattens don't have." She elaborates on the topic saying that she perceives it as if there are more harmonics in the sound of the Rudall & Rose type flutes, compared to the Pratten type flutes. She continues to say that she considers the Rudall & Rose type flutes to be harder to play in tune, since air pressure needs to be controlled more in comparison to playing a Pratten flute.

Beznosiuk adds that, looking at the vast output of the Rudall & Rose company, the flutes vary a lot regarding hole sizes and other features: "If you look at Robert's [Bigios] book[28], 'Rudall & Rose' refers to several types of flute." O'Grada, who played an original Rudall & Rose for thirty-five years (FL OG 1) adds:

> I don't know really. My Rudall & Rose had large holes like that (pointing at the flute in his hand, FL OG 2). I find I get more or less the same sound out of any flute, no matter what flute it is. You chase the sound you want and that's what you get. I don't really see the difference in the result, you know. (O'Grada)

Summarising the above statements shows that the idea of Rudall & Rose as a design concept, to be used by contemporary makers, is more homogenous than the idea of original Rudall & Rose flutes as perceived by O'Grada and Beznosiuk (who both played on original instruments). The homogeneity of the design concept Rudall & Rose seems to be most clearly discerned in comparison to the Pratten design.

In contrast to Rudall & Rose flutes, Veillon perceives Pratten flutes to have a larger, rounder sound. They also consume more air: "The Pratten is like a machine. It's strong and easier to play in tune. But you have to feed it too." Morvan's second model was based on an original Boosey & Co. Pratten flute. He deemed this flute to be generally easier to play than the previous flutes he had played. He was further inspired to develop this model due to its flexible sound and dynamic range.[29]

---

[28] Bigio, R. (2011).

[29] The original Pratten flute that was available to Morvan was tuned higher than today's standard pitch, which hindered him from simple measurement and reproduction of this flute. He had to make his model slightly longer than the original and, as a consequence, resize the finger holes. The model based on the Boosey & co. Pratten flute was Morvan's second model (FL MO 1).

Contrasting the concepts of Rudall & Rose and Pratten paints a picture of two designs at polar opposites regarding air consumption, timbre, sound volume and intonation. The contrast of these qualities, considered as inherent to the two models, prompted Morvan to develop a model that combined the best qualities of both; the complex timbre and the modest air consumption of the Rudall & Rose and the sound volume, and easy intonation of the Pratten. The result is the model of flute played by Veillon today (FL VE 4), although Morvan continuously adds minor changes in the design to further realise his vision. When asked whether he refers to his model as a Pratten type or a Rudall & Rose type, he answers that it is neither of the two, but rather a combination of them both. From this statement, I reply: "So it's the Morvan model?" He hesitates, arguing that he has borrowed so much from the 19th-century makers that he cannot claim this model to be his own.

Morvan's flutes have one middle piece instead of two – a feature associated with the Pratten design. For him it is preferable to divide a flute into fewer parts, if possible. He explains that on a Rudall & Rose model, it is necessary to divide the middle section into an upper and a lower part, due the shape of the bore. I ask why he still has a separate foot piece instead of having one long part consisting of both middle pieces and foot piece, thus minimising the number of joints. He gives two reasons for this: (i) it is hard to find such long pieces of wood, and (ii) the bore is wider at the end of the foot piece (a reverse conical shape compared to the bore of the middle piece). This makes it necessary to have a separate foot piece in order to be able to drill the bore. Morvan summarises his vision: "The most important thing is that the musician is able to forget about the instrument itself." Thus, an overarching goal in the process is to create an instrument that becomes as transparent as possible.

5.2.3 German flutes

Three of the musicians referred to German flutes. Beznosiuk briefly mentioned that she is not happy with an original Meyer flute she has been lent, and would like to get a better one. As mentioned above, O'Grada refers to the flutes available in Ireland in his youth as German flutes, and not very good instruments. Ralsgård has paid more attention to German flutes (both FL RA 1 and FL RA 2 are German flutes) and he explains that this type of flute was played by flutists in Sweden during the 19th century and existed alongside the Boehm flute well into the 20th century. In Sweden, when flutes are found at flea markets, in the attic or in the drawers of people's homes, they are most often this kind of flute:

> I had a strong idea that … if I am going to play and explore Swedish music … I mean, this is the kind of flute that was used [pointing at FL RA 1 and FL RA 2]. And if you go to an auction, a flea market or to Blocket and Tradera[30], the German style flutes is what you´ll find rather than old London flutes. So I decided to go in on that. (Ralsgård)

He then felt the need to modify the German flutes that he bought in order to adapt them to play Swedish repertoire. He enlarged the holes (see 5.4) to alter the tuning and the volume and states that: "In a way I have still sought to make it play like these (pointing at FL RA 3 and referring to Rudall & Rose type flutes), since I have enlarged the holes. You know, it's not just a tuning matter, it's also a matter of timbre." He describes the sound of those flutes (FL RA 1 and FL RA 2) as "veiled" – a timbre he associates with one-keyed baroque flutes – rather than the "shiny" sound of the "London flutes" (i.e FL RA 3). The veiled timbre is even more present in the flute made by Wahl (FL RA 4). Ralsgård's statements may seem peculiar: why search for a particular kind of flute, only to modify it into something else? While asked about this, he explains that there are still differences in timbre between the two models even after his modifications. There is also a visual aspect that is important; the most striking difference between the German flutes and what Ralsgård refers to as London flutes (i.e. Rudall & Rose flutes) is the pin-mounted keys (see 2.1.1). By finding German flutes in Sweden and adapting them to his playing style, Ralsgård made connections to the flute playing in the Swedish traditional music of the past, while at the same time distancing himself from Irish flute playing. This is not to be understood as a dislike for Irish flute playing (Ralsgård plays a lot of Irish music), but rather as a way for himself to, at this time in his career, find a new and different path: "this flute (FL RA 3) goes right into the Celtic thing." The pin-mounted keys on German flutes are also easier to change and modify than the block-mounted. The woodwind repairer working on Ralsgård's flutes has been able to use parts from clarinets which are much more easily obtained in Sweden.

5.2.4 French flutes

Beznosiuk is the only musician in the study that refers to old French flutes – more precisely her original Thibouville flute (FL BE 2). In the following quote she comments on the playing qualities of the instrument, and makes a comparison between French flutes in general and her Rudall & Rose:

[30] Swedish internet sites for trading

> I have sometimes found myself wondering if this French flute, (FL BE 2) would be loud enough in a big concert hall, because it is definitely not as powerful as the Rudall & Rose, which seems very loud close up. But in fact, good French flutes possess wonderful, lustrous and carrying qualities which might not be apparent to the ear of the player, but which sail out over the orchestra, especially in the middle and top registers. (Beznosiuk)

She exemplifies by playing in the second octave and then she continues to explain her view:

> The French flutes are good […] but the trouble is that they do not have much potential for change or variety. There is one sort of sound which works extremely well on them – beautiful, exquisite and lustrous tone quality – and that's it. What makes the Rudall & Roses so special is the variety and potential in their sound. (Beznosiuk)

Since she finds it possible to call forth the sound of the Thibouville flute also on her Rudall & Rose, she sometimes uses it to play the French repertoire: "I can create the quality of the French flute on this flute (FL BE 1), but it is just there on this one (FL BE 2)."

An interesting feature of her Thibouville flute is the F$^{\#}$ key. The flute has small finger holes in order to facilitate cross fingerings and it is possible to produce F natural using the fingering [234/24]. However, Beznosiuk perceives the F$^{\#}$ [234/2] to be flat due to the small fifth finger hole. This can be improved slightly by opening the F keys. Her Thibouville flute does however have another key designated only to improve the intonation of F$^{\#}$ (Figure 19).

Figure 19
The F$^{\#}$ key on FL BE 2. Referred to as the Tulou key.

This key is operated with right hand little finger. Playing an $F^{\#}$ using the key is accordingly fingered [234/25e].

5.3 Playing technique

All of the interviewed musicians go into detail about playing technique. How they talk about their technique, and what they choose to emphasise, varies. Central themes that emerge revolve around the usage of air, articulation techniques, intonation, and fingering.

5.3.1 Air volume and air pressure

The blowing of air into the flute is what produces the sound. Hence, it is a central aspect of flute playing. As a flute maker, Morvan divides playing styles into two fundamentally different categories, "hard" and "soft", which are based on the volume of air and air pressure produced by the player. Depending on these parameters, different demands are put on the flute's design. The flute players that he has collaborated with most closely have been blowing "very hard" and accordingly he has adapted his flutes to that style of playing. Today, however, he strives to make his model meet both sets of demands.

Morvan's comments are reflected Veillon's experience of switching from his Du Ve flute (FL VE 2) to a flute made by Chris Wilkes (FL VE 3), which was based on a Rudall & Rose model). When he switched flutes, Veillon had to rethink his usage of air:

> So adapting to the Chris Wilkes flute, the main thing was to blow less hard. Softer. And ... it's ... because I started to blow softer, the whole aesthetics... of what I was playing... I started to realise that power is not loudness. (Veillon)

During the interview with Beznosiuk, she allowed me to try her French Thibouville flute (FL BE 2). I picked up the flute and noticed its small finger holes. Judging from this parameter, I tried to blow gently into the flute, searching for a good way to handle it. However, Beznosiuk laughed at me, saying: ¨You can't do that to it." I wondered what she meant and she explained to me that I was blowing "fast and through." She demonstrated by taking the flute back and playing a phrase. "It's a question of less air and changing the speed of the air and changing the volume of the air. And that is how the music works as well." On a one-keyed transverse flute, every note requires a certain

approach, and thus has its own potential of volume and colour. Beznosiuk considers this to be true to a varying degree regarding simple-system flutes too, especially those with small holes, such as her Thibouville flute (FL BE 2). Even though I tried to meet the demands of the flute, I was so used to blowing "fast and through" that it was hard to adapt. She continues: "If you want to blow through, you need something with large holes, like that [pointing at my flute]. Or even a modern flute [i.e. a Boehm flute], where all notes are the same." Consequently, there is a distinction between my own Breton flute (made by Morvan in 2014 and similar to FL VE 4) and the French Thibouville flute (FL BE 2). Beznosiuk traces this distinction back to the evolution from the one-keyed flutes, whose design puts even more demands on the usage of air. Blowing too hard on a flute that is not designed for it will make for an "uncontrolled intonation and ugliness in the tone". Then she sums up the reasoning with almost the same conclusion as Veillon: "A good sound is not necessarily a loud sound; it's rather a colour."

5.3.2 Air management and breathing

Air management refers to the relation between air usage and musical material. In other words, the techniques used to ensure there is an adequate supply of air for a given musical purpose.

O'Grada plays traditional Irish music, where there are few prescriptions about where in the melody to take a breath, and taking a breath often means omitting a note and thereby creating a gap in the melody. O'Grada names the process of finding the possible places to insert breathing gaps (and working them in to the adaptation of the tune), as finding the breathing pattern:

> The first thing I do is to find the basic breathing pattern. And I play that over and over again until I have that breathing pattern. So then it is, OK, now I can play the tune. So, then you work from there. How are you going to change that? (O'Grada)

Thus, the breathing pattern is not static but something that may be changed by the musicians based on what makes musical sense:

> It is like a pause in speech. Because when you are speaking and you have a pause, you have just said something that is important, or you are about to say something that is important. And it's the same in music. (O'Grada)

He continues to see similarities between the lungs of a flute player and the bag of the Uilleann pipe[31]:

> You use 50% of your air for playing flute and 50% for staying alive. And there's a good reason for that, because it means that you are strong all the time and that is reflected in how you play. As your lungs empty, you start making compromises. But if you are always full, you can be strong all the time. (O'Grada)

By always keeping his lungs relatively full, the pauses made while inhaling can be made more subtle and controlled: "It means that when you take a breath, you take it very quickly, and you have much more control over your breathing and your breaths are not obvious."

Instead of adhering to the above guideline, Veillon discusses those compromises that O'Grada touches upon. In order to temporally extend a note when he is reaching a shortage of air, Veillon vents the note[32]. He exemplifies this by playing E^1 [234/23] and while the note gets weaker, he produces a vibrato by opening and closing the E^b key [234/235a]: "This flange[33] keeps it in tune. It's acceptable, and at the same time I spend much less air and I can stretch my note."

Ralsgård points out that the technique of air management is more important than having a huge lung capacity. Having that control creates the possibility to keep long melodic lines, while still being able to take a breath inside the phrase. He picks up the flute to demonstrate (Figure 20):

[31] A kind of bag pipe common in Irish traditional music.

[32] Venting is the technique of using a key to open a hole below the lowest open finger hole. This is usually made in order to make the note stronger and/or sharper. Veillon vents the note in this case to maintain the tuning of the note while he runs out of air.

[33] By "flange", Veillon associates the sound created with the electronic music effect *flanging.*

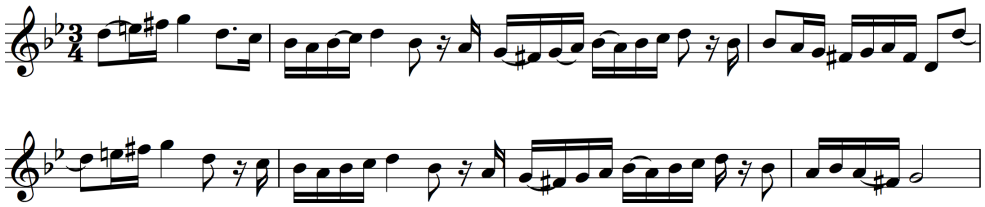


Figure 20
Ralsgård demonstrates how short breaths can be taken without interrupting the melodic line. The breaths are indicated by pauses.

Ralsgård continues to say that flute players new to Swedish traditional music run the risk of being susceptible to rhythmic instability. He demonstrates this by playing a phrase and goes on to explain that even though the rhythm may be noticeable, it is not emphasised enough: "You cannot grasp that sound, the rhythm is there, but nothing is happening to it." Ralsgård refers to a number of Irish flute players that have been inspiring for him, saying that: "In their way of playing, the breathing mechanisms […] is allowed to be heard."

5.3.3 Glottal stops and finger articulation

In O'Grada's terminology, articulation refers to the interruptions of the air column that take place both inside the body as well as outside (through finger articulations). O'Grada does not use the tongue to articulate at all, only glottal stops[34] and finger articulation[35]. He adds with a smile: "If I have students in my class and they use the tongue, I kick them out." That the fingers are seen as a natural part of the articulation system is explicit in the following interview excerpt where we talk about two different ways of fingering the note C^2:

> O'Grada: I suppose the key I need most is the C natural, but I actually prefer this C natural [34/]. Because I can articulate that, and I can't articulate that [2/2b].
>
> Tullberg: You cannot articulate that [2/2b]?

[34] Glottal stops are produced through the closing and opening of the glottis.

[35] Finger articulation refers to the quick opening and closing (or closing and opening) of one or more finger holes. This movement does not result in a separate note or grace note but as a rhythmic effect.

O'Grada: No, to cut the C natural you have to go to D. If you use the key, you cannot get to the D.

The logic behind this statement is the following: To be able to perform a particular finger articulation called a cut, the note being articulated must be fingered in such a way that it allows for a very quick grace note above. Trying to cut the C^2, produced by using the key would lead to the following fingering combination: C^2 [2/2b] to D^2 [34/234] and back again. Since the desired effect of the cut is only to articulate the main note (C^2) and not for the grace note to be perceived as a note in itself, the finger movement producing the cut needs to be extremely quick, almost percussive in gesture. The relation between the two articulation techniques (glottal stops and cuts) is further explained: "A cut and a glottal [in combination] is the heaviest, then a cut is next and then the glottal." When asked about his use of glottal stops, he refers back to the fact that there were almost no flute players in Cork when he first started and that he took inspiration from musicians who played other instruments as well as from older recordings that featured players using glottal stops. He explains that it fits musically very well to the playing of polkas, which is a predominant tune type in the Cork area: "You can get that off beat which is essential to polkas."

As some notes on the flute inherently are weaker than others, O'Grada compensates this through articulation techniques in order to provide "a hard edge in front of the note". For example, the weak character of the note E can be compensated by "scraping from a lower note", in this case the strong note of D (Figure 21):

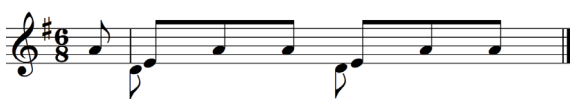


Figure 21
Compensating a weak E by "scraping from a lower note".

In striving to make repetition interesting, O'Grada uses different articulation techniques on repeating note. In the following phrase, he demonstrates differing ways to articulate a repeating note (Figure 22):

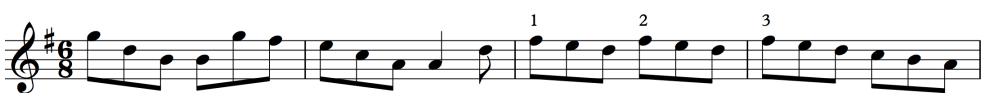


Figure 22
O'Grada exemplifying different ways to cut the F#.

The fingering used to produce the cuts in front of the repeated $F^{\#}$ in bar three and four are (1) [23/2], (2) [24/2], and (3) [34/2]. O'Grada mentions a fourth alternative [234/], but adds that: "I find that if you use something that is further away, you will get more differentiation." By this he means that the hole that you quickly uncover and cover again in order to produce the cut should not be the adjacent to the holes which remains open while playing the main note (the fingering for $F^{\#2}$ being [234/2]).

5.3.4 Using the tongue

Roussel does not use the glottal stop as she considers it to be physically uncomfortable and hard to control: "It's like when you see a tennis ball hitting the floor covered in red dust. You just see the red dust all over the place." Instead she thinks of different consonants when differentiating between the articulations produced. She does not talk about articulation in terms of how heavy they are, but rather how accentuated they are, T[36] being the most accentuated followed by D[37] and K[38] (which she uses mainly on grace notes). Roussel also refers to her transition from Breton to Swedish traditional music and the technical challenges that followed. Although the consonants used (and the combinations of these into double and triple tonguing (exemplified as "TaKaTa" and "TaKaDa")) were familiar to her, the placement of the articulation in the tunes was not. She describes this as a phase of relearning: "That is the hardest part really, [to] understand what to do and when to do it."

Ralsgård highlights the need to use different consonants in the different registers on the flute. When he plays the note D^{1} he usually uses the consonant G[39], while higher up in the register, he tends to use either consonants D or T. He elaborates on the use of different consonants: "You also have to get away from the idea of double and triple tonguing as something you just do to repeat a note. I always have the tongue work in different places." He also refers to the need to adapt the articulation depending on which flute he plays. The differences are obvious between his Baubet Rudall & Rose type flute (FL RA 3) and the flute made by Wahl (FL RA 4). He thinks the former requires a heavier movement of the tongue than the latter.

Veillon adds the idea of reversed tonguing. That is, instead of starting the note with a consonant, using the consonant to halt the note ("haT, haT"). He also stresses the need to adjust his articulation depending on the musical context (whether he is, for

[36] /t/ as in "tea"

[37] /d/ in "do"

[38] /k/ as in "cat"

[39] /g/ as in "go"

example, performing Irish or Breton tunes), and depending on what other instruments are being played. This is also true regarding the individual style of the other musicians: "If I play with a fiddle player, using this short bowing style, I'd chop [the column of air] more. And if it would be a legato style piper, I would play it more fluid." He goes on to mention his bad habits surrounding articulation and how sometimes he articulates in a way that he is not completely aware of: "It puts me in a rage when I think, 'why do I do that when I know I shouldn't?' I hear that I am bumping and I am not playing fluid enough. I have to think: 'put the tongue down in the mouth', and that's it."

5.3.5 "The blue sausage"

Veillon presents the idea of "the blue sausage", a visualisation of the air column. It starts in the lungs and extends through the throat and the mouth, passes between the lips and goes all the way to the tip of the flute (Figure 23). Along the way, the player has opportunities to interrupt the air stream and "articulate the column of air": the player controls the breath from the lungs; the throat provides the possibility to cut the air column by glottal stops; in the mouth, the tongue has the possibility to articulate through the use of various consonants; and the lips provide yet another possibility to interrupt the air before it leaves the body. Finally, the blue sausage passes through the flute, where the fingers can be used to articulate it further.

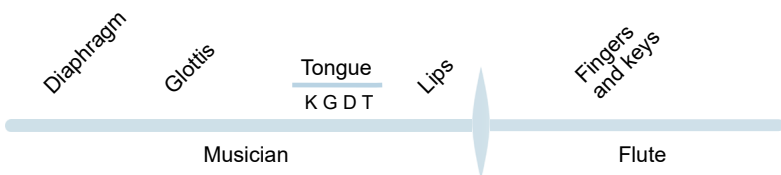


Figure 23
The column of air, and the possibilities to interrupt it, starts in the lungs, passes through the throat and mouth before it extends through the flute. This is the perspective on the column of air referred by Veillon as "the blue sausage".

5.3.6 The challenge of intonation

All the interviewed musicians discussed, to some degree, the challenge of intonation. Technical considerations of this topic are also presented in other sections, but here I explore some of the thoughts about intonation in a more general sense.

Beznosiuk highlights the fact that different flutes require different approaches on certain notes. This is especially critical while using more than one flute in one concert:

> Changing flutes is one of the challenges of my life. I have to remember which one is which, where the strengths and weaknesses lie and where the intonation is on each one … because they're all different. And then it's as much with the embouchure as with the fingering. Actually, it's mainly with the brain. I have to remember that the middle D is very flat on that one [pointing at FL BE 1] because of the low B joint. It's no good remembering these things after you've played the note – that would be too late. So it's like cycling or skiing or something … always being ready to adjust, quickly. Every flute is different and the intonation is in a different place. (Beznosiuk)

Beznosiuk also adjusts the tuning on the instrument using the tuning slide, depending on which register she is going to use – even if only for a short section:

> Sometimes you have solo that goes very high and very low and that's very annoying on this flute [referring to FL BE 1] because it is flat at the bottom. So usually, I push it in [the tuning slide] for the low bit and pull it out again as soon as I can. (Beznosiuk)

Ralsgård makes a comparison with the violin: "I think of it as playing the violin – all notes must be corrected all the time. You need to have your ear turned outwards." The corrections he refers to are made through small changes in the embouchure, and the volume and pressure of air. Roussel also talks about intonation as constant corrections in pitch. Beyond a flexible embouchure, she adds the possibility of rolling the flute inwards and outwards as a means to bend the pitch down and up, respectively. She says that she has learned to navigate the intonation on her own flute, and although she has spent much time on issues of intonation, the means of corrections are now automatised.

5.3.7 Alternative fingerings

As described in Chapter 2, the simple-system flute can be defined as having a hole for each of the chromatic notes, some of which are covered by the fingers and some by keys. This means that, strictly speaking, all notes in the first two octaves can be produced without the use of cross fingerings. However, the interviews reveal that cross fingerings are hugely relevant for some of the musicians, while not at all for others. The subject of cross fingerings and alternative fingering was discussed in particular by Veillon and Beznosiuk. Their background and approach are however significantly different. Roussel discusses cross fingerings as a means to alter the intonation of certain notes, which is a practice that she sometimes applies when playing Swedish traditional

music. O'Grada mentions cross fingerings and half holing techniques as a way to produce notes otherwise not possible to achieve on his Rudall & Rose with non-functional keys.

For Beznosiuk, cross fingerings are an inherent part of her playing technique. Before she started to play the simple-system flute, she played one-keyed transverse flutes, where cross fingerings are essential in order to play in any key other than D major. Beznosiuk has several flutes and she points out that flutes with smaller holes (for example FL BE 2) are more suited for cross fingerings than flutes with large holes (for example FL BE 1). For example, on her Rudall & Rose (FL BE 1), she would never play F natural using cross fingering [234/24], since the holes are too big and it would be much too sharp. In fact, in the two first octaves, the only cross fingering she uses on this flute is C natural [34/]. Cross fingerings are more useful on her Thibouville flute (FL BE 2), due to the smaller holes. Suggestions on fingerings is also a considerable part of the literature that she has researched and still refers to. This includes tutors and instructions written by flute players of the 19th century. In the discussion during the interview, she refers to Fürstenau as a particularly useful source with regard to fingerings. There are three reasons why she would choose to use a cross fingering: (i) intonation, (ii) colour (timbre), and (iii) fingering patterns. The different fingerings provide a way to adjust the intonation of a note. However, as she explains in the following quote, what might be perceived as an intonation issue in the ensemble might be about timbre:

> My experience is that I might decide on the "perfect"[40] fingering at home. In my private practice it will work well, it will sound good ... it will be "perfect" [as above] and I might write it into the music. And then, at the rehearsal with the rest of the orchestra, it doesn't work. Because, maybe, I am not in tune with the horn, or the oboe. Or perhaps I need to play it extra loud or extra soft because of the context, and this affects the intonation. Playing on your own is not the same as playing in a group with other people. Sometimes a different colour is desirable. On these flutes, there is a certain amount of personal choice with regard to fingerings, but the player also needs to consider particular sound qualities inherent in the fingering. For example, if you play a top F and the clarinet is also doing it an octave lower, if the colour does not match, it will sound like an intonation problem. It's often simply a blending issue, where one of us will have to change in order to make it successful together. But if I were on my own, I wouldn't change it. (Beznosiuk)

[40] The word *perfect* is accompanied by the gesture of quotation marks.

She goes on to explain that, for her, it is essential to have a big repertoire of fingerings in order to be able to adapt to a situation as the one described above. In order to demonstrate, she plays the following phrase, four times (Figure 24):

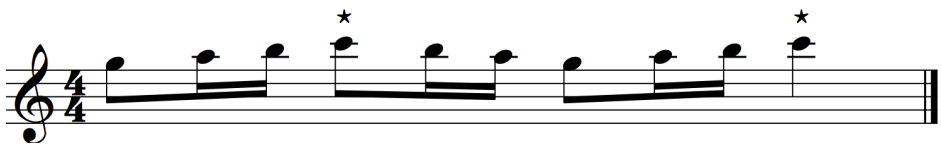


Figure 24
Beznosiuk demonstrates four different fingerings for C^3.

Each time she uses different fingerings to produce C^3: [2/2a], [3/234], [24/24], and [24/234a]. The adjacent notes will also impact the choice of fingering for a particular note. She exemplifies this through playing the following bars from Beethoven's Sinfonia Eroica (Figure 25):

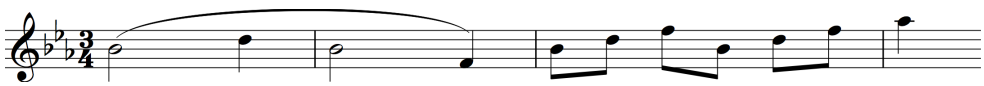


Figure 25
Beznosiuk demonstrates alternative fingering for F^2 in musical context.

The third and fourth bar exemplifies the problem of the successive notes D-F-A^b. Using the keys to produce F^2 will either require the use of the left-hand little finger to open the long F key [2345b/23], or the right-hand ring finger to open the short F key [234/234a]. However, to play the D^2, the right-hand ring finger is used to cover the sixth finger hole, and to play the A^{b2} in bar four, the left-hand little finger is used to open the $G^{\#}/A^b$ key. This means that to play the above phrase using the keys requires either the right-hand ring finger, or the left-hand little finger to do a quick sideways movement. To avoid this, Beznosiuk uses the cross fingered F^2 [234/24]. She refers to this fingering as the "old fingering" as this is the way she is used to play F natural on her one-keyed flutes. For certain passages, the decided fingering may need to be noted down in her sheet music (Figure 26).

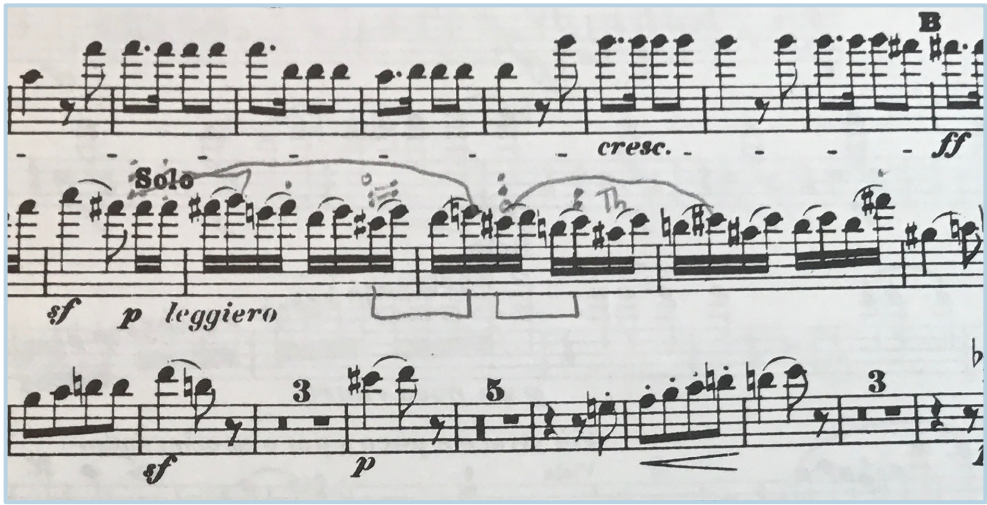


Figure 26
A passage showing Beznosiuk's handwritten notes.

The large repertoire of alternative fingerings is particularly important in the high register (C^3 and above). The fingerings for this register differ significantly between flutes as well. A note in the first two octaves that she comments on is $F^{\#}$. When possible, she opens the F keys (one or two) when she is playing $F^{\#}$. This raises the pitch slightly, which she considers to be necessary. On her Thibouville flute (FL BE 2) there is an $F^{\#}$ key for this reason (see 5.2.4).

Veillon frequently incorporates cross fingerings in his playing. He does not refer to older sources, such as Fürstenau, but rather to his own background. His first flute (FL VE 1) did not have any (working) keys and, in order to play the music of his ensembles, he had to use cross fingerings. When he got his second flute (FL VE 2), a short F key was added (see 5.4.2). However, this was far from enough and he still had to find out other ways to produce the notes:

> So here I was with new a flute with just one key, but not the key I had on the first flute. And that one and only key made me develop lots of alternatives. I kept putting my imagination to work all the time and with *Kornog*, I started to find ways to use that key as much as possible. (Veillon)

This phase of intense experimentation made the practice of using cross fingerings an inherent part of Veillon's playing technique. Even today, when he has keys for all chromatic notes, he still uses many cross fingerings. He highlights the potential to

change the colour of the sound by using cross fingerings, since these notes are weaker than the ones produced using a key. Adjusting the embouchure can further bring out this shift in timbre. He exemplifies this by the following example (Figure 27):

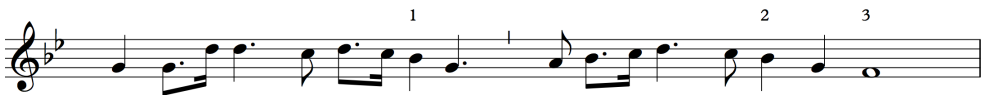


Figure 27
Veillon provides an example of alternative fingerings for B^{b1} and F^{1}.

In this example, Veillon uses two different fingerings for the note B^{b1}, none of which uses the B^{b} key on his present flute. When Veillon performed the tune with the group Barzaz, he played on a flute without B^{b} key. He played the phrase using the following fingering for B^{b1}: 1 = [24/234] and 2= [2(3)/]. The first fingering variant [24/234] comes with a nodding gesture, and a relaxed embouchure. This large physical movement gives the pitch a wave like form. The note produced by half holing [2(3)/] has a similar effect due to a slight sliding movement of the left-hand long finger. On the flute that he played at the time [FL VE 2], he would sometimes finger the F^{1} (3) at the end of the phrase by half holing [234/2(3)]. However, this solution was more feasible on that flute, since it had bigger holes. On his present flute he would use the standard fingering [234/23a], but using the long F key to give it what he calls "a small flange" [2345b/23a], sharpening the note slightly. He explains that the cross fingerings give the phrase a colour it wouldn't have when using the standard fingering: "I want to play it in a way that would be less precise in a way. And I can enhance this effect with the embouchure, releasing it, making it be a bit more hazy."

After playing fragments of different tunes for a while, obviously searching for a suitable phrase or passage, Veillon provides an example of a situation where he has used alternative fingering in order to produce a more fluid ornamentation. He settles for a composition by violin player Jacky Molard. In this tune, Veillon played in unison with Molard, who made a very quick trill on $G^{\#2}$ in the following passage (Figure 28):

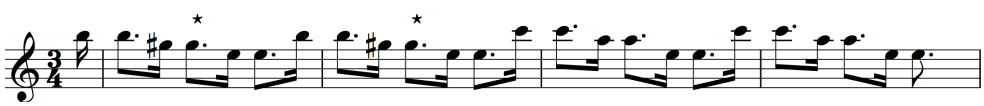


Figure 28
Veillon providing an example of alternative fingering in order to facilitate the desired ornamentation on $G^{\#2}$.

When he tried to perform the trill using the $G^{\#}/A^{b}$ key, he experienced this to be to slow and the result was too accentuated in relation to the more fluent quality of the trill produced on the violin. In order to produce a trill that blended together with the sound of the violin, he used the following fingering for $G^{\#2}$: [23/23][41]. He was then able to produce the ornament using right hand index and middle finger. He regards the note produced by the alternative fingering to be less in tune than that of the standard fingering [2345a/]. However, he concludes: "In the musical flow, it works". Veillon also uses an alternative fingering for C^{3} [24/234a] in the above passage. Except for cross fingerings, Veillon also uses harmonics[42] as alternatives to standard fingerings: "In order to create a special sound, I use sometimes a mix of octave and harmonics using completely different fingerings to create a blast, which to me means binioù/bombard."

O'Grada's first flute (FL OG 1) had keys, they were not working and he explains that, due to the tonality of the repertoire that he plays, keys are not necessarily required: "You know if someone said, 'I will take all the keys of your flute', I would say 'okay'. It wouldn't bother me too much. For most of the tunes, I don't need keys, you know." When he had to play an occasional note, outside of the scale of D major he used cross fingerings. He exemplifies by playing a tune containing the note $G^{\#}$ [23/234]. He could not play F natural using cross fingering [234/24] since the holes on that flute were too big. Instead he would use a technique of half holing [234/2(3)]. He finds both cross fingerings and half holing to work best in slow tunes, where he has time to optimise the sound, through adjusting the embouchure.

When Roussel begun to study Swedish traditional music, she quickly encountered the, sometimes very noticeable, deviations from the equal tempered scale favoured by some musicians. The most frequent adjustments that she had to make were accessible by alternative fingerings. Sharpening the minor third in D minor (a common key in Swedish traditional music) is possible by operating both the short and the long F key at once [2345b/234a]. She also tilts the flute slightly forward, thus blowing more across the hole and sharpening the note further. To sharpen the seventh in the scale of D minor, she uses the following fingering [3/0]. This fingering is also used when she wants to sharpen the third in A minor. To flatten the third in D major, she uses the "old fingering" for F natural [234/24]. As mentioned above, on flutes with large holes this fingering is not deemed as useful for producing F natural. However, for Roussel, this fingering is useful in order to produce a slightly flat $F^{\#}$.

[41] On his present flute (FL VE 4) Veillon needs to open also the short F key in order for this fingering to work [23/234a].

[42] Harmonics are produced through manipulating the angle and/or the velocity of the air stream. The first harmonic is the octave, the second a fifth above that, the third is another fourth above.

Before she moved back to Brittany, Roussel had a large repertoire of similar alternative fingerings in order to be able to produce the desired pitch. During the interview she tries to find more examples, but being out of musical context, she finds it hard to recall the fingerings. At one occasion she remembers a tune, in which she incorporated some other alternative fingerings. Through searching for the melody while playing, she finally remembers the fingerings used. She used these alternative fingerings to some degree in her work with the ensemble, *Skaran*, although the use of them was limited because of the (relatively) fixed intonation of the nyckelharpa.

5.4 Modifying the flute

The topic of modifying the flute surfaces in several of the interviews. Some of the musicians have made significant changes to their instrument, while others have not made any at all. Modifications include enlarging holes, adding keys, and switching parts. Before I present the modifications made, I will address the rather complex reasons why some of the musicians hesitate to make any modifications themselves (or even to have a professional repairman make them), even if they are not fully satisfied with their instruments. First, all of the musicians show great respect for the deep knowledge that is needed to fully understand the consequences of any modifications made. Furthermore, there is a general idea that the instruments are compromises, especially with regards to tuning. Enlarging one hole in order to sharpen the pitch of one tone, will also affect the tuning of other tones as well (see also 2.1). Since it is hard to actually see the inside of the flute and its undercutting[43], the success of any modification is left up to a certain degree of chance. Beznosiuk addresses the issue, saying: "I wouldn't dare. If you change something, you will probably pay for it somewhere else." O'Grada reasons along the same lines: "I wouldn't have the knowledge. Because you know, the undercutting in these holes is dependent on the angle of the undercutting of the embouchure. I don't know enough of how that works." Roussel tells the story of a friend who tried to improve the tuning of his flute and "now it's wildly out of tune". There is also an idea that the older flutes have a value, not directly related to the playability. This is reflected in Ralsgårds reaction when he received the flute made of Wahl (FL RA 4), after a woodwind repairer had replaced a spring underneath the $G^{\#}/A^{b}$ key. As may be obvious to the reader, Ralsgård is the musician in the study who has been most eager to improve his flutes himself. However, in this case, the repairer had not only replaced the spring but also installed a pin, which would facilitate an easier way to change the spring in the future (Figure 29).

[43] Undercutting refers to the shape of the hole from the perspective of the bore (the inside of the flute).

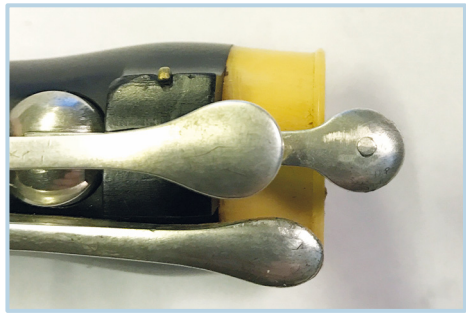


Figure 29
The pin is visible as a small circle on the touch of the G♯/A♭ key.

This pin does not change the playing quality of the flute, and the visual effect is minimal compared to the modifications made by Ralsgård on his other flutes (FL RA 1 and FL RA 2). However, Ralsgård reacted negatively to this modification despite its limited visual impact. He considered the repairer to have been insensitive to the flute, being a historical object. To him, there is a value in this flute (FL RA 4) that the flutes that he has modified himself do not have. This value is connected to the uniqueness of this particular flute and of its perceived quality. Ralsgård refers to his German flutes as mass-produced and of lesser quality. As mentioned above, German flutes are relatively easy to find second hand in Sweden, and often inexpensive. In line with this attitude lies Beznosiuk's comment on the repair made on her original Drouet flute. The G♯/A♭ key was broken and, satisfied with the delicate repair work, she points out that "it is exactly like it was before". She also complains about the springs on the original Grenser flute. These springs are the ones mounted on the flute when it was first manufactured, and she does not want to change them even though "they are a bit sluggish and slow". Beznosiuk is also hesitant to have modifications or improvements done, because if it is a flute of good quality, the maker would probably have made the best possible instrument. Her Rudall & Rose (FL BE 1) provides a good example of this point as Beznosiuk complains that this flute is too flat in the bottom register, due to the extra low B key. She does not, however, want to modify this, since it is a high-quality, 19th-century instrument, in its original condition. When questioned about whether she would make modifications to a copy of her original flute she answers: "In theory yes. If I had a copy of this and I wanted it to work as a Mercedes, then yes, I would, but I would assume that the maker already would have gone that path." There are three reasons why the musicians in the study hesitate to work on their instruments themselves: (i) they do not want to risk making it worse due to lack of knowledge; (ii) there is a value in (some of) the flutes which is not only about the playing quality, but

rather about keeping the flute in its original condition; and (iii) simple-system flutes are compromises and even a good flute inevitably has its drawbacks.

5.4.1 Improving the tuning

While Ralsgård left the modifications of the key mechanism to a professional woodwind repairer, he modified the tuning of the flute himself by altering the size of the finger holes (FL RA 1 and FL RA 2). This division of labour, he explains, is due to the individual blowing technique and anatomic disposition of the player. It is also a process of gradually widening a hole and simultaneously assessing these modifications by playing and testing. These circumstances make it hard for someone else to make changes to improve the tuning, at least without collaborating closely with the maker. One note that Ralsgård perceived as particularly flat on FL RA 2 was the $F^{\#}$ (in the first two octaves). He considers this note as particularly important since it is the third in the scale of D major, a key that is very much used in Swedish traditional music. The fifth finger hole was thus widened to bring the $F^{\#}$ into tune (see Figure 30).

As soon as Veillon received his first flute (FL VE 1) he discovered that it was lower in pitch than the instruments around him. In order to use the flute in ensemble playing he had to retune it. As this was early in his career and well before any of the flute makers in Brittany had commenced their work, he had no one to seek help from. Consequently, he found himself in a process that he describes as one of "trial and error". This process of trial and error led him to ruin his flute by cutting the foot piece too short. To counteract this, he had to retune each note by enlarging the holes.

> The flute was too flat [i.e. tuned lower than A=440]. So being very impatient, and not very clever, I thought that if I reduce the column of air, it will be sharper so … (Veillon makes a sawing gesture and sound) I cut it with a saw. Not very well by the way. [Then] I realized that it was completely out of tune, so I panicked, and I retuned it with a knife. (Veillon)

He says that the flute was in bad condition when he first got it, but adds that "it was even worse after [he] sawed it".

It is also possible to flatten a note by reducing the size of the hole that produces the out of tune tone. Roussel shows me her E^{b} flute, where this has been done to the second finger hole in order to flatten the note of B. Ralsgård has also reduced the size of the sixth finger hole on one of his flutes (FL RA 2). Ralsgård explains this had to be done since he had first enlarged the holes too much in order to sharpen the tones. To slightly flatten the note again he put wax around the edges inside the hole. At the same time,

this process allowed him to move the centre of hole slightly sideways, towards his own body. This was ergonomically preferable since it became easier for him to cover the, now relatively large, fifth finger hole (Figure 30).

Figure 30
The picture shows the enlarged fifth finger hole as well as the smaller (and slightly relocated) sixth finger hole on FL RA 2.

5.4.2 Adding and changing keys

Keys are added and changed in order to: (i) be able to play a note which otherwise is impossible or difficult to play; (ii) providing another way to play a certain tone; and to (iii) improve the usage of a certain key.

Veillon gives an example of how a short F key was installed on his keyless Du Ve flute. The work was carried out by a member of his band, Kornog. He chose to add an F key because it was the most useful, as Veillon needed "to play in D minor, to play lots of things, you know. And it was also aimed towards the repertoire that we played with Kornog." Also, the spare key happened to be a short F key from an original Rudall & Rose flute:

> There was a strange man, a gardener with a passion for flutes. He had flutes, so he gave me a key. Jamie McMenemy carved squares into the flute and inserted blocks of Blackwood. Perfectly done, and it never moved. And he had only one spare key. (Veillon)

Ralsgård has had an instrument repairer add keys in order to have more alternative fingering for some tones. In order to play B^{b} with fingering [23/2b] instead of [1a23/], he has added a second touch for the B^{b} key on one of his flutes (FL RA 1). He believes that this has improved the balance of the flute as this means that he avoids the necessity to use the left-hand thumb when playing B^{b}. He was inspired to this solution by his

background in playing the saxophone – an instrument where B^{b} can be produced using the same fingering (Figure 31).

Figure 31
The extra B^{b} touch on FL RA 1.

On FL RA 2 he also added another key in order to play the note G$^{\#}$ with fingering [1b234/], instead of [2345a/] (Figure 32).

Figure 32
The added G$^{\#}$/A^{b} key is the one with a narrow touch. The photo also shows the extended touch of the B^{b} key (FL RA 2).

This key facilitates the playing of the successive tones of D-F-A^{b}, sometimes occurring in traditional Swedish tunes. He exemplifies with the tune below (Figure 33):

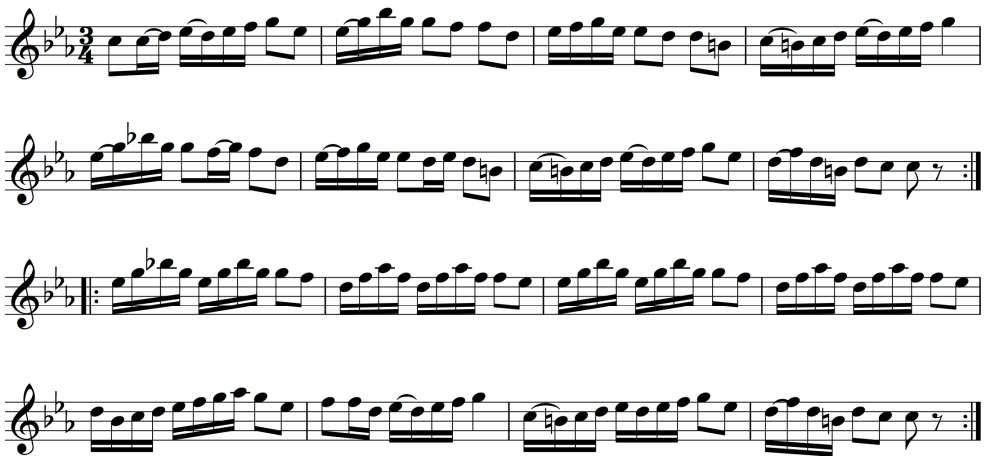


Figure 33
Polska after Jöns Persson, SvL 1 no. 93.

Interestingly, the added G♯/A♭ key does require the use of left-hand thumb, which Ralsgård sought to avoid by adding a second touch to the B♭ key on the other flute (FL RA 1). However, the uncomfortable use of the left-hand thumb is still preferable to the very fast sideway movements required to play D-F-A♭ in bar 10 and 12, that follows from using the standard fingering [34/234] to [2345a] via either [234/234a] *or* [2345b/23]. This is the same fingering problem that Beznosiuk solved through the use of a cross fingered F[2] (see the discussion on this topic in 5.3.7). Ralsgård was inspired to this solution after seeing an old Viennese simple-system flute with a key for G♯/A♭ operated by the left-hand thumb.

The ergonomic aspect of the key setup is only commented upon when it is not satisfying. For example, Beznosiuk complains about the placement of the G♯/A♭ key on her original Rudall & Rose flute (FL BE 1). She explains that a frequent use of that particular key (for example when playing a G-G♯ trill) gives her pain. As this is an original flute, Beznosiuk is not going to change the arrangement of the keys. However, there are ergonomic reasons for Ralsgård to extend some keys on his German flutes. Figure 32 shows the extended B♭ key on FL RA 2 and Figure 34 shows the extended C[2] key on the same flute.

Figure 34
The extended C^2 key on FL RA 2.

The C^2 key was extended in order for Ralsgård to play the successive tones B^1-C^2-D^2, using the key [2/2a] instead of a cross fingered alternative (such as [34/]). He preferred the sound of the note produced by using the key. However, the idea did not work out in the end since the right hand had to be repositioned in order to use the C^2 key while not touching the B^b key, which after a while brought him pain. As is visible in Figure 34, the extension of the C^2 key brings it very close to the touch of the B^b key.

5.4.3 Switching parts

Veillon, O'Grada and Ralsgård have (or previously had) flutes that consist of combinations of parts from different flutes. When O'Grada first acquired his Rudall & Rose flute (FL OG 1) it comprised of a head piece from a Fentum flute. O'Grada's current flute is also a combination of two flutes – his previous flute made by Hamilton (head piece and barrel) and a newer flute from the same maker (middle piece and foot piece). His previous flute was made of cocus wood and he kept the head piece and barrel from the previous flute since "blackwood is clearer, but cocus wood is slightly warmer in sound".

While experimenting with the German flutes (FL RA 1 and FL RA 2), Ralsgård tried several combinations of different head pieces and middle pieces, some of which worked better than others. If the physical fit was reasonably correct, the joint was tightened further by adding thread. The following quote regarding FL RA 1 provides an insight to what the process was like:

> I bought this flute from a friend, or rather, the foot joint comes from that flute. Because eventually this joint [between upper and lower middle piece] cracked, and then I took the middle parts from a flute that I got from an old man in

> Värmland [a region in the mid-west of Sweden]. And I replaced the head piece also. But where did I get that from? Oh, yes, I bought it from a jeweller who used it as decoration in his storefront. And that head piece was great. (Ralsgård)

Veillon tells an interesting story about when the head piece of his Du Ve flute (FL VE 2) was replaced by a head piece made by Hamilton:

> It was sort of a mistake. The flute was incredibly loud. I don't know how Hammy [Hamilton] did it, and I don't know if he meant it, but the flute sounded, "boom". I was blowing hard too. But the scale was weird. The A-note was very flat. But it was so loud. I don't think I have ever heard anything else that loud. And it was impossible to play it softly. It became truly depressing after a while. (Veillon)

This is an example of where an introduced part completely changes the nature of the instrument.

5.5 Other changes to the flute

While makers, woodwind repairers and players may deliberately modify the instrument, changes also occur due to the fact that the flutes are all made of wood and are played on to varying degrees at different times. Not being played on continuously may lead to instruments warping and cracking.

5.5.1 "Breaking in" a new flute

For a period of time when a wooden simple-system flute is new, the instrument often goes through some dramatic changes. The player is often recommended to be careful and to play the flute for only short amounts of time every day. Veillon is the musician in the study that comments on this the most. During his career he has played numerous flutes, many of which he ordered and received directly from makers. Since he established the collaboration with flute maker Stéphane Morvan, he has received new flutes on a regular basis. By the time of writing, Veillon is breaking in a new flute, which he claims will be his last. He estimates that it takes about two years to break in a flute. One aspect that he notes will be potentially difficult during this time is intonation: "Well, I would tend to think that these problems mostly occurs with flutes

that I have played [for] less than two years. After two years it starts to be much more stable and easier in my opinion."

5.5.2 Cracks

All of the interviewed musicians mention the problem of flutes cracking. This problem affects how they handle their flutes in different ways. As mentioned above, cracks were the main reason that O'Grada changed flute when he begun to travel more extensively. And cracks led Ralsgård to search for new middle pieces for FL RA 1. Beznosiuk speaks about a rather dramatic incident when her original Grenser flute cracked:

> I have an original Grenser. It's lovely. I have used it in concert, but once it cracked, thankfully just on the surface and not right through. It was due to the strong stage lights. I was playing the Eroica symphony at the time and was probably blowing quite strongly as one needs to when playing Beethoven. Ever since I have only used that flute for chamber music. The crack is still there – it opens a little on playing and then closes up afterwards. I think of it as a little valve in a living instrument. Luckily the crack didn't go all the way through, so it doesn't actually affect the sound. But I would never play it in an orchestral, or TV situation again … and I have other modern copies which I can use instead. (Beznosiuk)

There is also a small crack in the head joint of her original Rudall & Rose (FL BE 1). She points at it, saying that she has been playing the flute for the last couple of weeks, and that she will "probably give it a holiday", to avoid making it worse. It opens and closes according to periods of playing, but the metal lining of the head joint means that the opening crack does not affect the tone quality. Before Veillon received his Du Ve flute (FL VE 2), his Holzapfel (FL VE 1) was falling apart:

> This flute had become so much a wreck. So many cracks. So when I played at the *Fest Noz*[44], the cracks were opening up and I was losing all my air. I had to take a piece of cloth and plumbing rings, you know. (Veillon)

[44] A Breton dance and music event.

In this way cracks and the risk of cracking affect how the musicians travel with their instruments, in what performance contexts they use their instruments and how much they allow themselves to play a certain flute.

5.5.3 Other problems

There are also other problems, some of which relate to whether the flute is being played regularly or not. During the interview, Roussel picks up her E^{b} flute (FL RO 2), which she rarely plays. When she picks it up from the box, some of the metal rings at the end of each part fall off. She explains that when the flute is not being played, the wood dries up and shrinks, which cause the rings to fall off. This has also happened to Ralsgård's flute made by Baubet (FL RA 3), as is visible on the image below (Figure 35).

Figure 35
The metal ring on the barrel is loose due to shrinking wood, which is a result of the flute not being frequently played.

Roussel also highlights the need to maintain the flute by swabbing (drying) the inside of the flute after each use, as well as oiling the flute on a regular basis. She complains that she is not doing this enough herself and that this maltreatment causes problems.

As is visible in Figure 11, Beznosiuk's Thibouville flute (FL BE 2) is significantly bent. This is a well-known phenomenon that can happen to wooden flutes over time. However, Beznosiuk has never experienced any musical problems from this.

5.6 Perceiving possibilities in the musical material

The interviews were all situated in the musical context of each musician. References to tunes, composers and passages were frequent and essential in explanations of playing

technique and properties of the instrument. In this section, I will present statements that highlight the interplay between the musical material and flute playing.

In a discussion about her transition from Breton to Swedish traditional music, Roussel comments on, what she considers to be, fundamental features of the music. These features have strong impact on what she can and will do when she is playing the flute.

> The Breton tunes are like small boxes. There's not a big range, and only short melodic motifs. So variations and ornamentation become important. The Swedish tunes have longer melodic phrases and spans a wider tonal range. This opens up other dynamic possibilities, and I have played around with that and I find it really enjoyable. I have found something in Swedish music. I can say something with Swedish music that I don't feel I can with Breton music. I can say so much more. (Roussel)

The artistic freedom she experiences while playing Swedish traditional music is thus connected to her perceiving of possibilities in the musical material and the ability to elaborate on these.

Veillon also comments on these structural features of the musical material, but refers also to the context in which the music is performed: "There are things in the playing that are obvious and I think that anyone in my place would have done certain things, because there are some constant things in dance music." Parameters such as range, musical structures and performance context are considered as fundamental for the individual space for interpretation. Veillon explains:

> You have also the personality of each one [flutists]. Some will use more staccato or tonguing, some will chop the air column more, some people less. But in all cases you have to accentuate where it must be in Breton dances. When you adapt a tune from the vocal repertoire or from the tradition of other instruments, you have to do the right accentuations. (Veillon)

Veillon considers these interpretative choices to be based on what possibilities you perceive in the music: "Other musicians hear things that you don't hear. And you hear things that – or you dream of things – that they aren't necessarily concerned with or attracted to." Talking from the perspective of Irish traditional music, O'Grada also comments on the essential part of listening and exploring the relation between stylistic elements and technical aspects of playing: "It's all part of learning how to play – being able to hear all the things they [other flute players] are doing, and then work back into

the technical stuff, how to achieve the effects and then work from there." O'Grada further elaborates on how the personal perception of a tune is the departure point for working on an interpretation of that tune:

> If I like a tune, there must be something in that tune I like, some pattern or whatever it is. So how can I make that thing more obvious? How can I make sure that other people can see what I like? And that's how I play it. And different people see different things, I suppose Irish music is fairly simple melodically. And that is one of its challenges. So you play a tune for the second time and those sitting in the audience already recognize it, so now they can relate to it and they can engage with it. And that is was it's about, you know. So it's not like Rachmaninow where the audience says "wow" from start to finish. They are already part of it from the second time through. And the audience can relax too. […] I think that if you can make repetition fascinating, you have achieved something. (O'Grada)

The above statements connect the personal perception of the musical material, the identification of aesthetically favourable aspects in this material, and the technical abilities used to convey these to listeners.

5.7 Le Hout and descriptions of sound

Sound is frequently referred to during the interviews. This is hardly surprising as the interviews concerned musical practice, and sound is a prerequisite for music. In this section, I want to highlight certain interesting aspects of the sound related statements. The notion of "Le Hout", that surfaced during the interview with Veillon provides an insight to the collaboration between Veillon and Morvan:

> Stéphane [Morvan] often mentioned this – it means nothing in French – "Le Hout". Stéphane is a big fan of Matt Molloy, his music and his sound – and the Pratten [model]. Stéphane made some good Rudalls but he wanted the sound of Matt Molloy on certain recordings. But you know he goes through microphones, so it's Matt Molloy, but some microphones magnify the sound a little bit. But Stéphane [Morvan] was absolutely in love with the sound on certain recordings. "Le Hout" is a depth in the Pratten that Matt has. Because he has sort of, you cannot say that it is a released embouchure really, but he has this embouchure, I don't know how he does it. It's reedy at the same time, and there is this thing

> behind the tone and this is what he refers to by "Le Hout". And we listened sometimes to Matt together. And going: "There it was! Yes, exactly!" So he wanted that. And I kept telling him: "it's not only the flute, Stéphane, It's Matt Molloy." But anyway, he thought that he could get close enough to that.[45] (Veillon)

The search for Le Hout addresses a recurring theme emerging during the interviews – whether the sound that is produced is a quality of the player or of the flute.

Le Hout has been central in Morvan's progression as a flute maker. His motivation for developing new models (FL RO 1, FL MO 1, and FL VE 4) has been fuelled by this vision of sound. However, Morvan also contributes a great deal of the sound to the musician playing the flute. Sometimes it is hard to explain to a customer that expects his or her new flute to sound like a certain famous musician playing one of Morvan's flutes. However, as a maker, he still needs to consider the acoustic qualities of the flute itself. In order to do this, he plays and records tones on the flute while restraining from adjusting his embouchure or the cavity of the mouth. Striving to approach the flute from this neutral perspective, he tries to come close to the inherent sound qualities of the flutes.

If the physical properties of the flute are one parameter in the production of sound, the flute player is the other. As formulated by Veillon: "But the tone of the flute … it can't be only the flute. This is maybe where it is the most personal, maybe even more than fingering." One aspect that is thought to explain the highly personal dimension in the sound is the anatomy of the musician. In the discussions on the modifications made on his German flutes (FL RA 1 and FL RA 2), Ralsgård says: "Maybe someone with a different jaw wouldn't have the need to modify it." Veillon comments in a similar way: "Maybe the palette … it is all different with the teeth and tongue … everything is different. It's almost physical." However, there are also physical aspects of the musician that are not as static as the structure of the jaw. O'Grada highlights the evasive character of sound production: "Maybe it's in your mood as well. Maybe you got a cold one day, and it sounds terrible, and another day it sounds great." This is in line with Roussel's description of the loss of control of the embouchure that follows from not playing the flute for a while: "The first thing you lose is your mouth. And the air is all over."

[45] The interview with Morvan ended with the two of us playing a few tunes together. Since I am familiar with the music of Matt Molloy, and Morvan had talked about his sound during the interview, we played a couple of tunes from Molloy's recordings. When we played, I had the opportunity to listen to Morvan's own sound and I could clearly hear the influence of Molloy in his playing.

Also, the inner vision of sound is referred to. In Veillon's words: "it's the way you negotiated your embouchure, the way you set your embouchure to play. And probably, what you are aiming at when you play, without knowing." Beznosiuk makes a similar comment when she discusses the sound produced: "Well, you see, part of it [the sound] is me. Not just me, but that's the sound I have in my head. The sound I want to create." For O'Grada the influence of the player is dominant, provided that it is a good flute: "Most of it comes from how you actually blow it. So it's about what you seek, and you will get that in most flutes, [if they are] good flutes."

The quote about "Le Hout" in the beginning of this section involves yet another parameter, beyond the musician and the flute – the microphone. The importance of the microphone and sound engineer is stressed by Veillon: "If the sound is bad upfront [on the stage], there is nothing you can do. For this type of music, it is important, and it doesn't just come with the jack. We depend on the sound man." He goes on to talk about the possibilities of well-produced sound at a live performance:

> To me the ideal thing is [that] I hear myself correctly, and [that] I hear the others. But I hear myself in the hall, because you will play with the hall. And you hear your flute on stage and also in the hall, it is like inside and outside, here and there, in some sort of way. Then you can tend to play away from the microphone because you are comfortable and you are a little bit away from [the] microphone. Better tone, wider tone. It helps for nuance. It's what happened with Barzaz the other day in Paris. At first, I didn't hear the hall. I thought it was a weird hall, but when the concert started, then I detected my sound in the hall, my outside flute, and then I gradually started to play less close to the mike and it was great. At some solo parts I was almost playing away from the microphone, as if I wanted to mix my direct sound on stage with the reflected sound out in the hall. I love that. (Veillon)

The acoustic environment also stands in relation to particular flutes. Beznosiuk comments on this when she is talking about the qualities of her French Thibouville flute (FL BE 2) (see 5.2.4). Veillon makes a similar comment regarding a flute that he owned and played for just a short period of time:

> I recorded in the Duke's hall, in an old manor. It was a stormy day and I did an introduction. It's really interesting, for some reason, the sustain I had ... it was easier to play it on that particular flute. I remember that occasion for sure. (Veillon)

As is obvious from these examples, the discussion of the sound as a feature of the flute or of the player is never a matter of being able to eliminate one or the other. But it is rather a discussion about the relation between the two. Furthermore, the acoustic environment emerges as a third influencing parameter, highlighting the qualities of sound projection of the musician/musical instrument combination.

5.8 Exploration

According to the interviewed musicians, flutes often get better the more you play them. However, Ralsgård also comments on a particular flute that did not change. He describes this as a disadvantage: "You want to have a flute that grows as you play it." He is aware of the subjective character of such a judgement and it is not explicit whether he refers to an actual change of the flute itself or the possibility to discover more nuances in its already existing possibilities. It is seen rather as a combination of the two aspects and not necessarily desirable (or even possible) to make a distinction between them.

The subjective experience of playing a flute is also reflected in Roussel's reasoning about the possibilities of switching to another flute. She has played her current flute (FL RO 1) for so long (since 2005) that it would be hard for her to change: "It takes time to adjust to a new flute. I would have to play one of those [referring to my own Morvan flute of the third model] for several months, only to form an opinion." This is in line with what Veillon experienced when he transferred from his Du Ve flute (FL VE 2) to the Rudall & Rose type flute made by Chris Wilkes (FL VE 3) (see 5.3.1). The fact that you adapt and get used to a flute is also central to Morvan's decision not to maintain more than one model in parallel production, while many other flute makers have two or more flute models available through ordering. To Morvan it is essential to adjust his own playing to the current model and for him it is impossible to play more than one model properly.

As mentioned previously, when O'Grada assists Hamilton with opinions on his flute designs, he estimates his input to be very limited. The input he does offer concerns details: "You will notice it alright as an experienced player, but if you weren't an experienced player, you wouldn't be able to tell the difference." According to this statement, the ability to perceive the details of possibilities is not only linked to the individual experience of a particular flute, but the level of experience as a flute player in general.

This subjective experience of playing the flute is linked to the process of exploration. O'Grada comments on the necessity for students to sometimes "work things out themselves." This is particularly true with aspects that are hard to explain verbally, such

as embouchure position and how to work with the cavity of the mouth: "I usually try to go through the sound. Because it is almost impossible to describe how to form an embouchure." This is not only because of the extreme level of detail that is required in such an explanation but also because of the individual variations of anatomy (i.e. to produce a certain sound may require different approach from one player to another). This way of encouraging the student to listen and adapt to the possibilities of the interaction with the flute is also a teaching strategy used by Beznosiuk:

> I teach modern flute players at the Royal Academy of Music. I have several fantastic students, they win prizes and they get jobs in symphony orchestras. But they like studying this [kind of flute], because it is interesting to learn about earlier style instruments and because it has something to teach them about the music itself. It challenges their expectations and preconceived ideas about flutes and music. When they try to play these flutes, I have to tell them to stop trying to make it "work", that is, in the way which their modern flutes work … quickly, easily and efficiently. They use their well-developed modern techniques to try to make the flutes do something. But as soon as they stop doing it this way, let go of perceived assumptions and start listening and responding to the instrument, it starts to work properly. The flute is showing the way, the flute is the teacher. Flexibility and an open mind and ear are essential. (Beznosiuk)

The process of exploration has been central to Veillon as he is self-taught. In the following quote he elaborates on the difference between discovering and being taught:

> The fact that I never was taught by anyone means that I discovered everything which resulted in the fact that I had to experiment and discover by myself – sometimes I was thrilled, I thought I had discovered a totally new thing, and then I realised that it was a very well-known thing, like the harmonics. […] So it's a slow process, but what you discover yourself – I have this feeling – it creates what you are also. Because then when I was teaching in a workshop, after a workshop of four hours I had told them things that took me twenty years to discover. And I am always wondering, how will they use it? Because at the workshops, people often ask me: "on that recording, on that tune – how did you do it?" And I show them and then I will give them options. "You could do this or that." But what I cannot show them or teach them is the time it took me to make it properly. (Veillon)

The above statements show that the subjective experience of the interaction with the flute is a central aspect in the process of developing as a flute player.

5.9 Summary of the results from Study A

In this chapter, I have presented the analysis of the interviews in Study A. A number of themes are explored through statements emanating from the flutes. The availability of flutes has changed during the course of the interviewed musicians' careers. This topic reflects both the individual path as well as the different contexts that they are situated in. Among other things, this reveals whether the recently made versions of the simple-system flutes are preferable to original, 19th-century instruments. Playing a recently made flute potentially provides a possibility to collaborate with flute makers during the design process. However, as seen above this collaboration can be more or less productive depending on the openness of both parts. The topic of flute models reveals the great variety of instruments that are referred to as simple-system flutes, as well as different preferences and approaches regarding those models. Statements on playing technique reveal both similarities and differences between the interviewed musicians' approach to their instruments. The idea of the simple-system flute as a compromise is present in all interviews. When one aspect (for example sound volume in the lower tones) is improved, another aspect (for example intonation in the third octave) is less prioritised The ways in which the musicians cope with this compromise is different. Ralsgård, in particular, modifies some of his instruments in order to facilitate new technical possibilities. Modification is unthinkable for other musicians in the study, due to the risk of ruining the flute. This aversion to modification is also linked to the history and quality of the flute itself. In all circumstances, the flutes are seen as sensitive objects, always changing depending on how they are used and maintained. The changing, and even evasive nature of the flutes enhances the subjective experience of the interaction between the flutist and the flute. This experience leads to an exploratory approach towards the instruments.

Chapter 6

Results of Study B: Inquiry into the practice

In the following chapter, I present the results from the cooperative inquiry of Study B, in order to answer the second research question: *What roles do the simple-system flute play in the musical practice of flutists?* The themes that emerged in the analysis cut across the activities presented in 4.5.1: (i) communication, (ii) musical listening, (iii) tonality and timbre, (iv) interacting with the instrument, (v) learning new repertoire, (vi) embodied habits, (vii) theory in practice, and (viii) the body. Furthermore, two activities are not broken up into themes, but rather reported as units of results in themselves: the Lab-tune experiments and Swapping flutes.

This chapter is written from an emic perspective. However, much of the discussions taking place are to a certain degree analytical due to the character of the study, being a joint exploration of the participants musical practice.

One of my concerns have been to make the cooperative nature of the study manifest. The inquiry process is not driven only by me as the initiator, but initiatives are taken by all participants. In line with this, I have tried to bring forth the voices of the participants through a plentiful use of quotations. I have also chosen to include some fragments of dialogue, both because they are informative regarding the content itself, but also because they illustrate the collaboration. All transmission of music is done by ear, if not described otherwise.

6.1 Communication: verbal and beyond

Time is provided and effort is made by the participants to probe deep into the experience of musical practice. As implied by the extended epistemology, described in Chapter 4, this means going beyond mere propositional statements and to verbalize also phenomenon of experiential knowing.

In this section, the following forms of communication between the participants are described: (i) verbal communication, (ii) physical and musical demonstration, (iii) singing and gestures, and (iv) musical references. I will provide an overview of the structure of the communication between the participants in the group. This is not only for sake of transparency, but since communication is a substantial part of musical practice, the means of communication is also central to the answer regarding the role of the instrument in musical practice.

6.1.1 Verbal communication

In its purest form, the verbal communications amongst the participants are statements and explanations that convey their content only through words. Some statements are expressions of propositional knowing, which can be both referential information about the music or musicians, or descriptions of events and practices. These statements are usually easily formulated and is more a matter of telling than exploring.

The verbal communication also consists of presentational knowing, where stories and anecdotes are used to shed light on the topic at hand. These statements usually take more time to develop and there are more pauses in order to structure the account as it unfolds according to what is relevant in the on-going and joint reflection phase. In this sense, the scope of the cooperative inquiry extends beyond the limitations of the time and place of Study B. The participants have at their disposal the experience from their whole life to draw upon.

There are also attempts at verbalizing experiential knowing, which is a much more delicate project. As I intend to show in this chapter, the joint reflection has made experiences – previously unarticulated by the participants – surface and take the shape of meaningful accounts. Only at one occasion is there explicit resignation to the task. In a discussion about stylistic elements of playing in a particular recording, Oscar explains: "I find it is a struggle to talk about. We are doing one of the hardest things, which is to talk about music. You know ... it is just far too complex. I am not going to do it justice" (Oscar S9 01:34:01).

As in ordinary conversation the participants are, to varying degree, using body gestures (primarily with the hands) that accompany the words. Since the participants are holding their flute in their hands (if it is not lying on the lap) throughout the sessions, the instrument becomes a part of this gesturing. There is here a continuum that leads over to more intentional demonstrations that incorporates the flute.

6.1.2 Physical and musical demonstration

While the flute may be following the hand in a gesture accompanying a statement regarding, for example tempo, it is just because it happens to be in the hand at the moment of talking. But at other times the instrument is the locus point of what is being said. These explanations, descriptions and questions are frequent throughout the sessions. Inclusion of the flute is prominent in discussions on playing technique and instrument design. A commonality in this category of statements is that, without the flute, it would be hard to describe what can now be seen, and – if it was to be done – it would lose much of the precision made possible through the demonstration. Means of communication beyond verbal is here described inside square brackets:

> When you first showed the ornament, you didn't fully lift the finger, right? (Teo S6 00:38:15)

> No, it is just like this [Fingering 234/2 and wiggles the finger joints of right-hand index finger, while keeping the top of the finger on the flute. The result is a partially open fourth hole.] And sometimes, I lift the whole finger. (Viktor S6 00:38:21)

Verbal statements in combination with playing are used as a way to exemplify or clarify instructions to the other participants. As with physical gestures, playing is described inside square brackets. "When we play this part, it can be more articulated. Leave more space, like [playing]. And please [plays a phrase] do small … eh, not staccato, but folk music staccato, maybe" (Rikard S6 00:44:23). Where the content of the playing is significant, a transcription is added. In this quote, the musical demonstration is used to illustrate Rikard's instruction. It is especially crucial since he does not find a working terminology. Staccato is not the proper terminology so he invents "folk music staccato". Although the other musicians perhaps would intuitively understand what Rikard meant by this, the description lies in the musical demonstration more than in the words used. However, the words have the function of directing the participants' attention to a certain aspect of what Rikard plays.

Playing also works as resonance for thinking, a way to reach an insight that seems to be harder to reach without engaging with the instrument:

> There is major hijazz, like [plays a scale]. I think it is easier to explain if there is some kind of scale to refer to. This [tune] is just major, I think [plays a tune, analysing the modality of the tune as he plays it]. (Viktor S5 00:40:28)

In the above excerpt, taken from a discussion on modality, playing is used both as musical demonstration and as a means of thinking.

While musical demonstration can aid the (otherwise mainly) verbal statements, the hierarchy can also be the reverse. In such situations, the musical demonstration is accompanied by verbal comments in order to scaffold the understanding of the music. This is particularly the case when music is taught: "[playing] That is the same when you end the A part. So, it appears four times. [playing]" (Rikard S6 00:48:04).

6.1.3 Singing and gestures

A frequent way of putting the verbal statement in a musical context is to sing a few notes or a phrase to illustrate the point made. This is used both in questions: "The melody in the second part, is it [sings] or is it [sings]?" (Oscar S7 00:21:26) and as part of instructions: "Just dare to be like [singing], a bit square and really clear" (Rikard S7 00:23:38).

Hand gestures are often combined with the singing, as in this example: "It is interesting, I think. When I hear this kind of music and these ornaments, it is like an upwards movement [singing and gesturing with his hand]. Other times it is more like hitting from above [singing and gesturing]. But this is lifting as I experience it. But it is just in my head …" (Rikard S6 00:37:09).

The above quote illustrates how words, singing and gesture is combined to convey a fragment of experiential knowing, in this case a perception of sound that bears tactile information for Rikard. However, looking at the video sequence it is clear that, in this particular case, the other participants do not fully understand the account. What he sings, both times is more or less the same, but the hand gesture is different. It should be noted that a downwards movement on a key will result in an upwards movement in pitch if no other fingers are moved, whereas a downwards movement on an open hole will generally result in a downwards movement in pitch.

There are also physical gestures as part of the music making. Communicative gestures used are, for example, nods and looking. Bodies move to the rhythm of the music played. Especially feet move, sometimes it is audible, like stomping. There are individual differences between the participants. Some tend to move more than others while playing. There are also differences related to the activity at hand. When new repertoire is being transmitted, movements are limited, and when music is played bodies are moving more. The body movements follow the attention of the participants, inwards or outwards. At some occasions, physical ques are agreed upon as a means of moving from one section of an arrangement into the next.

6.1.4 Musical references

During the discussions, references to musicians, bands, genres and events are made in order to exemplify, describe and inform. In the analysis of the transcription, I created a code for these references, the highlighting of which provides one way to describe the musical world that the participants inhabit outside of the studio.

There are a number of sources of historical flute instructions mentioned: Nicholson, Rockstro, Tromlitz and Quantz. Early music flute playing (Renaissance and Baroque) are mentioned in descriptions of timbre and music aesthetics in general.

References are also made to Classical Boehm flute players, such as James Galway, Emmanuel Pahud, Robert Dick, and the more anonymous, "my classical teacher". Jethro Tull's Boehm flute player Ian Anderson is mentioned in a description of rhythmic articulation on the flute. Arnold Jacobs, a classical tuba player is mentioned due to his pedagogical work, documented by Frederiksen (1996).

Simple-system flute players from other traditions are mentioned, for example Breton flute players Sylvain Barou and Jean-Michel Veillon, and Irish flute players Matt Molloy and Mike McGoldrick, and Nova Scotian flute player Chris Norman. These flutists are mentioned in discussions on playing technique. The more general "Northern Irish flute players" are referred to as a style, characteristic of strong rhythmical emphasis.

Swedish folk musicians are mentioned, both currently active (Mats Edén) and those who have passed away but have left recorded material behind them (Assar Bengtsson). Also, musicians from the Swedish folk music history are referred to, primarily because of the repertoire associated with them (Blidström, 1658-1744).

Classical pianist Glenn Gould is mentioned in a discussion on recording situation relative to a live performance, and English accordion player Andy Cutting as a reference of style of composition.

Taken together, these shared references situate the cooperative inquiry group in a larger musical picture. The discussions are embedded in a web of references, sometimes tacit and sometimes articulated.

6.2 Musical listening

Listening was discussed at several occasions and from different perspectives. The discussions often prompted the participants to devise small impromptu experiments. This topic is divided into the following sections: (i) acoustic spaces, (ii) visual orientation, (iii) intonation and (iv) listening and paying attention.

6.2.1 Acoustic spaces

A discussion on listening in ensemble playing led the group to discuss the phenomena of the acoustics in various spaces and situations (S2 00:22:00-00:33:40). The initial remark was:

"It is good to play in here. You can hear everything. I was a bit afraid of all the dampening" (Rikard S2 00:22: 00). "Yes, there's some feedback at least" (Bill S2 00:22:05).

After commenting on the studio room in which the study took place, the topic expanded to include concert venues, practice rooms and session spaces. The general thought was that acoustic properties of a space directly effects the musical practice, although sometimes in subconscious ways. Teo tells of a situation of giving a lesson in a particularly acoustically damped room and only afterwards realizing that the room changed the way he played: "I was not realizing that I tried to compensate for the dry acoustics […] I mean, I know intellectually that the sound doesn't get stronger just by forcing the air into the flute but still, that was my reaction" (Teo S2 00:22:35). Oscar adds to this the experience of playing outside: "There is no sound coming back. I'm pushing and blowing much more than my embouchure and my instrument can take. It's something about not accepting the limitations of my instrument" (Oscar S2 00:25:20).

Participants also share experiences from attending loud Irish music sessions, and confronting the problem of not being able to hear themselves. While this may cause tension in body, an idea is also uttered that this space of musical practice has impacted the stylistic development of the sound of Irish flute playing in general: "Maybe this is where the ideal of the hard, buzzy edge of the flute comes from" (Bill S2 00:28:10). This is by no means a homogenous ideal, but a recognizable aspect of several Irish flute players and hence highlighting a characteristic to the flute, which may seem at odds with how the nature of a flute is understood in other contexts. The positive sides of various acoustic properties are also highlighted:

> Yes, it is hard work [to play in a room with dry acoustics] but also very revealing, you here all the nastiness directly and there is no covering up. I have two places in my basement. I practise in one and then I go into the other where I am rewarded. (Bill S2 00:24:00)

Oscar brings forth two extreme, and opposite situations:

> [It is] funny with the resonance thing. Because in some way you can hear yourself better. You're more naked. It's just your sound coming straight from the

> instrument to your ears and not rebounding off anything. But at the same time, you sound less. You hear yourself less because you don't have that reflection. You both hear yourself more and less. In a church, you are being bombarded by sound, being reflected off all the walls and everything. I'm sure it's been warped and distorted. But you are getting more of your sound back at you. Whereas, in an anechoic chamber, the walls are absorbing everything so all you are hearing is the sound directly emanating from you instrument. So, I guess you hear yourself clearly. (Oscar S2 00:28:30)

The anechoic chamber is then discussed, but more as a philosophical construction than a realistic situation. Some sort of acoustic space is so much taken for granted, including acoustically damped recording studios, that playing in a completely acoustically dead space seems unimaginable to the participants[46].

6.2.2 Visual orientation

How vision influences what is being heard is a reoccurring theme during reflections on listening. It is both discussed in terms of learning new repertoire (by ear), and as a way to support the aural perception in a wider perspective of musical practice, such as timing.

As a learning method (i.e. looking at someone's fingers), the following dialogue excerpt reveals different approaches among the participants:

> That [looking at someone fingers] never helps me. (Oscar S5 00:47:09)

> Oh, never? (Anton S5 00:47:11)

> Do you generally look? All the way through since you started playing this instrument? (Oscar S5 00:47:13)

> Yes, from when I started. But […] the more tunes you learn from a certain genre, the more you already have in your library. (Anton S5 00:47:21)

[46] There is an anechoic chamber as part of the Humanities lab, and we talked about visiting it in order to try it out, but at the end we did not.

> But, then, you have to be able to read someone's fingers […] I never, ever do it. It doesn't help at all. It is confusing. [I do not do it] unless it something very specific. Like when we first learned this [Tune B], I was wondering what you [Viktor] did with the G♯ key. Then it's really visual. But it was very much just like checking in to see what's happening. (Oscar S5 00:47:45)

When the theme emerges at another occasion, Oscar argues that visual orientation can have negative consequences:

> You can rely too much on the eyes. I have met guitar players [that] only hear what is going on when they see it visually. They are occupied with their hands and the position, where their fingers are. So, they use that as a big orienting factor. It can be very limiting. (Oscar S6 01:25:20)

Like Oscar, Viktor rarely looks at fingers unless it is hard to hear someone, he gives an example of being in a jam session and trying to hear another player across the table (Viktor S5 00:47:34). While learning a new tune, he might occasionally look at the other player's fingers to see if what he hears is correct, but only if he is uncertain about a particular tone.

Teo put forth the idea that timing is dependent on visual as well as aural perception. More specifically he tells of an experience from a recording situation where he was asked to add a flute track on an already existing recording with fiddle and guitar. Having played live with the other musicians without any problem, he considered the task to be rather easily achieved. It was however much more problematic. Although the pulse of the recording was consistent and predictable, the timing inside each beat was less homogenous. It was an intentional way of phrasing and in the live situations it fell into place naturally since there was an ongoing communication between the fiddle player and Teo (playing in unison). But without this two-way direction in the communication and without any visual cues, the task was much harder. "In the room you affect each other. You see the body and everything" (Teo S9 01:03:54).

6.2.3 Intonation

Intonation, as it unfolds in the discussion of the group, necessitates a kind of listening that includes both perception (listening either to others, to oneself or inner listening) and action (reacting on what is heard in terms of adjusting the pitch).

The following excerpt is taken from Session 2 (S2 00:06:30-00:21:55), when Rikard taught the second voice that he composed to Tune A (see Figure 43 for transcription).

The broken A7 chord in the last bar of the A-part was highlighted as a challenging phrase regarding intonation. Especially the $C^{\#2}$ varied in pitch among the participants. This prompted Oscar to ask the question: "How does one play in tune?" Initially he was met with silence from the rest of the group, seemingly not understanding the perspective behind the question. He then unloaded a cluster of questions:

> To what extent do you listen to yourself? To what extent do you listen to others? How much do you go for a note that is already in your head? How much do you listen to all the notes? To what extent is it in your head and then you monitor yourself and others? (Oscar, S2 00:06:56)

This opened up a discussion regarding what the participants listen for in order to orient themselves pitch-wise, and what actions are taken while playing, consciously and subconsciously. One tangible aspect of being out of tune is the beating that occurs when two tones with close, but different pitches are heard together: "I guess you have that pulsation if you are not in tune" (Oscar S2 00:15:57).

Two problems are addressed in this particular discussion. The first is the similarity of sound (since all participants are playing simple-system flute):

> I find it hard to know if it is me that is out of tune. Because, if I can't distinguish my own sound, then how do I know that it is me that is out? Then no matter what I do, it isn't going to help the situation. (Oscar S2 00:16:10)

The other problem highlighted is the uneven volume of sound between the participants: "our instruments are of different volume, so maybe we should think about that, and equalize?" (Viktor S2 00:16:30)

A joint focus is supposed to guide the process of finding a collective intonation. Although this is not explicitly stated, Viktor conveys that in this situation it is implied that the group should follow Rikard, since he is teaching the tune: "Also, someone is the leader. I feel it is you right now, Rikard. […] So, I listen to your intonation" (Viktor S2 00:08:38).

Furthermore, a broad approach to the problem (instead of trying to unpack the problem of unsatisfying intonation into parameters of playing technique) is formulated: "It is probably better to focus on something that embraces the whole problem than certain notes, or certain small stuff, I think. Even if you have to do that [focus on the technical aspects] in your practice room" (Rikard S2 00:07:57). In technical terms, this can be understood as being flexible and ready for adjustments: "We played that broken A7 chord. And like you said, Rikard, now we got it. And we then played it again and I

figured: "What am I doing? Well, I was much more loose in my embouchure" (Teo S2 00:07:27). In short, this is summarized as: "So, focusing on having a good sound includes getting rid of that fluctuation" (Teo S2 00:16:08). "Good" in this sense does not seem to be specified, but rather highlights the perceptual attunement to another kind of parameter; a musical quality instead of a physical factor.

Another topic that surfaced was the idiosyncratic character of simple-system flutes, thus highlighting that no single technical solution would be valid on all flutes:

> But this problem is also unique to each individual flute. They aren't very much in-tune as they are constructed, but you need to push them [adjust the stream of air] a little bit here and a little bit there. And now, when we are only flute players, we don't have any external control. So, we play and think that "yes, this C sharp is great", but in fact … (Bill S2 00:09:40)

Bill's observation also confirms the relevance of discussing intonation in more general terms in a group situation, since all participants have different flutes and, thus, accurate intonation would require specific technical solutions for everyone.

Bill's statement also led to some remarks regarding the intonation when playing with other instruments, such as piano (commonly with a tuning based on equal intonation) and violin (flexible and dependent on the skill and intention of the violinist). An awareness of this complexity is conveyed through a joke: "Yes, [if you are] playing in tune with a well-tuned piano, then you know you are wrong" (Bill S2 00:10:00). Participants are also referring to research where measurements and calculations on acoustic properties of historical flutes are used to reveal their respective tuning.

Viktor believes that, when it comes to simple-system flute, intonation always need to be adjusted during the course of playing: "I think you always have to compensate. Push some notes more than others" (Viktor S3 01:00:03). He says that he sometimes adjusts the tuning slide depending on what key he is playing. In this way the fundamental note of the scale is tuned and the other tones in the scale are adjusted, through air management, according to that.

6.2.4 Paying attention

The phenomenon that listening can be directed through deliberate attention (the similarity to vision is noted by participants) is considered in the discussions. As a consequence of discussions regarding listening and reacting, Tune C (Figure 36) was composed to work as a springboard for further reflection on the topic. Each participant was given a separate line to learn (by ear from video clip) and to play. Since all played

their own distinct harmony it was easier to discern the individual musicians and to try out different approaches to listening and following.

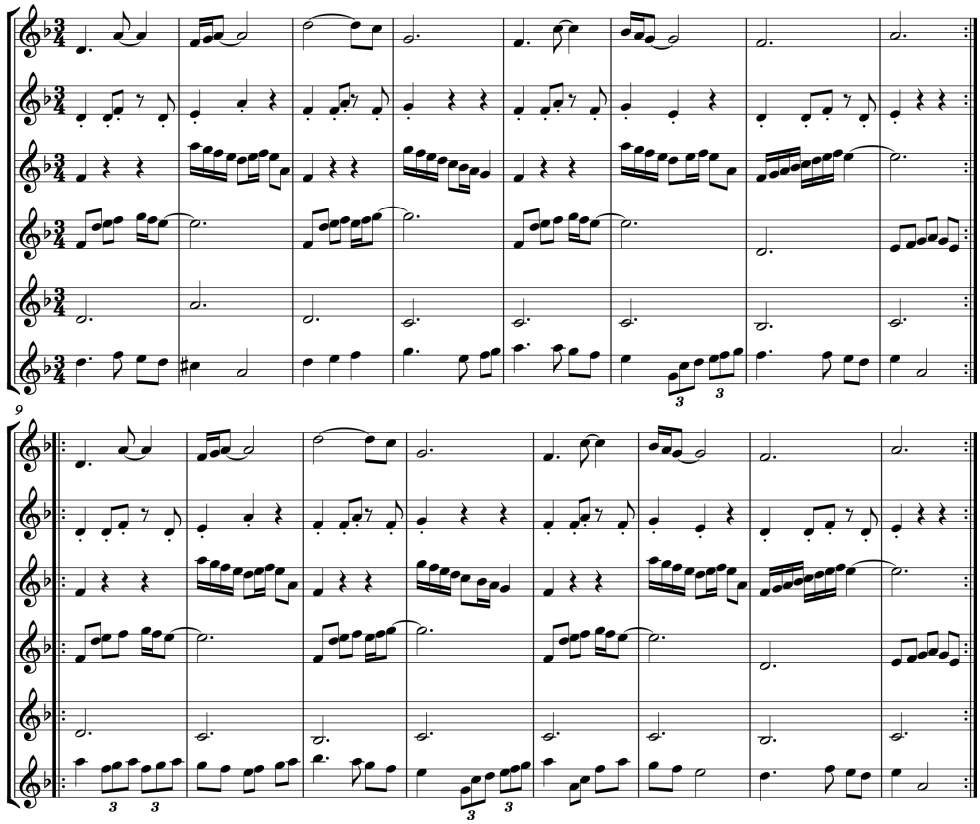


Figure 36
Tune C. Line one was played by Bill, line two by Oscar, line three by Rikard, line four by Anton, line five by Teo. The bottom part is the melody which was played by Viktor.

The consensus in the group is that attention is limited and that it is impossible to perceive everything that goes on in the music with equal carefulness. This is highlighted in statements such as:

> Am I going to put a bold musical statement out there? Or should I be listening to what others are doing? But I think that [if] I'm doing something, and want others to be listening to me, I'm not taking in the other. (Oscar S8 00:45:15)

Rikard adds that it is hard to focus on listening when the own part needs full attention: "I had problems listening since I had to focus on myself. My part is so … [sings a rapid succession of notes while signalling with his body that it is demanding] it needs to be exact to be good" (Rikard S8 00:55:30).

In the experiments done through Tune C, two different approaches were tested that are called (i) targeted listening (to choose one of the other participants to follow) and (ii) holistic listening (listening to the whole group, also phrased as "taking in the sound landscape"). The targeted listening resulted in everybody following each other. Consequently, the rhythm was unstable: "I wonder if it something tentative about it. If it is that you are on the back foot. If everyone is following like that" (Oscar S8 01:02:03).

Some aspects appeared as especially attracting attention. Bill noticed the facts that some parts stood out, such as Oscar's rhythmical line: "It was easiest to follow you [Oscar] because of the rhythm" (Bill S8 01:02:13). Also, Anton's tapped his foot while playing which drew attention, both visually and audible (as noticed by Teo and Rikard).

Although it was to certain degree possible to direct the focus towards other participants and to "shut the rest out" (Bill S8 00:52:35), the participants agreed that the experiment involved their playing in a way which conflicted with their intuitive orientation to the music, which is more flexible and holistic: "What we did now is not my style of playing and following. For some reason I like to close my eyes and listen to the whole" (Anton S8 01:02:57).

Before leaving Tune C in Session 8, the group decided to look at the same spot. The 360-camera, placed in the centre of the circle, became the joint focus. All participants were able to see each other at the periphery of their visual field. The general opinion was that this worked well: "Actually, I think this worked at least as well, maybe better [than looking at each other]" (Bill S8 01:14:44). "Yes, there is some collective focus. We all know we are looking at the same spot. I agree" (Rikard S8 01:14:57).

Attention may also be subconscious. The group is about to move on from the topic of attention and listening, when Oscar jumps in: "Can I offer one more thing about this? I think I wanted to play what Viktor was playing since we came here by train together. So, I have a feeling that we are following each other today" (Oscar S8 01:31:18). It should be noted that this insight did surface towards the end of the reflection phase, accessible through intensive focus.

6.3 The lab-tune experiments

As described in Chapter 4, three tunes (D, E and F) were composed with the aim of spurring on a conversation about interpretation. Tune D and E were composed by me and tune F was composed by Rikard. Sheet music and MIDI files of these tunes were shared with the group through the Facebook-page. The sheet music contained nothing other than the notes (leaving out additional information, such as tempo, dynamics, slurs etc.). Similarly, the MIDI file did not convey anything else about the character of the tunes, beyond the notes in the notation. The tunes were shared during the period between two consecutive sessions. Before meeting the second time, the participants had learned the tunes and recorded them on their recording devices without communicating with each other. The participants, who mainly play traditional music, are accustomed to learning and memorising tunes by ear. Sheet music is mostly used when learning tunes from music collections or archives, and sometimes as an aid for memory or when music is prearranged.

Tune D (Figure 37) was recorded by Viktor, Bill and Rikard. Tune E was recorded by Oscar, Bill, Anton and Rikard. Tune F was recorded by Teo, Oscar and Bill. Each occasion (Session 8, 9 and 10) followed the same outline of format. The participants talked about the process of learning and recording the tune and if there were any particular difficulties. The recording was then played, and the discussion progressed into topics about interpretation and playing technique. Below, I will summarize the statements and discussions.

6.3.1 Tune D

(Session 8, 01:15:18-01:34:14)
Rikard begins by drawing some associations between Tune D (Figure 37) and a couple of polskas after a particular Swedish musician (Blidström), with regards to some similarities that he points out: (i) a scarcity of notes, almost like a skeleton of a melody which leaves much room for melodic variation, but also provides some difficulties of interpretation, (ii) same key as the tunes that he is referring to. He continues: "But then I played it as a waltz and it fell into place for me" (Rikard S8 01:18:4). Played as a waltz, Tune D instead remembered him of "The Old Queen", a waltz composed by English accordion player Andy Cutting. Two characteristics that he thinks were driving this association are a perceived underlying polyrhythmic quality (two against three) and the intervals in the melody following a similar harmonic structure.

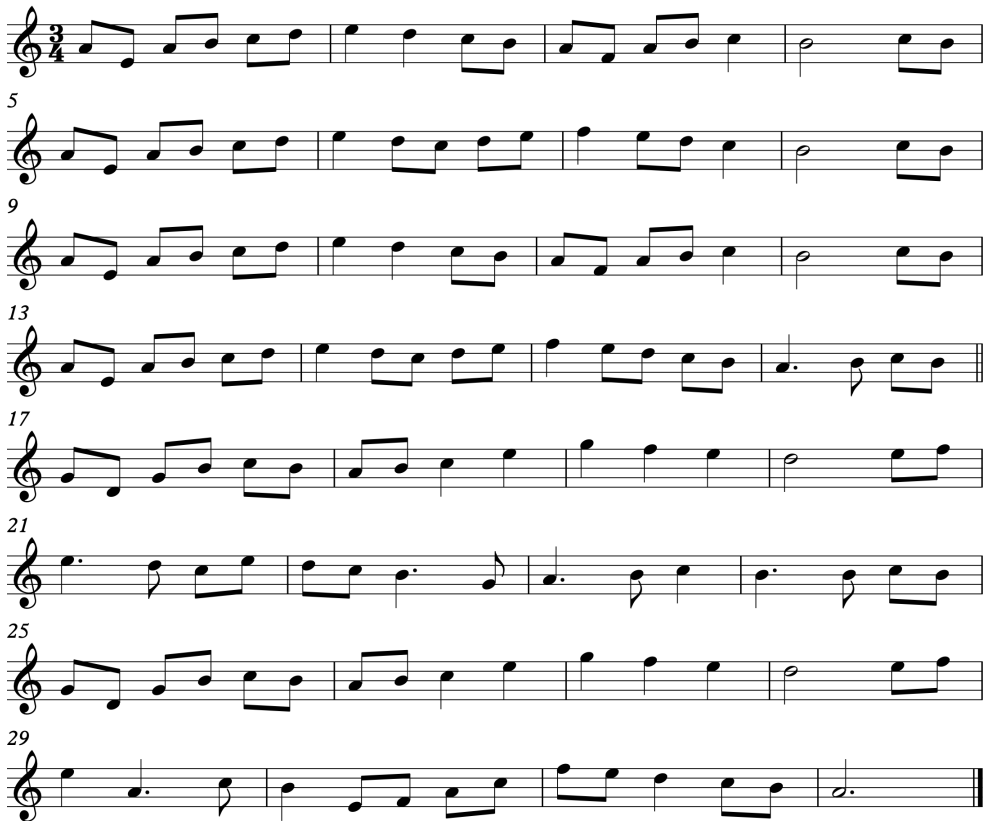


Figure 37
Tune D

Viktor has a similar approach to Tune D, but for him it was intuitively a waltz directly as he associated this tune with a traditional Swedish waltz (Silkesvalsen), which is commonly played in the same key. A recurring characteristic of Viktor's recording is the treatment of the longer notes in the third and eleventh bar of the B part. He was also inspired to make a harmony to it.

Bill does not explicitly refer to any certain kind of tune (i.e. waltz or polska). However, he loosely associates the tune to "a slow piece of renaissance music" (Bill S8 01:17:20), and claims it "needs some spicing up" (Bill S8 01:17:33). His version is slower (ca 99 bpm) than the others and it has an underlying triplet structure, which is most apparent in the beginning of the B-part (Figure 38).

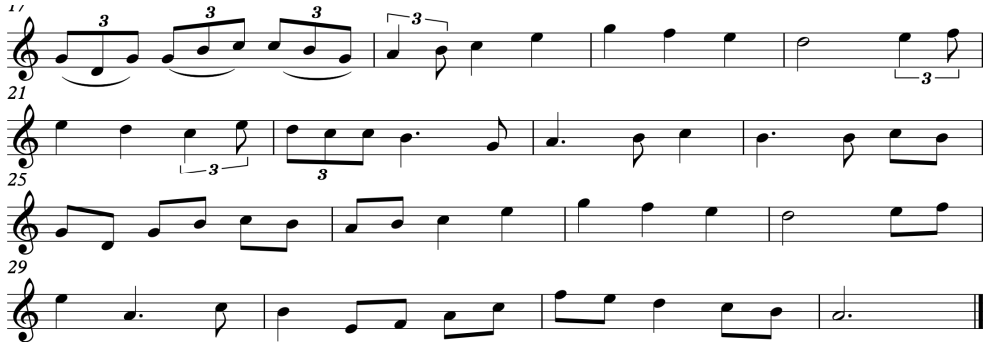


Figure 38
Bill's variation of the B-part of Tune D.

About this variation he says: "I just added a few notes, I did not change the tune, per se" (Bill S8 01:16:45). After having heard the other recordings he considers his own version to be a bit too slow.

6.3.2 Tune E

(Session 9, 00:09:45-00:32:44)
Rikard considers Tune E harder to memorize than Tune D and other participants agree. Oscar adds that, this time, he did not look at the sheet music (Figure 39), but only listened to the MIDI file.

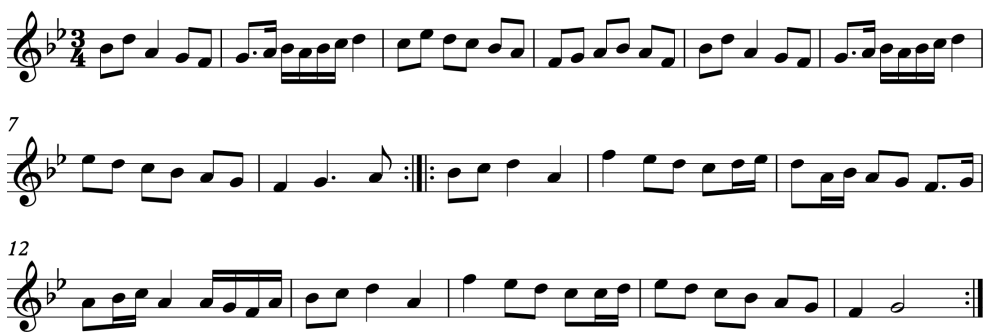


Figure 39
Tune E

For Oscar, this was a much easier way of memorizing the tune. "It stuck when I listened" (Oscar S9 00:10:27). He transposed the tune from G minor to E minor, because he found the original key challenging and also since he appreciates "the E minor timbre", which is "deeper and richer" (Oscar S9 00:10:45). In the recording he makes a few conscious alterations of the melody. He intentionally intonates the diatonic sixth (C) sharp. He is using the C^2 key [2/2a] and adjusts the angle of the airstream by tilting the head slightly backwards. He explains: "It is naturally sharp, much more than the cross fingering" (Oscar S9 00:14:16). He also adds notes in the version notated below (Figure 40).

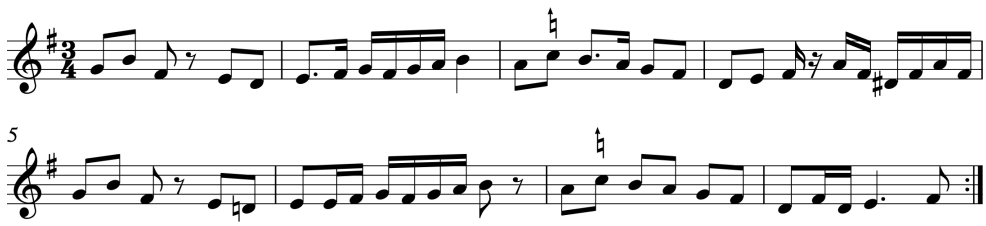


Figure 40
Oscar's version of the A-part of Tune E.

About the variant, he explains:

> Yes, there is this little motif. It's just because, that day, I practised a lot in E flat. I really liked the sound of it. I like to just go: [Playing, see Figure 41]. I played a lot of that in my warm-up, so it just snuck into the tune. […] There is this motif that is constant. And then also the sharp C. Rest is more fluid. (Oscar S9 00:14:45).

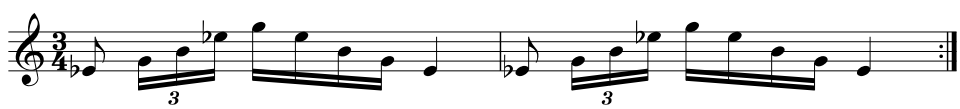


Figure 41
The fragment that Oscar played when he was warming up.

Learning the tune, Bill had listened a few times to the MIDI file and then looked at the sheet music. He too found the key challenging, stating that "I have the worst pinky finger in the world. It is very undisciplined. It is because I never use the E^{b} key. So, this was very good practice" (Bill S9 00:16:15). He further explains how this affected his recording of the tune: "In another key, it would probably be slightly faster. My E flat wasn't very agile, so I played it slow. But I like it this way" (Bill S9 00:19:34). About the recording, Anton comments: "It might be because of the key or that it is a new tune, but at least here your playing feels careful and tentative" (Anton S9 01:37:40).

Anton both did listen to the MIDI file and looked at the sheet music. A bit surprised, he says: "The sheet music actually helped me" (Anton 00:22:03). He did first learn the A-part and recorded it and then repeated the procedure with the B-part:

> Some notes were difficult, and I didn't like them. So, I threw in the F sharp, like you did [referring to the high seventh note in Oscar's recording ($D^{\#}$ in Oscar's case)]. The tune needed a sharp … or maybe not needed, but I felt for it. (Anton S9 00:23:54)

He also says that he took some notes out and made other longer. However, Oscar comments this by saying: "Well, I think that, if you count, in the end you actually added more notes through the ornamentation" (Oscar S9 00:25:27). For him, Tune E was a *slängpolska*[47].

Rikard also comments about the key: "I thought it would be tricky with two flats. But also that I need to do it more [play in G minor], for practice. But it wasn't that hard, actually" (Rikard S9 00:27:06). Regarding the character of the tune, he continues:

> It fell into the same part of my sonic world of music [as Tune D], because I was thinking again of music from Blidström. Both of these tunes say something to me that makes me refer to that, I don't know what exactly. Well, not the previous tune [Tune D] anymore, because as soon as it got the waltz gown, it became something else. (Rikard S9 00:27:45).

However, Tune E remained a *polska*[48] for Rikard, although not necessarily a slängpolska (as it was for Anton).

[47] Slängpolska is a kind of polska with an even, rhythmic emphasis across the three beats of the bar.

[48] In this case with a rhythmic emphasis on the first and third beat.

About Rikard's recording, Oscar asks "Do you ever not use the tongue? Your idea of a note is as accentuated by the tongue. It sounds characteristic of you. I appreciate it" (Oscar S9 00:31:30). Neither the MIDI file or the sheet music conveys any information about phrasing (in this case articulation or legato). This is a convention within the genre (see for example the referential twenty-four-volume collection, *Svenska Låtar*). With his comment, Oscar draws attention to the fact that the various recordings of Tune E that the participants share, are representative of their individual musical tendencies. Rikard, as Oscar claims, uses more marked articulation than the other participants usually do. Most often, this is less obvious when a tune is taught by ear, as an approach of articulation is transmitted alongside the tune itself (although not always explicitly). Rikard replies by saying: "I don't hear it as much as you do probably, since it is what I do" (Rikard S9 00:31:42).

6.3.3 Tune F

(Session 10, 01:03:44-01:15:21)
The third Lab-tune, Tune F (Figure 42), was composed by Rikard. It was published as sheet music in the Facebook group. Three participants learned the tune and recorded a version each. Teo and Oscar interpreted the tune as an asymmetrical polska. Teo had applied a meter of a short first beat (where the beats of each bar were relative to each other in approximately the following pattern: 2+4+3) while Oscar had instead applied a meter of short third beat (4+3+2). Both of these rhythms are found in the repertoire of Swedish traditional music being performed today. Bill was not sure how to interpret the tune: "I was thinking that it would need some kind of rhythmical adjustment. But I couldn't make it out so mine turned out like this instead" (Bill S10 01:07:49). His version follows the notated rhythm more closely than the others.

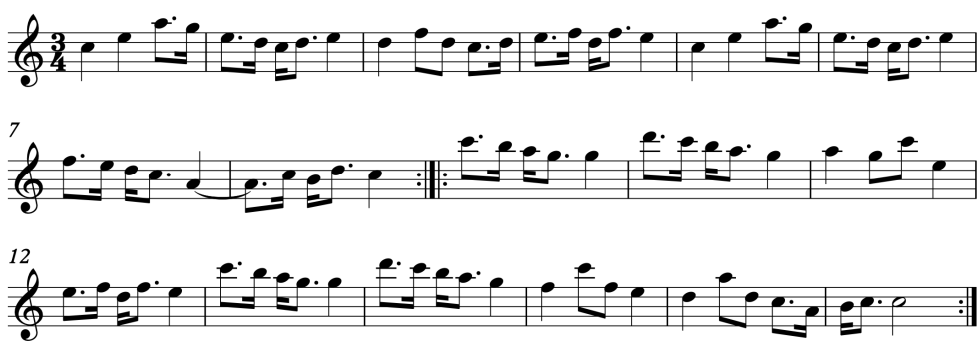


Figure 42
Tune F

For Teo, the rhythmic interpretation was instantaneous and due to the rhythmic notation in the sheet music. In particular, Teo interpreted the syncopation of the second beat in the second bar, as an indication of the tune being short first beat type of polska. Oscar was instead guided by his knowledge of the composer (Rikard). He states:

> I played it a bit and tried a bunch of different approaches, but nothing was really working. And then I thought of [Rikard]. Yeah, short three. And one of the parts, A or B was particularly short three. Some kind of biographical information was in there as well. My world of short three is very much entangled by [Rikard]. (TO S10 01:06:27)

Behind this statement lies the fact that Oscar has previously learned a number of short three polskas from Rikard.

Beyond the rhythmic dimension, Tune F also encourages a discussion about the timbre of different tonalities. Teo recorded one version in D (whereas the original is written in C): "I played it in D as well and then it became a much more lively tune" (Teo S10 01:12:31). A short extract of the discussion serves to illustrate the discussion that followed:

> It is hard to get a good final C. It becomes a bit [sings a weak note]. It is not like a heroic ending (Bill S10 01:14:03).
>
> Yes, and then you have to adapt the whole tune to correspond with that (Teo S10 01:14:24).
>
> And [otherwise] when you start over it's like: well, maybe it shouldn't be like that bright (Bill S10 01:14:26) …
>
> … which [to adapt] is nice because then you have to search for something else (Teo S10 01:14:30)
>
> I think you have to go for the Renaissance, Baroque sound of the instrument, when you play in certain keys. You cannot really go for the fat, Pratten sound. […] You have to find another world of sound in the instrument. (Rikard S10 01:14:43)

The ornamentation, heard on the recordings is also commented upon. The discussions reveal that this parameter of the interpretation is sometimes conscious and other times subconscious. Examples of such statements include a comment by Oscar upon a glissando leading up to C^3 in the recording of Teo. Teo explains: "Yes, that C (showing [2/2a] is very much [playing a glissando] for me. That kind of movement is built into it" (Teo S10 01:11:27). Teo also refers to a passage in Tune B, where he previously noticed himself playing the same glissando. In other words, for him that this particular fingering of C^3 is associated with the idiomatic possibility of the glissando (at least if the melody is in the key of C major).

6.3.4 The Lab-tunes experiments in summary

The above sections illustrate some aspects of what happens when the participants interact with new repertoire. It should be noted though, that the situations were rigged in some sense. It was clear that, when looking at the instructions posted in the Facebook group, some process of interpretation and reflection would occur. This perhaps resulted in the participants using their abilities of interpretation more than they would have outside the context of the study. However, the ways that these processes would unfold and how they were to be presented to the group through descriptions and recordings were not predetermined.

The perceptions of the tunes are articulated against a web of associations. Traditional music and Renaissance music are mentioned and it is obvious that associations to other tunes, musicians, traditions are important parts of thinking about the music. Rather than using established concepts regarding musical character, associations to other tunes fill this function.

Throughout the discussions, there does not seem to be a consensus on how various aspects of the interpretation are conceived. Carefully listening to the discussions referred to above, unfolds an insight that, among the participants, the answers to a number of questions would probably be different: What is a note and what is ornamentation? What is a planned version of the tune and what is spontaneous? What is conscious, deliberate, and intentional and what is subconscious, habitual, and automated? This moving ground is illustrated by Rikard's answer to Oscar's comment about his use of articulation in the recording of Tune E: "I don't hear it as much as you do probably, since it is what I do" (Rikard S9 00:31:42). From the perspective of the player, for whom this is part of the embodied habit, it is less obvious, or even noticeable.

The participants perceive idiomaticity in relation to tonality and key differently. This is most obvious in Tune E, which is in G minor. While Oscar transposed the tune, Bill's version was clearly affected by playing in G minor, especially by the necessity of using the E^b key, which he found difficult to operate with ease. The limitation was most

obvious for Bill in terms of tempo, but rather than adjusting his interpretation according to this limitation, his conception of the tune itself grew out of this prerequisite. On a detailed level, the idiomatic structure of the tunes, determined by the various tonalities, invited particular ornaments which again were different amongst the participants (for example Viktor's ornaments in Tune D and Teo's glissando in Tune F).

It is also relevant to notice that while a certain perception and interpretation of a tune is conditioned by aspects such as background, references and technical abilities of the participant, it may also be dependent on very fluent aspects. One example is Oscar's version of Tune E, which was directly influenced by the movements readily at hand through the technical exercises that he had worked on, prior to learning and recording Tune E.

Tonality was also seen as entangled with certain timbral possibilities. The challenge of playing in the non-standard (in this context) key of C Major (Tune F) is looked upon positively and as an opportunity for musical exploration and discovery: to explore, discover and make use of. However, this attitude is only mentioned in relation to tonalities that makes adjustment necessary, in other words more standard tonalities can be performed in less reflexive manner.

6.4 Tonality and timbre

As seen above, the theme of tonality and timbre was part of the Lab-tunes experiments. The theme also surfaces across several activities of the inquiry. In general, timbral qualities of different tonalities are mentioned when those tonalities are experienced as a challenge. One potential challenge is in the context of ensemble playing: Bill states that the different characteristics among the various tonalities are highlighted when one is "calling the shots, leading the melody, then it might be hard to keep up. At least the flute will have a different character. It may be harder is some keys than in others. The differences [in timbre between different keys become crucial" (Bill S10 01:16:42). Again this is (at least partially) thought of as a positive aspect of the instrument. Oscar argues: "I love it in this instrument [referring to simple-system flutes in general]. Each new key is a new exploration. It has its own timbre and effect on the music. It's not just getting your fingers around it" (Oscar S10 01:20:14).

However, it seems that in practice, the two aspects (fingering and timbre) are, at least in some aspects, tied to one another. Bill states that, for him it is hard to separate the two, since the technical demands of playing in unfamiliar keys overshadows the timbral qualities of the different tonalities: "For me it is too much influenced by the ease of

playing in the keys. So, [I] cannot say anything about the timbre in different tonalities. It would end up being D, G and A, then" (Bill S10 01:22:40). Even for Viktor, who is used to play in a broader range of keys acknowledges that idiomatic issues make him "play less energetic", which also has effect on the timbre (Viktor S10 01:19:32).

Oscar brings the idiomatic aspects of Irish traditional music into the discussion: "I like the open keys [referring to tonalities that do not require the use of the flute's keys] for obvious reasons, but also because they open up ornamentation [rolls and crans]" (Oscar S10 01:23:02). The conventional practice of ornamentation in Irish traditional flute playing does not involve the keys on the flute and is more dependent on the open holes. Viktor makes a comparison between ornamentation in Irish and Bulgarian traditional music. According to Viktor, Bulgarian traditional music is less associated with any particular key, as the ornamentation, to a large degree, consists of semi-tone movements and thus requires the use of keys.

It is also noted that different flutes work differently across various tonalities. In a discussion regarding tonalities, Rikard refers to one of his 19th-century flutes, made by Danish maker Niels Christiensen Thorsen:

> I was thinking of my Danish flute. On that one it is really good to play in E flat. On this not so much. These keys are so stubborn. […] I don't get the E flat feeling with this flute but on others. So, it is very instrument specific. (Rikard S10 01:27:08)

While Oscar argues for the positive side of the "open keys", Teo provides a contrasting insight. He argues that the physical properties of the holes covered by keys afford certain musical advantages since they are placed in such a way that they are more even in size:

> For me, I think that it is the correct size [fingering the scale of E^{b}]. In D [major] there is such a big difference between F sharp and E when it comes to how to approach them. […] I have to make big difference in the air management in order to make them be in the same world. (Teo S10 01:25:13)

The argument here is that the non-keyed holes that are relative to notes of $F^{\#}$ and E have to be of different sizes, due to them being covered by the fingers. Furthermore, Teo points out that the potential of a certain note may have an impact on the tonality depending on its placement in the scale: "E is a weak note but it is a major difference if E is a third or a fundamental note of the scale" (Teo S10 01:21:43). The reasoning here refers to the fact that C is the fundamental note in Tune F (6.3.3).

6.5 Interacting with the instrument

How the flute is perceived and experienced in the act of playing is an overarching theme that surfaces throughout the study and becomes relevant in various situations. It is a question of how the instrument is present for the musician in the course of playing.

6.5.1 Inner visualization

The flute is not visible while playing, as is the case for other instrumentalists, such as pianists and guitarist. The flutist is not aided by the flute being visible during the act of playing. There are significant differences between the participants regarding how and whether they describe an inner visualization of the instrument while playing. For some (Anton and Teo), the flute is present as an image and the notes hence become shapes of movements: "It is kind of like seeing the sheet music but instead of the dots seeing the finger pattern" (Teo, S9 01:20:20). This is not recognized by all participants. However, Anton describes the same phenomenon:

> When I play that tune [sings the melody], I see exactly this [holding up the flute as if playing it, but a couple of inches in front of him]. This is exactly what I see in my head. But I can't see it for real. (Anton S9 01:21:24)
>
> From that view? (Oscar S9 01:21:37)
>
> Yes, just in front of me. Focusing on the D, I know the tune starts there. (Anton S9 01:21:39)
>
> So are you like me then, that you always start in the right key? Because a D is a D and it is six fingers? (Teo S9 01:21:59)
>
> Yes. (Anton S9 01:22:09)

Rikard provides a contrasting view: "What do you mean by seeing? I don't see anything. If you say feeling, I can much more relate to that. But I don't see anything" (Rikard S9 01:21:05). Teo also gives one example how this mode of thinking is used while playing:

> When I am making up harmonies, that is what I see. I can see something else [beyond the finger pattern of the melody] when I play, if I know the tune well. I can relate to that [the inner vision] when I make a harmony. But it becomes very theoretical at times. And then sometimes I lose it. (Teo S9 01:19:46)

This inner visual mode is described by Teo both as an asset and as a handicap:

> That is why I very rarely start to play in the wrong key. As for others that only perceive the sound, they may go into a wrong key and a few bars later discover it. But that almost never happens to me because it is engraved with the fingering. I don't think it is a very good thing at all. But it is the way it is. And it is good in sessions. When you need to think of a tune while playing another one. Because it is like opening a library [of tunes]. But it would be great to shift sometimes. (Teo S9 01:20:23)

As Anton suggests, this inner visualization of the flute, and in extension the music, can be in conflict with what is being heard: "Yes, so when I hear someone playing a tune that I know, but in a different key, I might be fooled, starting to play in the key I think it is" (Anton S9 01:22:09). Bill describes a less visually oriented mode of thinking:

> I can sometimes start in different keys. No strange keys though. But when I know a tune, I rarely remember how it starts. Maybe I can think of some phrase in the middle and then find it. But some people are like libraries, they remember everything. I am amazed by that. (Bill S9 01:22:32)

Oscar, who also describes a less visually oriented way of experiencing flute playing, makes the following statement: "I find it is impossible to think of another melody. The melody [I'm playing at that particular moment] just takes over the head. It is problematic when playing in a session and I have to think of the next tune[49]" (Oscar S9 01:17:47).

[49] In an Irish session the player that starts a tune usually have the initiative to start the next tune in the set (medley). This can be planned in advance or made up in the moment.

6.5.2 Visualizing other instruments

As mentioned above, Oscar does not recognize the inner visualization of the flute. In a previous occasion, Oscar mentions that the piano was an important instrument for him during crucial times of musical learning. As such, Oscar considers it to have impacted the way he perceives music: "D major scale is definitely white and black for me. It is a shape of both colours" (Oscar S5 00:55:44).

Anton, on the other hand, has a background as a guitar player. He explains that, when he was taking an entrance test for admittance to a music academy, the guitar fretboard appeared as a tool for theoretical thinking, even though he had not played much guitar during the years previous to that. At the time of conducting Study B, the fretboard of the guitar has been more or less replaced by an inner visualization of a bouzouki fretboard: "Because I love playing chords and stuff to, so that is what my brain looks like" (Anton, S5 00:55:10).

For Teo, both the bouzouki and the mandolin fretboard have a place in his inner visualization. As the mandolin and violin share the same tuning (the violin being a common instrument in Swedish traditional music), he describes tunes that are idiomatic to the violin as "visually idiomatic". This means that melodic patterns may by easily grasped (because they would be so performed on the spatial layout of the violin/mandolin) while still be difficult to play on the flute.

The topic of visualizing other instrument than the one physically at hand thus highlights aspects of the background and interests among some of the participants.

6.5.3 Tactile

The tactile dimension is referred to in several comments throughout the study. While Rikard does not recognize the descriptions of an inner visualization of the flute, he instead says that he *feels* the tone. Oscar adds:

> F has this pattern [he holds up his right hand in the position of covering holes 4 and 5 while pressing down the short F key], like pinching. And C is like that [he holds up left hand with the position of covering two and three. (Oscar, S6 01:22:37)

Rikard, who also plays the saxophone makes the following comparison: "On the saxophone each key [tonality] and the finger combinations have clearly a more distinct identity physically. On the flute, it is obvious that D [major] is the most convenient key. It is not the same on saxophone" (Rikard S7 01:55:59). Following from this,

Rikard also considers the key system on the saxophone to be more allowing to play across all tonalities, than the simple-system flute.

Muscle memory is also referred to by the participants. In Rikard's words, some patterns of movements, for example the key of D minor, are "etched into the system" and playing in another key may be less intuitive.

6.6 Learning new repertoire

The process of learning new repertoire highlights the various modes of interacting with the instrument. Statements on learning and memorizing repertoire are found across several activities and throughout the sessions. Expanding the repertoire in such way, appears to be a central activity in the musical lives of the participants.

As mentioned above, the process of learning tunes is, for Oscar, a completely aural process. Singing is used as a way to aid the learning: "I sing it actually. When I can sing it, I can more or less play it immediately. Which proves, I guess, that it is about learning the notes and the flute is just an accessory" (Oscar S5 01:21:05). It should also be noted that singing does not always mean actual singing: "When I say singing, I don't mean sing it out loud, but only in my head" (Oscar S6 01:30:18). For Viktor, who also refers to singing as a way to learn new tunes, singing often means humming the tune quietly.

Anton refers to a visual notion of the learning process:

> I think of the tune, the melody, as an obstacle course. I put like little flags on certain notes. [sings the beginning of second harmony of Tune A (see Figure 43)] for example. Then it – the F there [bar 3] – and I know from there it is an F again but an octave down. So, I put up these flags along the obstacle course and the A-part is one and the B-part is another side of the course. And I also have this mental picture of the flute. [...] So, when it is tricky it becomes a visualization of the fingering pattern, and it is this visualization. (Anton S7 00:36:56)

Oscar describes how theoretical knowing has a role in learning and remembering music: "When I learned the melody (Tune C, see Figure 36) there is an F chord (Bar 5 in the B-part), a first inversion F chord: A, C and F. I used a bit of theory to make it out." Furthermore, he points out that this process of being aided by theoretical thinking is merged with his memory of the tune itself: "So when I come there [play that part if the tune], I am like: 'Oh yes, an F chord'" (TO S5 01:22:22).

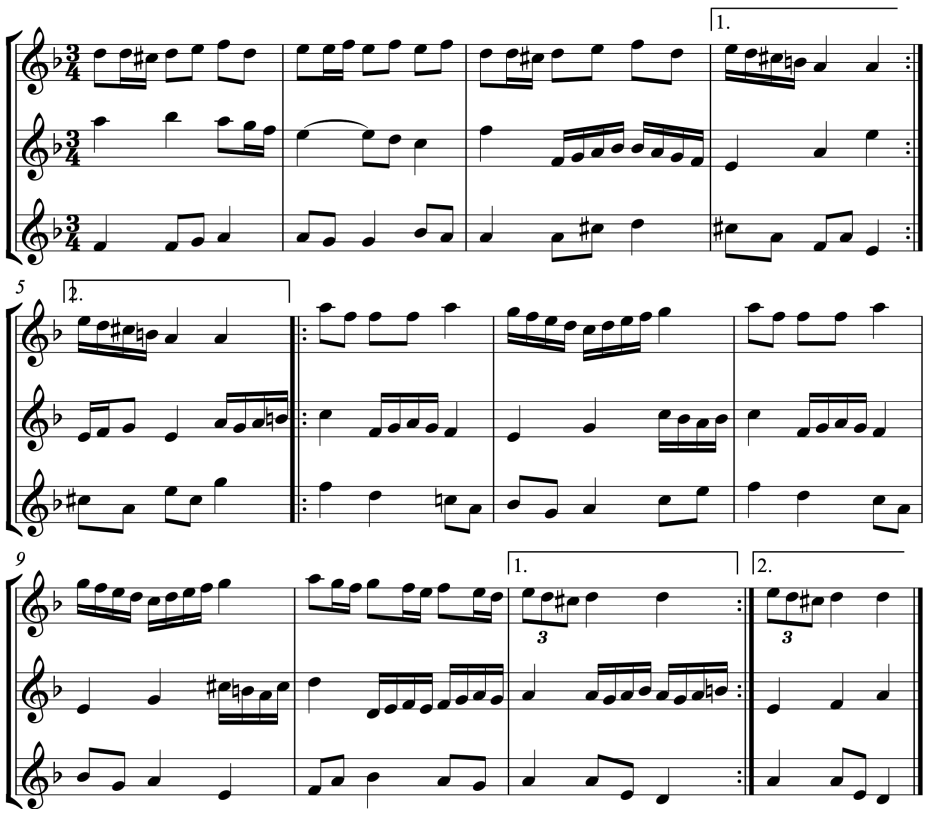


Figure 43
Tune A

While Oscar is not aided by looking at the fingers of the musician who is teaching the tune, it does play a role for some of the other participants. Learning the Bulgarian tune (Tune B) did highlight issues of learning strategies, since the music was rather unfamiliar to most participants in the group. Anton states: "It is so chaotic and new I thought: 'let's make this easy'. And it [looking at Viktor's fingers] helps a lot" (Anton S5 00:46:54). The same strategy is used by Bill. He explains it is due to the fact that he cannot easily learn the phrases and sing it since the melody and the rhythmic meter is very unfamiliar to him. "Like if you can sing it you can play it and if you can't sing it, you can see it" (Bill S6 01:24:13).

The role of previous experience and familiarity with the genre is articulated as important when understanding the music, for instance when inserting ornaments into the melody.

> The thing is when you just learn a tune, it is not difficult when you know the ornaments and where they usually come. (Viktor S5 00:45:08)

> Yes, when you hear them as ornaments. It has to do with what I said about just perceiving the tune as a flow of finger movements. But it is easier when you can discern what is the melody, what are the ornaments, and what scale it is. (Teo S5 00:45:42)

Furthermore, Oscar widens the notion of ornaments:

> And they [ornaments] come in different sizes as well. Like the small grace notes. If you knew it was a grace note and you had it under your fingers, you wouldn't think twice about it, you'd just play it. But for a fresh ear it is like, "Woah!" And then there are bigger [ornaments], like the rolls in Irish music or this beginning of klezmer tunes [sings]. It is like a chunk. So, there are different scales. (Oscar S5 00:46:13)

The tempo is crucial when it comes to perceiving the shape of the melody. Since Bulgarian music (Tune B) was unfamiliar to most of the participants, the tune was taught at a slow tempo necessary for the participants to catch the notes, the rhythm and the ornaments. It was generally agreed upon that the slow tempo also made it hard to learn the tune: "Now it is so slow that you don't really understand it" (Rikard S4 01:23:10). The same issue is developed more by Bill at a later stage of learning the harmonies to Tune A:

> It is a very different melody when it gets up in tempo. Now, it gets automatically more flowing lines than when you slur more notes, at least I do. When we play them separately and slower it gets very [sings a passage in staccato]. Now it's more like [sings a legato melody]. It is a melody, it is a tune. (Bill S7 00:34:55)

The participants agree that various forms of distraction negatively impact the memorisation process. A new melody may require concentration in order to be correctly remembered in the course of its performance. Rikard addresses that intonation issues may be a factor that makes it hard to properly execute the tune that is being learned at the time. The discussion concerns a part which several of the participants had problems of remembering:

> When we are landing on that C, it can vary a lot of how good it sounds [Rikard plays C^2 with different fingerings and the discrepancy of pitches becomes apparent]. But when the C becomes clear that part will become easier. (Rikard S7 00:34:21)

The point of Rikard's comment is to highlight that all aspects of the performance are inseparable, it is harder to remember the melody that is being learned if a part of the attention is being hijacked by other aspects.

Musical memory is discussed during several sessions. Since the majority of the music that the participants play is learned by ear, the memorization of the music is part of the learning process and essential to musicianship. While the learning situation requires working memory in order to "catch the melody", long-term memory is essential when it comes to recalling tunes at a later stage. Sheet music is only used sparingly and when it is used, it is mainly as a tool for preparation of musical arrangements or as a way to share repertoire between rehearsals or meetings.

The key to remembering a tune may not always be the opening phrase: "Remembering one phrase in the middle of the B-part can open up the rest of the tune" (Oscar S5 00:50:50) Viktor shares this experience: "I try to find phrases that are distinct […] then the next phrase will follow" (Viktor S5 00:50:15).

Anton describes how different forms of memory play various roles in the course of playing:

> It is a mix of the sound in my head and the fingering. I have a visualization of the flute in my head, and the fingering. So it goes: [sings three notes and moves fingers on the flute], and then it goes from there. Not so much visual anymore and just the oral memory and the muscle memory. (Anton S5 00:48:50)

Tunes are associated with the teacher of the tune, or the place in which it was learned. (Teo S7 01:48:28). In addition to these kinds of associations, Anton shares some other associations that he finds harder to explain. Playing *Träskodansen* (Tune G) in $G^{\#}$ reminded him of a bus station in Dublin (S7 01:46:34) and the smell of Rikard's flute reminded him of a specific old book that he used to read as a child (S10).

Dynamics between different scopes of focus seem to be an underlying and somehow unifying aspect of learning new repertoire. There is an interaction between the focus on details and grasping the tune in a more structural sense. With more familiar music, both of these layers of perspective are processed more simultaneously, since the patterns of rhythm, melody, ornamentation and so forth are understood. This predisposal becomes apparent when such understanding is not present, as with the Bulgarian tune

(Tune B). How a new tune is memorized seems to be highly personal and tied up with what kind of knowing is involved was learning the tune. Examples given by the participants include theoretical understandings, visualization of the structure, and a sequence of fine motor movements. What Oscar perceives as chord structures, Viktor perceives as a string of notes.

6.7 Embodied habits

Embodied habits is a recurring theme, which surfaces at several occasions during the discussions. In the colloquial terminology used by the participants during the study, it is sometimes referred to as "the reptile brain" and "the autopilot".

A number of activities contributed to the articulation of these issues: Anton's practice guide, Bill's Grips and Lips and Oscar's breathing workshop, and when tunes were being taught. The influential role of embodied habits on learning and playing music became especially noticeable when we worked on Tune B, since this tune did require new small movement patterns to be incorporated into the playing. At the same time, the routinized patterns of movements needed to be avoided.

Two broad sub-categories of the theme of embodied habits can be discerned throughout the study. The first category is small automised movements, such as ornaments and articulation. Isolated as they may seem, they are clearly bound up with the musical context. The other category is a broader, bodily dimension, here discussed as breathing and posture. There is some ambiguity present through the discussions on the theme. Embodied habits are both described as annoying and desirable, as they both help and hinder the successful execution of a given movement. The fourth section of this topic reports the participants' statements regarding how to become aware of these habits and to change them when necessary.

6.7.1 Automised ornamentation and articulation

Ornamentation, as it is discussed by the participants, is the practice of adding grace notes above and below a note: either before the note (as an embellishment upon it), or in the transition between two notes. These ornaments are described as being produced by small, seemingly isolated movements, automised through muscle memory.

This connects to the fact that the music discussed is mainly learned by ear. When sheet music is used by the participants in their musical practice, it rarely carries any information about ornamentation, since this is a stylistic parameter that is expected to

be added by the musician themselves: "The things that come automatically when you learn a tune. The reptile brain as you say" (Anton S7 01:02:51).

The automaticity of the process is highlighted in the following statement by Oscar: "They are there as a reflex. A good practice is taking all ornaments away for a while. But at the same time, you want them to be hyper-automatic, when you want them to be there. As automatic as possible" (Oscar S7 01:07:01). Bill puts it in a more drastic way: "Ornaments is a disease, spreading without control" (Bill S7 01:08:47). Rikard also provides a drastic example of how, when asking flute students to play a long A^1 in order to tune their instruments, they ornament the note without being aware of it: "Then, I think you have a problem. You should think that [the ornamentation] is something you do when you play a tune, but maybe not when I tune the instrument or learn a tune from someone" (Rikard S7 01:03:32). Oscar also bring forth the idea that ornamentation can be used – either consciously or subconsciously – to cover up other, less desirable, aspects of the playing: "I think it also helps you fake it a bit better. If you ornament every single note, you hide" (Oscar S7 01:08:10).

The view that automatised ornamentation is a habit bound up with certain idiomatic conditions is highlighted in the discussion following from the transposition exercise where Tune G was played in all twelve major keys. Anton noticed that in some tonalities, he ornamented more notes, while in other (such as A^b, where several keys are required) he barely made any ornamentation at all. It should be noted that he describes this awareness as noticing something happening as only remotely involving himself: "Oh, there it [ornament] was, okay" (Anton S7 01:51:14).

The tendency for individual musicians to habitually ornament musical material can be taken as a part of a musician's individual voice: "The things you always do on certain notes" (Viktor S7 01:03:02). It has thus a certain value: "Do you think you should get rid of that? Because that is your trademark, your signature" (Bill S7 01:03:07). As an automised part of the practice, ornamentation becomes a watermark, and perhaps even more so just because it is subconscious.

Viktor also describes a generally different approach to fingering, between Irish and Bulgarian traditional music: "I try to keep the fingers as close to the wholes as possible [when I play Bulgarian music], in contrast to when I play Celtic music" (Viktor S6 00:38:10). This is due to the finger movements of the ornaments. The "ready-state" of the fingers is different, inviting more continuous movements (in Bulgarian music) versus more ballistic movements (in Irish music).

There is a place for the automised ornamentation, but it may become a problem when it is so much part of playing the instrument that it is not even perceived by the flute player. A negative connotation can be understood through the term "involuntary ornaments", that Anton applies in his practice guide.

Articulation is also talked about as a partially automatized aspect of flute playing. Teo tells of a practice session where he discovered that he sometimes uses articulation subconsciously as a way to negotiate certain small technical difficulties. He first noticed it while listening to recordings that he made as part of the practice: "I did tongue in some occasions where I did not really want to. And then I understood that I did so in order to hide something, like a tricky interval or something. But it was hard to refrain from it" (Teo S7 01:27:49). This resonates with the discussion following Rikard's recording of Tune E (6.3.2), where Rikard suggested that he himself did not notice the way he articulated, just because it was his habit.

6.7.2 Breathing

Breathing is addressed particularly in Oscar's workshop in Session #3. Oscar describes himself as being obsessed with breathing. One aspect that fascinates him is that it "is fairly complicated for something that we can do without thinking" (TO S3 00:27:40). Much of the workshop that follows is about directing attention to this partly automised bodily function.

At first, some opinions and concerns are ventilated by the participants. Bill and Viktor describe other struggles related to breathing whilst playing: "I need to focus on so many other things when I play the flute." Bill has lengthy experience of singing in choirs. In this context, he finds his breathing satisfactory and he would like to have the same breathing habits when he plays the flute: "When I play flute, I am much more restricted since I cannot change my mouth so much. So, I tend to just suck up air on the top of my lungs" (Bill S3 00:34:20).

Viktor believes he has problems with his breathing. When he turned to flute playing, after having played other instruments, he started to play what he describes as fast music, without any clear guidance on how to breath properly: "Since I always have been playing fast music, and haven't really payed attention to it [breathing] until lately" (Viktor S3 00:38:50). He often finds himself unable to fill up his lungs enough and consequently needs to breathe more often. He describes the tension he experiences when he finds himself running out of air on a particularly long passage. However, when he knows a tune well, the breathing often becomes more intuitive and he is able to find the right places to replenish his breath.

Anton highlights that contextual aspects may interfere with an otherwise sufficiently working way of breathing: "When I am nervous I breath up here [points at chest]. Not good. The air is thinner. [The flute] doesn't get the fuel that it needs. I do not get a proper tone, it gets shallow" (Anton S3 00:35:20). He further explains that this feels physically tense and uncomfortable.

Oscar then leads the group through exercises in which the participants are asked to try out different ways of breathing. First a neutral state is established, where the air pressure inside the lungs equals the air pressure in the environment. Oscar explains: "So, the lungs are elastic. If you distort them, they want to get back into neutral position" (Oscar S3 01:08:24). Then the elasticity of the lungs is explored. Oscar directs the participants' attention to the muscular effort that is needed both to push air out of the lungs (to go below the neutral state), and to fill the lungs with more air than the participants are accustomed to. The focus shifts, instead, to the moment of release, where the muscles relax and air flows in or out as the lungs return to neutral state. The sensations that the participants experience are verbalized through descriptions.

Bill describes his feeling of pushing air out of the lungs in order to go below the neutral position: "First phase it just relaxation. It doesn't cost you anything. But then you push and then finally, you squeeze. It gets more intense the less air that is left. And the very last part costs a lot" (Bill S3 00:54:00). Later he adds the following to the description: "At the bottom, the spring is loaded, and it gets directly back to neutral position just by relaxing" (Bill S3 00:56:40). On taking the really deep breath, Viktor describes how the muscles in his torso hurt and how the ribcage moves when he fills his lungs more than he usually does.

These descriptions make it clear that the breathing explored in the workshop is not part of the everyday behaviour of the participants and accordingly evokes unfamiliar bodily sensations. The spotlight is further put on the perception of these sensations through the discussion among the participants and the questions posed by Oscar.

Oscar argues that when the elasticity of the lungs is properly utilised, there is sufficient energy in the relaxed. exhalation, in order to play the flute, and that no muscular effort is needed.

> One of the benefits of playing with more full lungs, is that you get more pressure and being relaxed. The other advantage is that you have more air available if you need to play longer phrases. It makes sense to hover around here [pointing at the higher end of a graph depicting air pressure and volume of air inside lungs] rather than playing around here [pointing at the lower end]. (Oscar S3 01:21:41)

The participants are asked to give an approximation of how much of the lung capacity is used when they normally play the flute. The general opinion among the participants is that there is a potential in Oscar's suggestion, that would have direct application on flute playing.

The three advantages would be: (i) inhaling more air in shorter time span, (ii) more air in the lungs allows the musician to, when necessary, play longer phrases without

breathing, and (iii) a more relaxed feeling in the body will improve the flute playing in general. Underlying the discussion is the fact that the music discussed does not present ample breathing opportunities, thus it is a vital part of good flute playing to find places to breath, which minimally interrupt the flow of the music. Many of the instruments with a similar melodic function do not require the musician to blow directly into the instrument (for example violin, bagpipes and accordion).

However, there is also a consensus amongst the participants that it is hard to change the habit of breathing, even though the benefits are acknowledged. As Bill states: "It feels like losing control" (Bill S3 01:16:25).

6.7.3 Posture and balance

Another habitual aspect concerns posture and how to physically hold and balance the flute when playing. Over the years, Bill has experienced problems physically balancing his flute, which has led to difficulties in getting a proper and stable tone. In his presentation, "Grips and Lips" (Session 3) the discussion on these topics is informed by references to historical sources, which take the form of instructions written down by flute players of Western art music, during the 19th century. At the end of the presentation, he also illustrates, through pictures, the variety of approaches to posture and balance that can be found among distinguished, currently active flute players.

Observations regards aspects of aspects of anatomy are highlighted as the participants try out, compare and discuss manners of holding the flute. For example, the right-hand thumb is used differently by the participants. It is discovered that the participants' thumbs have differing flexibility in how much they can be bent backwards. A consequence of this is that some of the participants have a resting position of the thumb which is different from others, and various resting positions offer more or less contact with the flute. Although this is not necessarily beneficial or even used, it shows a variety in bodily configurations. It might seem as a small detail but understood as one of three points of support it is a parameter worth considering.

Rikard shows a pressure mark on his thump, which clearly shows signs of contact with the flute. It is so noticeable that Oscar comments with a joke: "Are you sure you didn't have an accident with the kitchen knife" (Oscar S3 00:34:47). Where the thumb is placed along the flute varies a lot and is connected to how (or if) the E^{b} key is used as a balance point. Bill comments: "I sometimes use the block of the E^{b} key [the wooden part on which the key is mounted] as support for the pinky finger. It is not what I want to do, but somehow it just gets there" (Bill S3 00:37:00).

Finger placement on the flute is also connected to the wrists, a site where tension can occur and even lead to severe problems. Viktor tells of how he had to reconsider how he held the flute due to problems with his wrists. Oscar suggests shaking the hand in

order to relax the hand and discover a neutral way of holding the hand, which can be recalled and reenacted when holding the flute.

Bill highlights another anatomical constraint: the shape and flexibility of the joints of the left-hand index finger. He states that for some flute players substantial flexibility of this finger can result in what he describes as a shelf for the flute. "I have rather stiff joints so I compensate by pushing harder, which is not good at all" (Bill S3 00:38:20).

The way the flute is held is also considered by the participants to impact how the flute is aligned. In order for the chin to support the flute in a way that corresponds with how the hands make contact with the lower parts of the flute, the head piece must be twisted inwards or outwards. This twisting may in turn also impact the intonation and seems to conflict with some of the historical sources referenced in the presentation, where very precise instruction for the alignment of the flute is given.

How the flute is aligned varies a lot among the participants. Some (Oscar) have the mouth piece turned inwards, while others (for example Anton) has turned the mouth piece outwards. Oscar comments on the possible variations: "There is a great flute player in London who has the head piece turned almost 90 degrees outwards, and then there are also the shoulder-resters" (Oscar S3 00:41:36). The latter refers to flute players that supports the head piece of the flute with their left shoulder (if right-handed).

Viktor adds that the way that the flute is aligned also affects the sound: "If you turn [the mouth piece] inwards the tone gets more reedy [demonstrates by playing]" (Viktor S3 00:42:55). Rikard recounts how he had at one time experimented with the alignment of the head piece:

> I remember that during one period in my flute playing life, I experienced that the tones where very scattered out like that [pointing with his fingers and referring to uncontrolled intonation] and that turning the head piece inwards made it more controlled. These days I don't have it very much turned inwards, but I remember experimenting with that. (Rikard S3 00:42:10)

Teo shares a similar experience:

> When I started to play the flute, I had the bad habit of changing the angle of the head piece. When I picked up the flute I had it like this [showing the head piece slightly turned outwards] and when the flute became warm I turned it inwards to get another kind of sound. But that meant my intonation was really messy. So, then I decided to be consistent, to have the far edge of the mouth hole aligned to the centre of the finger holes. And, later on, I changed to having the centre of

> the mouth hole aligned to the centre of the finger holes. And it makes a huge difference. (Teo S3 00:43:20)

Bill usually has the head piece turned in. On rare occasions, he finds himself, almost subconsciously, adjusting the head piece to be more centrally aligned. "And I am not sure why it happens, if it is how I have my arms or how I twist my body, but I have never found a pattern" (Bill S3 00:44:10).

Bill summarises the essence of the historical sources: "A lot of it comes down to that you should feel natural and relaxed. So, curved fingers and a firm grip."

6.7.4 Becoming aware and to change

The participants agree that it is impossible to be aware of everything that is going on, but it might be advisable to confront certain problematic aspects of one's playing: "I don't think it is possible to be aware of everything. But be aware if you do the same thing every time" (Anton S7 01:25:58). But the participants' view is not to be understood as a division into two separate modes or levels of playing, where one is subconscious (and only noticeable through analysis of recordings or through observations by others), and the other is always conscious and intentional. Rather, the descriptions portray a picture where attention can be directed to certain aspects of one's playing, such as breathing, articulation and ornamentation.

Recordings and exercises are suggested methods for aiding this redirection of attention, as well as in-depth discussion with other musicians. As such, this can be the first step towards changing or developing otherwise hidden aspects of the practice. The sense of loss of control is associated with changing the habits of playing.

6.8 Theory in practice

A recurring theme is the role that musical theory has in the participants' musical practice – both as an aspect of learning new music and as way to create and act in the music as it unfolds. Music theory can be described as a mode of thinking in action, or as a scaffolding technique. How music theory informs the playing is different among the participants. Knowledge of music theory is here referred to in two different, but interlinked, dimensions: (i) as an explanatory asset in verbal communication, and (ii) as a conceptual tool to be used when playing.

Regarding this first dimension, Teo points out the fact that theoretical concepts are frequently used in the communication among the participants. He points out an

example when the inquiry group learned the Bulgarian tune (Tune B) from Viktor (Teo S5 01:08:29). The unfamiliar music demanded explanations in terms of scales, intervals, and harmonies. Oscar comments on the situation: "Yes, anything that can bring order in chaos" (Oscar S5 01:09:15), meaning that theoretical concepts were helpful in order to decipher the music. Viktor brings forth the idea that the communicative dimension is perhaps driving the use of theoretical concepts in the first place. "It is true that if you just have good ears, you can play it […] but you won't be able to explain it" (Viktor S5 01:09:24).

The second, perhaps more hidden dimension of music theory as a conceptual tool, surfaced when the participants reflected upon how they solved a certain task. As part of Anton's exercises, the group played Tune G through the twelve major keys. The tune's single part starts on the fifth note of the scale and ends on first. The exercise was to play the tune through once and then repeat the tune, starting over on the end note, which then became the fifth in the new key. Accordingly, the transposition looks like: G-C-F and so on, through the circle of fifths, until G major is reached again. While some of the participants found music theory a useful tool to navigate the task, others either didn't think theoretically, or intentionally avoided using this tool.

Bill wishes he was "more theoretical", as he thinks it would be helpful in order to play more in, what he refers to as, "off keys" (Bill S7 01:54:39). Rikard also suggests that a theoretical method of tackling the exercise is positive: "I tried to be more theoretical than I normally am. I enjoy that. Thinking, okay this is the fifth so now I am in this tonality" (Rikard S7 01:56:46).

For Oscar, the exercise prompted him to exploit his background in piano playing. As the group moved through the circle of fifths, he was aided by an inner image of the keyboard as a means to navigate in some of the less familiar major keys: "In A flat I was thinking of the piano. Tracing my finger in the piano while I was playing the notes" (Oscar, S7 01:54:57).

Oscar, who calls himself a "compulsive thinker" explains more how "pieces of musical theory come out" for him:

> I use theoretical thinking to correct myself. Like the turnaround between A1 and A2 (harmony of Tune A). It goes like this: F A E [a sequence of notes] and then back to A [pointing in the air to show the intervals]. And I thought theoretically that it was F A F A, so I thought of two chords there, which are the same, just an arpeggio up. But then I realized it was actually two [different] chords there. So, use that kind of theory to correct mistakes. (Oscar S7 00:38:29)

Viktor adds that, for him, theoretical thinking fades away after having filled its purpose as a scaffolding technique. In the exercise of transposing Tune G, he states that: "We have played this tune so much that it is in the fingers" (Viktor S7 01:55:21). Teo describes how theoretical patterns "unfold" through the fingering: "To me [theory] is very linked to the fingering […] When I play it [a certain phrase], I feel it like an F major scale. If I just listen to it, I wouldn't have thought of it as much" (Teo S7 00:42:31). Again, Oscar refers to how his perception of music is influenced from piano playing:

> I started learning music seriously through piano. And learning about chords. Like, [the sequence of notes] C E G. It is difficult not to think of these notes as a chord. They are so linked to the idea of a chord, even if you play them melodically. And also inversions of chords as well. That happens a lot. (Oscar S7 00:41:09)

The last comment, "that happens a lot", illustrates well how this theme of theoretical-thinking-through-practice emerges through the study: It is one way of thinking that has a part in the process of learning, memorizing, and making music. It is a tool that is accessed when needed, to differing extents by the participants. It is both consciously used and a predisposition to perceive music according to previous experiences.

6.9 The body

The reflections on flute playing often involve references about the body. It is explicit in some of the themes of this chapter, such as the theme concerning embodied habits. While most such reflections are driven by the flute playing, and involving the body as relative to that, there are also statements where the perspective is reversed. In such cases the bodily experience comes first and it is then put in the perspective of how it influences the flute playing. Such statements are described below.

Rikard brings forth the idea that a bodily perspective is necessary to understand the music. He refers to his activity as teacher:

> I always speak of dancing and the body, and the impact this has on dance music. Not weighing anything and just levitating would be the opposite. Peoples bones, flesh and intestines … what does that mean and what impact does that have in traditional music? […] Lots of classical repertoire and ideas about classical music is about not having a body. Being light and heavenly, which is the opposite to

> this [sings a traditional tune]. This is like devil's music. [Laughter] Speaking of rhythm and timing like that would maybe improve the ability to ground your music. (Rikard S9 01:08:46)

In a discussion about practice habits, as part of Anton's practice guide, the topic of pain surfaced. Several of the participants felt tensions and even pain if they played for a long time – particularly if not paying attention to posture. Teo, who rarely has any such issues, tells of a critical situation during a recording process:

> When we recorded for a few days, I actually lost my shoulder. I just couldn't lift my arm. So, the final day, I had to sit like this [showing a position facing downwards]. But that never happened before or after that day. (Teo S7 01:11:31)

Anton explains how he uses a combination of sitting down and standing up while practicing, and how this has bearing upon the situation:

> If I practice a tune, and it is new to me, I tend to sit down. Because it is more focused, digging down into the music somehow. But then after a while, I go into some kind of performance mode and stand up and play it. (Anton S7 01:11:53)

Teo highlights that the physical experience of the instrument may vary depending on what kind of activity has preceded flute playing. He gives the following example: "I had an experience with playing ice-hockey a couple of years ago. I played hockey and then went straight to the music academy. It was interesting to experience the flute. It felt so small and tiny in my hands" (Teo S3 00:44:30).

The participants agree that the body has a significant role in sound production. The following excerpt illustrates a perception of a state of playing where the body is attuned to the flute:

> When everything works the way it should, it is just a flow of air. And I think this is one of the keys to get there, to breath more. And when it works here [pointing at the cheeks] and with the embouchure, then it can handle a lot more air, and everything turns into sound. (Teo S3 01:49:21)

> Yeah, I recognize that. Sometimes I can blow as hard as I like and it converts into sound. Other times the flute won't take it. It must be combination of the embouchure and all sorts of things. (Oscar S3 01:30:50)
>
> It is properly oiled and you are not too dry in your mouth and … (Teo S3 01:30:59)
>
> And there's lots of feedback back into the body. (Oscar S3 01:31:01)
>
> And into the fingers. (Viktor S3 01:51:02)
>
> The resonance of your instrument must meet the resonance of your body. (Oscar S3 01:51:17)

Several of the participants have had positive experiences of singing in combination with flute playing, as a method of creating a sense of resonance in the body. This is either done in terms of singing the notes before playing the flute or meanwhile playing. Teo mentions *throat tuning* where the mouth and glottis moves as if singing the notes that is being played. This is thought to create a space for resonance.

6.10 Swapping flutes

During the last session, the participants agreed to try out each other's flutes (Session 10, 01:29:04-02:15:45). We played a tune together (Tune E) and then passed the flute to the participant to the right. In this way, each participant played on all six flutes in the room. This experiment opened up comments revealing what participants are familiar with and what they value in an instrument. Thus, different perceptions regarding the same instrument were described. As Rikard put it: "A flute speed dating" (Rikard S10 01:29:26). Tune E was chosen because of its key (G minor) and to play it requires the use of three or four keys ($B^{\flat}$, $E^{\flat}$, short F and/or long F). Keywork was also frequently commented upon:

> The keys were in unexpected places. I missed them several times. (Teo S10 01:50:32)
>
> The long F key is really brutally placed on this flute. (Bill S10 02:14:03)
>
> This [flute] feels so different from Teo's and I am talking about only the keywork even though they look so similar. (Rikard S10 02:14:11)
>
> Interesting, just picking it up and finding the keys. I was slamming the fingers into the flute itself. Like the B^{b} keys on your three flutes [pointing to three other flutes], they are a lot further towards the end of the flute. But it is interesting how fast the body adopts. At least, I could get by. (Oscar S10 01:45:50)

Looking at the video sequence of the experiment also reveals a tendency to adjust the way the flutes are assembled. When participants receive a new flute to try out, the following actions are often taken: The flute is received and brought to playing position. It is taken down again and the head piece is either twisted towards or away from the mouth. At some moments, the foot piece is also adjusted in order for the E^{b} key to be in the right position for the right-hand little finger.

The following excerpt illustrates how an initial impression is articulated through dialogue among the participants (S10, 01:50:32-01:54:32):

> There is something about the keys of Oscar's flute. [Teo thinks, is about to say something but hesitates. He then picks up Oscar's flute again and try out the keys.] (Teo S10 01:50:32)
>
> Is it the placement of the keys, or what? (Oscar S10 01:51:05)
>
> I think it is … [keeps on pushing down the keys] … it is very mechanical. It is the sound of course [using the keys creates a clicking sound, which is obscured if the flute is being played], but there is much happening from this position [the touch of the $G^{\#}/A^{b}$ key is up] to this position [pushing down the touch of the $G^{\#}/A^{b}$ key]. (Teo S10 01:51:25)
>
> It's a long travel? (Oscar S10 01:53:55)

> Long travel, yes. But the resistance isn't even. It is a bit more resistance in the beginning and then it loosens [after the initial movement]. (Teo S10 01:54:15)

Not only is the opinion articulated in words, but the dialogue is also a process for Teo to actually realize why he felt an aversion towards the keywork of the particular flute. What was initially just formulated in unprecise ways: "There is something about the keywork […] a big difference between the feeling of the open hole notes and the keyed notes" (Teo S10, 01:50:10). The above dialogue exemplifies that there may be, at times, a step between an impression of an instrument and realising what this impression is based upon, in terms of material properties.

There are also several statements about the "potential" of the flutes. By this, the participants mean that it takes time and effort to adapt to the various flutes in order to form a proper opinion, kind of humbleness towards the instrument. Examples of this approach include: "I feel I would like to keep those two flutes for a week or something" (Anton S10 01:55:11); "If we had a more time, it would be a very different experience" (Teo S10 01:48:10); "This has potentially the most volume" (Viktor S10 01:48:50); "Your flute is not easy, but maybe interesting to pursue" (Oscar S10 01:45:50); "This flute is heavy to drive, but maybe rewarding after a week" (Teo S10 01:56:09).

At the end of the experiment, Oscar describes it as a kind of out-of-body experience. His flute looked very different when it was in the hands of others. For example, the keys looked a bit chunky.

6.11 Summary of the results from Study B

In this chapter, I describe the work undertaken by the members of the cooperative inquiry. The study took place over ten sessions and includes a number of activities, such as tunes, workshops, and experiments initiated by various participants.

The communication within the group consists of a mixture of verbal, gestural, and musical statements, which are weaved together in different ways. Often, the verbal statements main purpose is to direct attention towards details of what is being played or demonstrated on the flute. Body language and gestures is important in terms of communication but takes different shape between the participants. Gestures are diminished during moments of intense learning, such as when trying to memorise a new tune. The participants are, to various degrees visually oriented when learning from another player. For some, looking at the other musician is helpful when it comes to understanding what is being played, for others it is confusing.

The group frequently reflects on listening and address a number of phenomena, such as how musical practice is affected and effected by the acoustics of a particular space. This happens both on a conscious level, but also in subconscious way, for example, when leading to tensions and a forced way of playing. In a way the acoustics cannot be separated from the direct sound from the instrument as playing music is always acoustically embedded.

Effort is also made by the participants to inquire into what they listen for and how they listen, as the music unfolds. Attention is discussed as a limited resource which can be consciously directed, but is also caught by certain events, both visual and auditory. The participants agreed that attention can either be directed towards certain musicians' actions or towards the whole sounding picture. Attention is also constrained by, for example technically challenging music.

The character of the simple-system flute is discussed. Aspects put forth by the participants include the problem of intonation with regards to temperature and the idiosyncratic nature of the simple-system flutes, and the changing timbre across tonalities. Such aspects of the instrument are both considered frustrating and rewarding. How such challenges are perceived is partly connected to the technical skill of the player.

The Lab-tunes experiments give an insight into the individual's perspective on the repertoire. What possibilities in the music are perceived depend on the participants' experiences, technical skill and aesthetic preferences (intonation, rhythm, ornamentation, and melodic variations). Some aspects of interpretation, such as articulation, are not always executed in a fully conscious manner, but rather as intuitive responses from the musician to the music presented.

There are differences regarding how the flute is perceived, when it is being played by the participants. Some of the participants describe an inner visualization, other refer to tactile identities of the notes. Knowledge of music theory also influences the interaction with – and the perception of – the instrument, as well as experiences from playing other instruments.

Embodied habits are described as a paradox. Automatisation of movements are necessary in building a playing technique, but also occlude the perception of the own playing. Ornamentation is used as an example for this: it is necessary for the fast finger movements to be automatic but ornamentation is also referred to as a "disease, spreading without control". Embodied habits discussed also include posture and breathing. The problem of becoming aware of undesired habitual ways of interacting with the instrument is also addressed and possible solutions include listening to recordings with a critical ear.

Chapter 7

Affordances of the interaction with the musical instrument: A discussion

The two result chapters (Chapter 5 and 6) constitute the answers to the two research questions presented in 1.1:

i. How do flutists talk about their approaches to, and the possibilities of, the simple-system flute?

ii. What roles do the simple-system flute have in the musical practice of flutists?

In the following chapter, I will discuss the answers to these two questions, reflected in the theoretical framework (Chapter 3), and further animated by previous research (Chapter 2). Driving the discussion are two questions, which emerged from the results:

iii. How can these roles, approaches, and possibilities be understood in terms of affordances?

iv. What kind of perspective on learning and musical development emerges from the answers to the above questions?

In the first section, the sensorimotor relationship between the flutist and the simple-system flute is discussed. In doing this, examples taken from the empirical material are used to discuss aspects of the concept of affordances. From this, I suggest a definition of affordances of musical instruments.

In the second section, the interaction between the flutists and their instruments is explored further. The theory of direct perception assumes a continuous relationship between action and perception, which this raises questions about the more precise nature of this relationship: What kind of perception? What kind of action? Following

from these questions, this section discusses sensory modalities and perceptual experience.

Section three discusses the themes of learning and musical development, emerging from the results, and how these might be understood, which leads into to the fourth section, educational implications.

Finally, I comment on the interpretation of musical affordances that has emerged in a dialogue between previous research and the results from the present thesis.

7.1 Affordances of the simple-system flute

In this section, the first of the above questions – *How can these roles, approaches, and possibilities be understood in terms of affordances?* – will be addressed. The point of departure is the reciprocal sensorimotor relationships that are described by the flutists in both studies. At no time during the interviews are the properties and features of the flutes discussed without references to the musicians themselves, or the actions that they intend to perform with their instruments. And vice versa, the playing techniques that they bring forth are never stated as eternal truths, but rather as approaches that depend as much on the instrument they are playing as well as the repertoire and genre they are performing.

Although the relationships between the flutists and their flutes are deep, complex, and multifaceted (the instruments are in many ways partners in life), I will here focus on one aspect of this relationship – *the sensorimotor relationship*. The concept of sensorimotor relationships is not a taken directly from the literature presented in Chapter 3, but rather a minor elaboration of mine. The need for this concept is due to musical instruments being a particular kind of object. Although Noë (2004) does not limit the notion of sensorimotor knowledge to the interaction with everyday objects, such as tomatoes or door handles, I believe the intense interaction with a musical instrument over time give rise to sensorimotor knowledge of a certain character. This is what I refer to as the sensorimotor relationship between a musician and their instrument. Although I stress that affordances of a musical instrument arise in the present moment, the notion of relationship highlights a wider temporal scale that needs to be taken into consideration, a backdrop towards which the sensorimotor contingencies must be understood. Throughout the discussion in this chapter, I will elaborate on the meaning of sensorimotor relationships. This relationship is divided into three dimensions: (i) the column of air, (ii) the spatial networks, and (iii) sound (Figure 44).

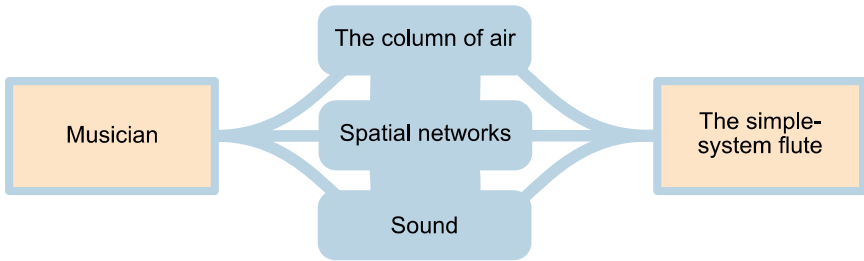


Figure 44
Three dimensions of the sensorimotor relationship of the interaction with a simple-system flute.

These three dimensions share the fact that they are dependent on both the musician and the properties of the simple-system flute.

The three dimensions forming the basis of the sensorimotor relationship are first discussed separately. These analytical threads are tied together in 7.1.4, which is the heart of this section. I then continue this by exploring five themes, through which some aspects of the complexity surrounding affordances of musical instruments are addressed.

7.1.1 The column of air

From the perspective of the musical practice of playing a wind instrument, the empirical material challenges the usefulness of the conventional definition of the column of air. The following example is taken from Oxford Companion to Music:

> The body of air contained within the bore of a tubular wind instrument. Sounding a note causes the air column to vibrate; the frequency of the vibrations determines the pitch of the note heard. The acoustic properties of the air column are affected by the shape of the bore (which may be conical or cylindrical) and its length, which may be altered by the use of valves to increase or decrease tubing on brass instruments, or by the opening and closing of side holes in woodwind instruments. (Cochrane, 2011)

Accordingly, the column of air as a sensorimotor relationship between flutist and flute can be understood as combining the air column of the instrument (as described above) and much of the respiratory system of the musician.

The properties of these are otherwise often discussed as separate entities. The air column as defined above (i.e. the air contained in the bore of a wind instrument) has long been an interest amongst acoustics researchers. Examples of such research are referred to in Chapter 2 (Nederveen, 1998; Felix & Dalmont, 2012; Benade, 1960; Keefe, 1982; Backus, 1964; Coltman, 1971). With some exceptions, this body of

research does not include the musician, but is more concerned with calculating the acoustic properties of the instrument itself.

Although acoustics research can be informative for an instrument designer, its relevance for musicians may be limited. This is not only due to the fact that the research builds upon scientific calculations that demand specific knowledge to be understood, but also because – for a musician – the experience of playing music can be considered to have primacy. In a performance situation, a wind instrument is conjoined with the body of the musician, hence the air column is extended.

Concerning the Boehm flute, discussions regarding the part of the air column situated inside the body of the musician rarely include the properties of the instrument. Perhaps the greater standardisation and less different response between individual instruments of the modern Boehm flute, partly eliminates the flute in the discussion on the column of air. Indeed, articles in flute periodicals rarely discuss individual musical instruments and how these affect the air management within a musician's body (examples of such perspective include Buchman, 2013, Kara & Bulut, 2015; BastaniNezhad, 2013; Baker, 2013; O'Riordan, 2015a; 2015b; 2016). Of interest are also discussions on the implications of which language a musician speaks, in relation to the effects of the consonants used in articulation. Here, some examples (Helgeson Torres, 2012; Valette, 2010) concerns the subtle nuances of articulation without any reference to the variation in response of individual instruments.

The results of the present study suggest that the definition of the column of air must be broadened to include the musician. A discussion isolated to either the bore of the instrument or the musician's body would only tell half the story. On the contrary, the statements of the interviewed musicians in Study A, as well as the discussions among the participants of Study B, describe the inextricable link between the idiosyncrasies of a particular flute and the musician's body, playing technique and stylistic preferences. This relationship is described in different ways by the musicians.

Veillon (Study A) defines the column of air as extending from the diaphragm to the end of the flute. As such, it literally bridges the division between the body of the musician and the flute. Furthermore, it exists only when the musician is playing the flute. Veillon refers to the column of air when he talks about the various ways it can be interrupted (i.e. articulation techniques). This "blue sausage" is a framework for understanding articulation as the interruption of the air stream in broad sense (beyond tonguing) and, as the interviews indicate, an individual flute player tends to use some of these articulation techniques more frequently while omitting some altogether. Roussel, who considers the glottal stop to be too imprecise, and O'Grada, who does not use the tongue at all, exemplify the diversity in approaches.

Veillon and O'Grada clearly have different approaches regarding management of air. While Veillon discusses how to keep a note in tune while running out of air, O'Grada's

advice is to keep enough air in the lungs, in order to "be strong all the time". This different perception of affordances of the column of air clearly reflects aspects of their musical ideal.

There are examples of previous research striving to bridge the gap between the musician and the musical instrument. Acoustics research combining the air column of wind instruments with the body of the musician have been conducted in order to measure the impact of the vocal tract on the sound produced. Such research has explored clarinets (Benade, 1986; Backus, 1985), and saxophones (Scavone et al., 2008). However, this research does not account for the individual differences among musicians, nor variations from one specific instrument to another. From the perspective of the present study, the research project on Boehm's transition flute conducted by Balosso-Bardin et al. (2017) is of interest, since it so clearly shows the significant variation in action and demanded between different individual flutes. Although the study is made on Boehm's transition flute model from 1832, its results resonate with the present study and shows that the instrument is not complete without the musician, without whom intonation is uncontrolled. The human body is needed to alter the virtual length of the sounding tube by increasing and decreasing the opening of the lips (see also Coltman, 1966; 1979).

In a similar vein, the different individual flutes featured in Study A are described as demanding significantly different approaches regarding the column of air. As stated by Beznosiuk, adjustments of the air are also required for different notes. One of the most striking examples of this is when Veillon describes how the demands for a sensitive approach towards the column of air, when playing his Wilkes flute (FL VE 3), made his whole aesthetics change. This is to be juxtaposed with Veillon's comment about his Du Ve flute (FL VE 2), which he found impossible to play softly. As Ralsgård highlights, a certain flute also responds to articulation in different ways on different notes, depending on the register. Bill in Study B also articulates this when he points out that all simple-system flutes need to be approached differently regarding intonation: "You need to push them […] a little bit here and a little bit there."

The inconstant character of the column of air is even more clear in O'Grada's (Study A) comment on parameters that may impact the capacity of the player (e. g. if the player has a cold). Roussel adds to this the condition of the embouchure; if she has not played the flute for a couple of days, she cannot focus her airstream, in her words she "loses air". While the feature and properties of the flute lead to adjustments by the musician, a certain playing style may also give rise to a certain set of demands on the flute. This is obvious from the examples of modifications presented in Chapter 5. The approach to the column of air is one of the main parameters of playing style that Morvan considered when he started to develop his current flute design (i.e. if a player blows "hard" or "soft").

In summary, the results demonstrate that important aspects of flute playing are articulation, management of air, intonation, dynamics, and embouchure. The reciprocal nature of these aspects implies that so much of the action performed by the musician is dependent on the particular choice of instrument, as well as the playing style of the musician, that the column of air emerges as one complete unit.

7.1.2 Spatial networks

Closely related to the column of air, but still a distinct dimension of the sensorimotor relationship, is the networks perceived in the spatial layout of the instrument. Inspired by the research of De Sousa (2017), spatial networks in the present text relate both to the specific fingerings that a flute player uses, but also to the habitual patterns of finger movements, and the perception of the spatial layout. I will draw from the empirical material showing how the emergence of such spatial networks, realised in the act of fingering, is reciprocally dependent on both musician and the musical instrument.

The empirical material resonates with Baily's (1985) argument for a revaluation of the *spatiomotoral* mode of musical experience: that the interaction between the spatial layout of a musical instrument and the musician is, in many ways, foundational to the music produced. Baily further nuances his statement, adding that it is "important to stress that the constraints imposed by a particular layout are only tendencies; they do not necessarily present insurmountable difficulties" (Baily, 1985, p. 256).

To Beznosiuk, the keys of the flute are inherently part of the instrument. She has a large repertoire of fingerings that she uses depending on the given flute and musical context – they are part of her way of thinking through her instrument. This can be contrasted with O'Grada's approach to the keys as something to be used when it is necessary to produce the odd note outside the pitches found in D and G major (and their relative minors). He states that he would not be concerned if someone removed the keys from his flute, since he does not really need them. Although Beznosiuk and O'Grada play instruments with the same capacity of producing all the semitones in an octave, it could be viewed as though Beznosiuk is playing a chromatic flute, while O'Grada is playing a diatonic flute with the possibility to sharpen or flatten certain notes. This individual approach to fingering resonates with Brown (2002), who states: "it is virtually impossible to prescribe definite simple-system fingerings without hearing the flautist and knowing the flute, since information and response vary greatly" (p. 42).

The possibilities for alternative fingerings are partly dependent on the features and properties of the flute. Certain fingerings are available to the player who knows both the fingering as well as the blowing technique needed to "make them in tune" (Beznosiuk) – or "optimise them" (O'Grada). When Veillon demonstrates his solutions for playing B^{b} without the use of keys, not only are the alternative fingerings produced

by a specific embouchure, but also tilts the head. Oscar (Study B) is also tilting his head when he produces the sharp sixth in E minor while playing lab-tune E. Although [2/2a] is a standard fingering, Oscar considers it to invite the sharp intonation. In a way it becomes an alternative approach to a standard fingering.

The alternative fingerings require far more from the player than just a particular finger combination. As mentioned above, these fingerings might have been thought of by the maker, and perhaps even documented by someone like Fürstenau. Additionally, a musician may also discover new fingerings through exploration. These fingerings each have their own potentials of timbre, volume and intonation. Thus, it is possible to talk about affordances of each fingering combination as well as its character.

One example of this is the affordance of the cross fingering for F [234/24]. When Beznosiuk is playing her Thibouville flute (FL BE 2), this fingering affords Beznosiuk the production of F natural (providing the solution to the problem of D-F-A^{b}). However, for Roussel, while playing a Rudall & Rose type flute made by Morvan (FL RO 1), the same fingering affords an intentionally flat $F^{\#}$, which she sometimes uses when she plays Swedish traditional music. O'Grada and Veillon bring up the technique of half holing. For Veillon, large holes afford half holing, and O'Grada adds that, as with cross fingerings, half-holing also requires the player to adjust their embouchure.

As pointed out by Huron and Berec (2009) there are connections between the term *idiomatic* and the concept of affordances. Whereas the term idiomatic most often ascribes certain qualities to the instrument itself (such as certain passages of notes or timbral effects), affordances of the spatial networks can be taken as individually constructed notions of idiomaticity (what one musician perceives as idiomatic may be due to particular playing techniques developed through specific demands and exercises). This is connected to the repertoire that these musicians engage with as well as their embodied habits in terms of sensorimotor schemes (Di Paolo et al., 2017), which inform their perception of the possibilities of their instrument. As certain patterns of movement are idiomatic, it follows that there are also patterns of movement that are harder to execute than other – if some patterns are to be seen as idiomatic, then there must be some that are non-idiomatic. This has been discussed in terms of difficulties (Huron & Berec, 2009), constraints (Mooney, 2010) and resistance (Aho, 2016). Although it makes sense to discuss this range of possibilities between what is considered easy and what is cumbersome, it should be remembered that Gibson's original formulation on affordances contained both ends of the scale: "The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill" (1979/1986, p. 127). Just as affordances of the instrument are foundations for musical actions, the resistance is equally influential: "It is possible that particular harmonic, or melodic events arise due to idiomatic concerns, constraints, or opportunities. Detailed study of the 'micro-structure' of performance difficulty might

prove to be rewarding"[50] (Huron & Berec, 2009, p. 120). O'Grada provides concrete insight into one such micro-structure arising from the weak timbre of the note E, which is a feature inherent to the construction of the simple-system flute (as discussed by Greene, 2012). In order to compensate for this drawback, O'Grada demonstrates the ornament that he refers to as "scraping from below". For O'Grada, the weak E affords this particular ornament.

Affordances of the spatial network are not fixed. Just as affordances of the column of air, they may change according to the situation. Oscar's variation that he made in the recording of lab-tune E (Study B) provides an interesting example of how a certain spatial network may be perceived as "momentarily idiomatic" since he had repeated that pattern as part of his practice earlier that day. Affordances of the spatial layout are also instrument-specific, and may depend on minor differences in, for example, key design. For example, Rikard (Study B) comments on this when he states that tonalities remote from D major, are more accessible on one of his flutes.

As Aho (2016) summarises, both affordances (in a positive sense) and constraints are foundational for the playing of a musical instrument:

> Musical instruments are situated in a "cognitive loop" of the human brain and the environment, in the sense that not only are their players constrained by the real or apparent limits of their instruments' tacit usability, but they also use the instruments as aids for musical thinking and planning. (Aho, 2016, p. 32)

The real and apparent limits that are perceived in musical instruments, situated in this cognitive loop, are tied to the individual perception of the spatial layout of the simple-system flute, as exemplified by Beznosiuk's and O'Grada's different approaches to the keys.

While the spatial layout is a stable property of the instrument (as long as it is not being modified), the perceived spatial networks are dependent on the skill and interest of the musician. It encompasses both the fingering used and the melodic and harmonic patterns that are perceived.

7.1.3 Sound

Similar to the column of air and the spatial networks, the sound itself forms a relationship between the musician and the musical instrument – both are needed to produce the sound (at least in a traditional sense). Of interest is, however, to what

[50] In an article on flute teaching in the context of higher music education in relation to my own practice, I use Schippers' (2010) notion of the atomistic approach to learning and teaching to conduct what can be viewed as such a study on micro-structure (Tullberg, 2017).

degree the sound is considered to be a product of the qualities of the flute, or the actions and intentions of the musician. As can be seen in Chapter 5 (Study A) and Chapter 6 (Study B), the ways to talk about this varies.

The sound produced is a direct result of the interaction between the flute and the flutist, and the existence of sound is literally dependent on both. Even when Morvan wants to examine the acoustic properties of the instrument itself, he still needs to blow into the flute, hence creating the sound himself. The statements of the interviewed musicians about sound quality and characteristics can be viewed as positioned along the continuum below (Figure 45); from ascribing the quality of the sound to the player to lengthy discussions about the sound of different flutes. Examples of adjectives used in order to describe the sound include: veiled, shiny, round, lustrous, homogenous.

Figure 45
Continuum of statements regarding the root of the sound quality.

The player affects the sound through the embouchure and blowing technique, but also through the physical properties of the jaw and the cavity of the mouth. Comments on this side of the continuum are presented in Chapter 5 and include for example "you chase the sound you want and that's what you get" (O'Grada) and "that's the sound I have in my head" (Beznosiuk). On the other end of the continuum are statements from the lengthy discussions about the sound of different flutes. The features and properties of the flute said to influence its sound are the wideness of the bore, the size of the holes, the type of wood, and history of its use.

Designing his third model (FL VE 4), Morvan strived to combine certain features from his previous models (a Rudall & Rose type flute and a Pratten type flute). His intention with the design is, among other things, to create a flute with a moderate consumption of air but still with wide dynamic range. He wants the flute to have flexibility in sound, and to offer the particular timbral quality, referred to as *Le Hout*. However, since some of his customers are not able to bring out a satisfying sound, Morvan's flutes do not automatically afford the sound of Le Hout to anyone. The musician aiming for that sound must also have the capability to produce it. Viewing Le Hout as an affordance of Morvan's third model would not do justice to the complexity of the act of playing an instrument. However, viewing Le Hout as an affordance of the

sound, possible to act upon due to the features and properties of the instrument and the capabilities and body of the musician, opens up a path for an exploration on the correspondence between these two poles. Ralsgård's modifications to his German flutes (RA FL 1 and RA FL 2) are also partly motivated by the desire to change the affordances of sound.

In the perception-action loop visualised in Figure 3, Windsor (2016) includes the sound as part of the loop, referred to as information/trace. The sound is a result of the interaction with the musical instrument and it is there to be perceived by the musician themselves, as well as other musicians and the audience. However, not only is the sound the result of this interaction, but in Windsor's (2016) terms it is a trace, and as such it points in the other direction as well: "the trace of a gesture is the information that specifies a particular action" (Windsor, p. 60). O'Grada highlights this corporeal property of sound (Froese & González-Grandón, 2019). When he teaches, he rarely provides detailed descriptions on how to form an embouchure. Instead he demonstrates what a good sound might be, and the student then tries to recreate that sound. In this way, the sound is specifying the adjustments needed, given that the student has the ability to pick up the information and adjust his or her embouchure accordingly.

Affordances of the sound described in this way resonate with Clarke (2005), saying that a sound potentially specifies objects and events, if the listener has the adequate skills to perceive it as such. In Nilsson's (2011) words: "the system self-adjusts in order to optimize its resonance with the environment." The same idea is formulated by Aho (2016) as: "The movements of the performer's body are there embedded in the sound for the listener to feel. We can identify the music-producing movements we hear in the recorded sound" (p. 22). A flute maker such as Morvan, who has other interests and perceptual skills, is able to adapt his instrument design in order to facilitate a certain sound, in this case Le Hout. The same is true in the case of flute maker Patrick Olwell who is interviewed in Lochridge's study (2004). For experts like Morvan and Olwell, the sound of a flute player does not only carry corporeal properties (Froese & González-Grandón, 2019), but something that perhaps might be labelled as "constructional" property.

As Wettermark (2016) argues, sound can have priority over the physical object with regards to the forming of an identity of a musical instrument. Indeed, Veillon decided to play the simple-system flute (or the Irish flute, as he thought of it at the time) when he found himself deeply fascinated by the sound of the instrument on an early Chieftains album. The sound was his first encounter with the instrument and when he later received a flute he did not even realise that it was another type of flute, since he had not even seen the instrument that he had decided to play.

The statements from the musicians in both studies include examples of how the sound emerging in a certain acoustic environment impacts how they play. Influencing

parameters brought up are dependent on the performance context and include acoustic properties of the room itself, microphones/sound technique and the sound of other instruments. As Beznosiuk and Veillon points out, a specific instrument might flourish in a certain acoustic environment. This means that the sound, by its nature, draws the surrounding environment into the equation. As such, the sound is acted upon by subconscious, intuitive means. As stated by Teo, he experienced physical tension when playing, teaching or recording in acoustically dry rooms. Even though he tried to prevent it, his body tried to compensate for the lack of acoustic response with physical force. Bill has two different locations for practice in his basement, one that is very revealing and one that is reassuring. The two locations complement each other in his practice. In this way the sound can be seen as an extension of the musical instrument, realised through the interaction with the musician. The instrument is not only an output, but also impacts the musician's actions and reactions in ways that the musician both will be aware of and unaware of.

While the dimension of sound is clearly a result from the other dimensions described in this section – the column of air and the spatial networks, it is not only that. The causality also points in the other direction, approaches to the column of air and the spatial networks are results from the dimension of sound.

7.1.4 Defining affordances of musical instruments

The three dimensions of the sensorimotor relationship – *column of air*, *spatial networks*, and *sound* – lay the groundwork for a definition of affordances of musical instruments, that I devise from the dialogue between the previous writings on affordances and the empirical results of Study A and B: *Affordances of a musical instrument are perceived opportunities for actions arising from the sensorimotor relationship of the interaction with the instrument, as these unfold in the flow of musical practice*.

The three dimensions presented above are dimensions of this sensorimotor relationship. While affordances of the simple-system flute may be more associated with one of the dimensions of the sensorimotor relationship than the others – such as a certain ornamentation is to the spatial networks, or an articulation technique is to the column of air – they are always entangled. I will use Veillon's alternative fingerings for B^{b} as an example (Study A). Even if this is an affordance of the musical instrument that is demonstrated through a finger pattern, the column of air needs to be adjusted in order to make it work. Furthermore, the resulting sound is not only a matter of pitch but also of timbre. Finally, all of these dimensions are dependent on both the properties of the flute and the musician. When affordances of the musical instrument are associated to a particular dimension of the sensorimotor relationship, it means that there is an emphasis on this particular dimension, even though it is not isolated to the

same. Since affordances are perceptual content, it can be thought of as if the perception of one of the dimensions of the sensorimotor relationship is driving the action taken.

Affordances of a musical instrument are, thus, complex, and it is futile to break them down in technical abilities of the musician or properties of a musical instrument since such a dualistic perspective tends to draw attention to the outcome and result of the interaction rather than the organization of the same. While the former can be done through mapping theories, focusing on the constitution of the interaction is, as I see it, a more fruitful path to explore, and one which I will to follow in the coming sections.

First, however, I would like to explain what I mean by the last words of the definition – *in the flow of musical practice*. As described previously, this is a paraphrase of Gibson's *optic flow* (1979/1986). It highlights the fact that sensory input is fundamentally temporal in nature – vision is more like a video clip than a snapshot. Similarly, musical affordances are arise from the physical interaction with the instrument and through a particular musical event. It is not only a matter of technique, but of perception. Since perception is relative to skill, and sensorimotor schemes have a role to play in tactile perception, a developed playing technique is likely to expand the range of affordances perceived and realized, but it is not the only factor.

Even if musical affordances are tied to a present moment, they stand in relation to both past and future. As Augustinus (n.d) noted in *Confessions*, the present is three-folded: While the present moment is available through attention, it is influenced by the past through memory and the future in terms of expectation. Music is a temporal art form and the single note has musical meaning as situated in this temporality. Accordingly, musical affordances are temporally rooted by its nature. Since affordances are the result of goal-directed perception, the concept also encapsulates intentionality.

It is against this background – the temporally rooted, intentional and context-bound nature of musical affordances – that Veillon's (Study A) comment on how teaching versus exploring should be understood. He refers to himself as being self-taught, when he says that "it's a slow process, but what you discover yourself – I have this feeling – it creates what you are also". During workshops, he says that: "I had told them things that took me twenty years to discover. And I am always wondering, how will they use it?" This comment is of course dependent on genre-specific conditions: the interpretation (and rendition) of tunes and arrangements of the music is a matter of personal style and competence. Consider again the examples of alternative fingerings for $B^{\flat}$ (5.3.7). During the interview, Veillon showed me the fingerings and I, as well as anyone else, could easily reproduce the fingerings, blow into the flute and get a tone with the same pitch as Veillon. But what for him was an affordance of the spatial networks was for me a piece of playing technique. Having the technical ability to execute something does not mean the same as being able to perceive the opportunity

to make use of it in a musical context, that is, to perceive affordances of the musical instrument.

7.1.5 The sensorimotor profile of the musical instrument

As described above, affordances of musical instruments emerge in the above-mentioned sensorimotor relationship. In this section, the sensorimotor profile of the simple-system flute is in focus. It is discussed as *properties* and *features* of the musical instrument.[51]

The approaches to these properties and features that are presented in Chapter 5 and 6, are embedded in the reciprocal relationship between the interviewed musicians and their surrounding environments. That is, the different genres and traditions in which they are situated, the different ensembles they are working with and the instrument makers they are collaborating with. The statements presented in 5.1 show how the prerequisites for finding a flute have changed over time and are very much dependent on where the musician happen to be based. This is in line with the findings of Lochridge (2004). The advent of contemporary makers of simple-system flutes is of course a breakthrough regarding the availability of flutes. However, as the statements from Beznosiuk show, the modern versions are not necessarily of interest to her since they are being adapted towards the market of Irish traditional music.

Simple-system flutes are, as described in Chapter 2, designed objects and are, in most cases, hand-made by a maker who has a more or less precise idea of how it is going to be used in the hands of a musician. Windsor and de Bézenac (2012) writes: "The instrument does come with a set of carefully designed affordances which guide exploration and constrain action" (p. 8). From the perspective of the definition presented above (7.1.4), affordances should here be changed to *features*: the features guide exploration, in which the musician perceives the affordances. These affordances are hence the result of the interaction between the musician and the instrument.

However, a musician does not only elaborate on these features, in this case designed and crafted by the flute maker. When Veillon (Study A) discovers ways to musically imitate a binioù with his flute through harmonics and alternative fingerings, he is not only using the features of the flute such as finger holes and keys. Due to his previous immersion in the genre of traditional Breton music, he also elaborates on the acoustic properties of the instrument in ways that lay beyond the original intention of the design.

Another, perhaps subtler, example of how musicians elaborate on the features of the instrument concerns the long and short F keys. These keys are present on the flute in

[51] My use of the words properties and features are not to be confused with Chemero's (2003) terminology in his theoretical discussion on affordances.

order to provide two options for fingering F natural: [234/234a] and [2345b/23]. On some flutes (such as FL RA 4), the two touches are set up to open the same key. This means that there needs only to be one hole for F natural drilled into the bore. In principle, this is considered to be a good thing since the column of air is less perforated. However, Veillon and Roussel (Study A) use both the long and short F key simultaneously in order to alter the pitch of the note F. This would not be possible if both touches opened the same key. Beznosiuk (Study A) also uses both F keys at once when she plays the note F$^{\#}$ in order to make the note sharper.

Explaining the above examples – the availability of flutes, the biniou-sounding flute and the affordance of altering pitch through the use of both F keys – thus moves the focus of the discussion to the embedded nature of musical practice.

The properties of the flute, taken as its material constitution, also change over time. Reasons for such changes, as mentioned in the interviews, are due to maintenance (or lack of maintenance), cracking, and the process of breaking in a new flute. As the examples with Ralsgård's German flutes show, a flute's features can be changed through modifications, or, as in the case of O'Grada's original Rudall & Rose flute (FL OG 1), the features may become broken and lose their functions.

To a musician exploring affordances of an instrument, it might not be of interest to distinguish between properties and features in such way. However, in a further discussion on the relation between a maker and a musician, this distinction may be of interest.

Beyond the features and properties of the instrument, the value that some of the musicians in the study ascribe certain instruments also informs the relationship between the flute and the flute player. This is a quality of the instrument as an historically valuable object that may not have direct impact on the actual playing situation. However, as is evident in the interviews, this sense of value affects in what contexts the musicians use their instruments and what modifications to them they would consider. Similar to the (sometimes strongly opinionated) texts published during the 19th century (Bigio, 2006/2011), the simple-system flute is still an on-going site of negotiation regarding aesthetic values and preferences. With its presence in several genres and traditions, this instrument has never ceased developing and changing. As such, it is still in the dialectical relationship with its surroundings, as Racy (1994) argues is always the case with musical instruments. This is clearly an aspect of the relationship between the musician and the musical instrument that would benefit by further research in line with the body of research presented in 2.2.3 (Dawe, 2001; Racy, 1994; Qureshi; 1997; Bates 2012; Wettermark, 2016).

These, other perceived, qualities (beyond qualities directly related to the function of the instrument) are tied to the simple-system flute as an instrument, embedded in history and culture. The character of this embeddedness is dependent on the individual

musician's knowledge and ideology. A musician's experience of a musical instrument goes beyond the purely functional dimensions of features and properties (as these are defined above). In the experience of the musical instrument, all of these dimensions may be merged together and only discerned through conscious reflection.

The modification of features of the flute is discussed in two ways in the Chapter 5. Both ways represent strategies to facilitate new or altered affordances. The first is the modification on current instruments. This is done to Veillon's first and second flute (FL VE 1 and FL VE 2), and to Ralsgård's German flutes (FL RA 1 and FL RA 2). The modifications of these flutes are examples of attempts to modify the features of the flute, in order for them to correspond more closely to the abilities and intentions of the musicians and the demands from the musical material. Through this, affordances also change, opening up for new possible actions. Both Veillon and Ralsgård provide examples where the results of these modifications were not satisfying, and new modifications had to be made in order to correct the mistakes.

The work of Morvan provides an example of the second strategy for altering the features of the musical instrument. This process is primarily done through the development of new models of flutes. This development is motivated by his own musical preferences as well as the collaboration with other musicians, among them Veillon. The sound of Matt Molloy, referred to as Le Hout, has been a driving force behind Morvan's work. The same is true for Patrick Olwell, the flute maker interviewed in Lochridge's (2004) study. He describes a similar circular relationship between the work as a flute maker, the musicians playing his instrument, and his own musicianship. The way notable musicians collaborate with these makers resembles the stories of the flute makers of the 19th-century London and their virtuosi, such as Nicholson and Pratten. As De Sousa (2017) notes: "instrumental alteration takes place within social networks that include players, instrument builders, listeners, and so on, as well as with other instruments, other machines, other technologies" (De Sousa, 2017, pp.107-108).

These ways of modifying the features of the flute in order to change the affordances contrast to the process of adapting the playing technique to meet the requirements of a certain flutes. In short, it is a question of adapting the flute, or adapting to the flute, and these processes can be seen as two ends of the same continuum. While clearly gravitating towards one side, it is hard to think of a scenario where one of these processes unfolds totally exclusively of the other. In the terminology of Noë (2004; 2012) this is a process of changing the sensorimotor profile of the instrument and adapting to these changes. Going even further on the continuum would at some stage result in the invention of a new model of flute. This is what happened when the simple-system flute emerged from the one-keyed transverse flute, and again when Boehm invented his new key system.

Affordances of a musical instrument are situated in a musical context. In the next sections I will explore such examples which are taken from the results of the present thesis. The first example is affordances of musical repertoire. The second concerns in what ways the instrument may be understood as information bearers as part of a particular musical tradition. The third example specifically concerns the notes $F^{\#}$ and F natural. These examples also point towards the specific importance of addressing the embedded nature of affordances, one aspect of which is the acoustical.

7.1.6 Affordances of the repertoire

While the present discussion concerns affordances of musical instruments, I will now address how the above-mentioned sensorimotor relationship relates to the musicians' engagement with their repertoire in terms of interpretation and personal style.

As pointed out by Veillon and O'Grada (Study A), different musicians perceive music in different ways. Thus, the repertoire affords different possibilities for action. At the same time the personal perception of affordances of the repertoire is embedded in a shared ecology of meaning. As such, it refers to conventions of a genre or a tradition.

Adapting Breton traditional music to the simple-system flute, Veillon considers some of the interpretative aspects of his playing to be given by the repertoire. He refers to certain rhythmic aspects as a constant in dance music, claiming that anyone in his situation would have made similar choices. How basic these aspects may be, it still requires some insight from the musician to pick those up and incorporate them into the playing.

O'Grada provides another example on how musical structure may afford certain interpretative practices when he refers to the structure of Irish tunes: "If you can make repetition fascinating, you have achieved something." He concretises this ideal when he provides examples of variation through the use of varied ornamentation.

Roussel's fascination with the tonal range and dynamic possibilities in Swedish traditional music are to be understood with reference to her background in Breton music (describing Breton traditional tunes as being "small boxes"). She contrasts the two genres in a way that shows that her background impacts what interpretational possibilities she perceives in Swedish traditional music. Thus, her background stands in relation to the features of the music and causes her to pick up and act on certain affordances of the repertoire that would not be there for another musician.

The lab-tune experiments in Study B revealed how associations to other tunes can drive the interpretation process. Viktor and Rikard could point at specific tunes to which they associated Tune D, while Bill rather thought of renaissance music in general terms. The perception of the tune is embedded in the musical world of the participating

musicians in a way that is uniquely entangled to their specific experiences. While these associations sometimes are apparent (such as in Tune D) it can also be harder to find the parallels that underpin the associations, such as Rikard's comment on Tune E, stating that it says "something to me that makes me refer to [the music of Blidström], I don't know what exactly".

As Oscar points out, the interpretative process may also be influenced by personal relationships. A tune is never perceived as an isolated musical entity. In the musical practice of the participating musicians in Study B, it is often transmitted from another musician. Even in the lab-tune experiments, where the teaching process is omitted, the musical identity of Rikard influenced Oscar's version of lab-tune F. He says that his "world of short three is very much entangled by [Rikard]". This influence is of course much stronger if the music is being transmitted by ear. Thus, the mode of transmission and the additional information provided in the learning situation will be part of shaping the perceived affordances of the repertoire.

As these above examples illustrate, the repertoire is always, but in different ways, embedded. References, experiences and associations may be shared, but they can never be exactly the same. Musicians will therefor always have, at least slightly, different ways of perceiving repertoire.

The interaction with the musical instrument of choice influences the affordances of the repertoire. It emerges as a frame through which the opportunities for action are concretised. O'Grada points at the necessity to be able to connect aspects that one hears in other musicians playing to the technical procedures behind this effect, in O'Grada's words: "work back into the technical stuff". Examples of other statements that connect interpretative aspects to playing technique include Beznosiuk's reflection about air management: "It's a question of less air and changing the speed of the air and changing the volume of the air. And that is how the music works as well".

The lab-tune experiments of Study B further highlighted how the technical constraint impacted the interpretation of the tunes. For example, Bill's rendition of lab-tune E was slower due to the relative difficulty of playing in the key of G minor, specifically the frequent demand to use the E^{b} key. The key of C (lab-tune F) provided certain dynamical constraints (column of air) as well as ornamental possibilities (spatial networks), for example the glissando leading up to C^{3} (Teo).

While an original flute may provide insight to historical interpretation practice, the perceived affordances of the repertoire are also a driving force behind the development of new flute designs. Perceiving the potential affordance of a wide dynamic range in the repertoire, prompts Morvan (Study A) to develop his flutes accordingly. The perception of limited tonality in Irish traditional music, as captured by O'Grada's indifference towards the non-functioning keys of his original Rudall & Rose flute (FL OG 1) leads to makers to provide diatonic flutes without keys. As Roussel point out, LeHart even

sells keyless flutes with the possibility to add an optional number of keys at a later stage. Depending on the musician, each new key may expand the affordances of the spatial network, through allowing for new tonalities and new ornamental possibilities. However, the necessity of such new affordances is embedded in the genre and its musical structures.

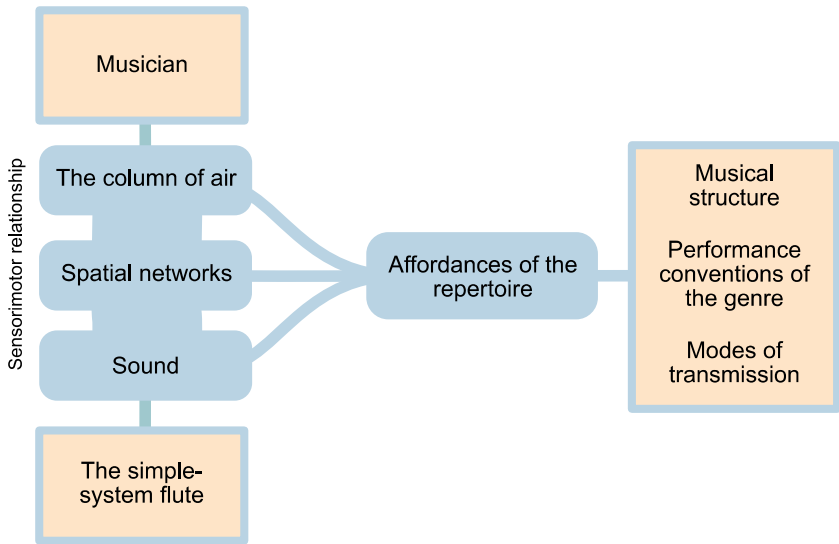


Figure 46
Affordances of the repertoire oscillating between the musician and musical instrument, and aspects, such as musical structure, performance conventions of the genre, and modes of transmission.

While affordances of the musical instrument, associated with the three dimensions of the sensorimotor relationship: (i) the column of air, (ii) the spatial networks, and (iii) sound, can be seen as oscillating between the flute player and the flute (Figure 44), affordances of the repertoire, emerging in the analysis of the results, can be understood as oscillating between the musician/musical instrument and aspects, such as musical structure, performance conventions of the genre, and modes of transmission (Figure 46). Focusing on affordances of repertoire can be viewed as another layer of analysis, beyond affordances of a musical instrument. It should be noted, however, that for an instrumentalist, affordances of repertoire are grounded in the interaction with the musical instrument.

This area of affordances is embedded in a web of references to persons, music, instruments, musical concepts and performance contexts. This embeddedness partly overlaps with other musicians, hence Veillon's reference about basic principles of

interpretations as more or less given. But even when aligning the interpretation according to these principles, the space for individual interpretation is rather wide. The instrument may be a catalyst in this process, as exemplified when Veillon describes how the different flutes have impacted his style of playing. This style of playing is, in important ways, manifested through his interpretation of tunes.

7.1.7 Affordances of guidance

In this section, I will present one aspect of musical affordances that draws upon the three dimensions of the sensorimotor relationship presented in the beginning of this chapter, as well as affordances of the repertoire. Affordances of guidance are relevant in order to adapt to a certain flute. While this approach is found at one end of a continuum, the approach of adapting the instrument is found on the other end.

Beznosiuk praises the flexibility of her Rudall & Rose flute (FL BE 1), stating that "you could do anything with this flute". She is however also very interested in the various potentials (strengths and weaknesses) of her other instruments. This is most explicit in her statements about her Thibouville flute (FL BE 2). She considers the flute to be less flexible and rather limited, saying that it has one thing that it does. What she refers to as "the French sound" is "just there", in contrast to it being achievable, but not immediately present, on her Rudall & Rose flute (FL BE 1). The perceived limitation of FL BE 2 is directing the player to a certain way of approaching the instrument (such as blowing in a way that is sensitive to the potential of each individual note). Beznosiuk's interest in this limitation is related to the historical dimension of her musical context. This flute is inherent to her genre since its design and construction is closely related in time, place and context to the repertoire she plays. As such, it is a guide to performance practice and interpretation of this repertoire. Thus, in this situation, the limitation is an affordance which guides her towards making certain stylistical, musical choices. In Beznosiuk's words: "the flute becomes the teacher." This resonates with Gibson's original formulation, that affordances are what the environment "*provides* or *furnishes* for good or ill" (1979/1986, p. 127, italics in original). What is for advantageous for one person may be for disadvantageous for someone else. In this case, what can be perceived as a constraint or resistance is also a source of information, depending on the perspective of the musician. In 7.1.6 the musical instrument is mentioned as a tool for perceiving possibilities for action in the musical material. The limitation of flexibility in Beznosiuk's Thibouville flute (FL BE 2) can be understood as limiting the affordances of the musical material. Since the flute does demand a certain playing style, some interpretative alternatives are excluded, or at least harder to achieve. However, exploring affordances of guidance requires the musician to consciously change the approach to the instrument according to the

sensorimotor profile of the flute. This is also addressed in Beznosiuk's comment on how she has to ask her students to "stop trying to make it work". By backing off from their habits, the flute "is showing the way". In other words, by trying to put your own habits inside brackets, you open up for the possibility to adjust yourself towards the unfamiliar instrument. Similar processes, described by musicians and artist-researchers, include Ljungar-Chapelon's (2002) study regarding the *Basse de Traversière*. This instrument was reconstructed from historical sources by flute maker Alain Weemaels. However, the essence of the project is not the musical instrument itself, but the process that was involved when Ljungar-Chapelon set out to master the flute. In his description about this process it is evident that the new instrument demanded him to drastically adapt his playing technique. This has been beneficial regarding his playing on other types of transverse flutes: "It has had an almost therapeutic effect on my flute playing in general" (Ljungar-Chapelon, 2002, p. 26).

Seen from this perspective, Ralsgård's experimentation on his German flutes (FL RA 1 and FL RA 2) presents an interesting case. He thinks of these flutes as having a history in Swedish traditional music, yet his approach towards these flutes is rather different from Beznosiuk's approach. For Ralsgård, these flutes do not afford guidance regarding the interpretation of Swedish traditional music, but are rather a point of departure for experimentation. The freedom to experiment with these flutes, as opposed to the flute made by Wahl (FL RA 4), is related to the quality ascribed to the latter as a valuable historical object. The collaboration between Morvan and Veillon is also a process related to Ralsgård's experiments. Morvan strives to develop his flutes according to a certain vision, informed by the collaboration with Veillon and other flute players. Instead of modifying existing flutes, this is achieved through the design and production of new models. His statement, "the most important thing is that the musician is able to forget about the instrument itself", can be understood as an ideal goal that his instruments seamlessly fit the vision of the musician so that the musical instrument becomes transparent[52].

Paying attention to affordances of guidance can be understood as the opposite to the process of modifying the features of the musical instrument. As mentioned above, it is a question of the player adapting to the instrument on one hand, and adapting the instrument to the player, on the other. The two contrasting approaches can be seen as two ends of a continuum (Figure 47).

[52] The idea of the musical instrument as a natural extension of the body has been subject for research projects, such as the project described in the above-mentioned article by Nijs, Lesaffre and Leman (2013).

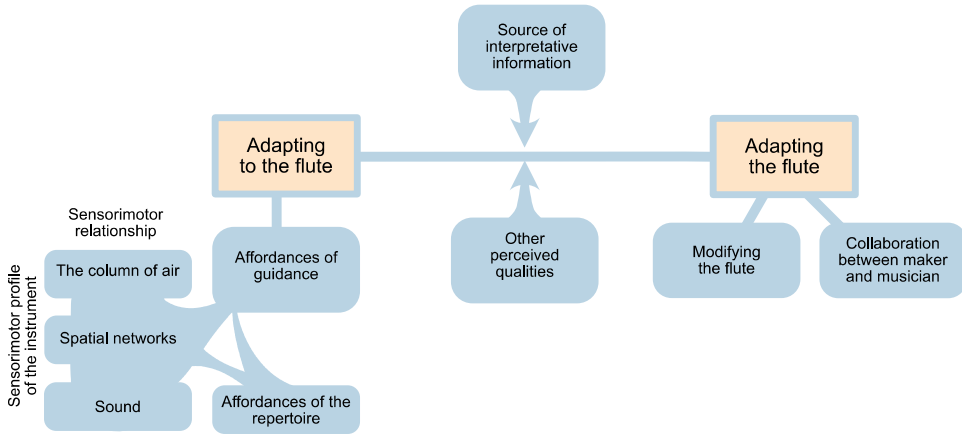


Figure 47
Continuum describing the two approaches "adapting to the flute" and "adapting the flute".

The continuum is a visualisation of two perspectives on the simple-system flute, as a historical instrument and as a contemporary instrument situated in a tradition. That the term tradition in itself carries notions of history (Ronström, 1989) should not be confused with the instrument itself as a carrier of historical information. Depending on which instrument a musician is playing, the approaches to the tradition may vary, even regarding the same tradition (von Wachenfeldt et al., 2013; Tullberg, 2018b). The relationship between the musician and the musical instrument is thus embedded in the genre. And depending on the choice of instrument, the structure of the embeddedness varies.

7.1.8 The issue with F$^{\#}$ and F natural

While the affordance of guidance is an example of musical affordances in context, a discussion about a seemingly small technical detail can open up a pathway to study how areas of affordances are interwoven with each other as well as embedded in layers of historical and aesthetical issues. The notes F and F$^{\#}$ in the first two octaves form the basis for such a discussion. Statements regarding these two notes reoccur in several places in Study A. The discussion goes back to the 19th-century sources and is apparently still relevant today. Thoughts about these notes span all dimensions of the sensorimotor relationship; it is obviously a matter of fingering which, in turn, is bound up with behaviours regarding the column of air, which give rise to certain potentials of sound. Additionally, the repertoire informs the various approaches taken in the matter.

In the interviews of Study A, four different ways of producing the note F in the first two octaves were considered: (i) half-holing [234/2(3)], (ii) using the short F key [234/234a], (iii) using the long F key [2345b/23], and (iv) cross fingering [234/24]. Veillon notes that the alternative of half-holing is easier to execute satisfactory on a flute with large finger holes. O'Grada adds that this alternative works best on slow tunes where the player has time to correct the intonation through careful placement of the fingers. Both options include the use of keys are considered unproblematic, with the exception for legato passages containing the successive notes D/E^{b}-F-A^{b}. This problem, referred to by Brown (2002) as a "perennial problem" (p. 21), is brought up in two of the interviews, exemplified by the passage in Beethovens Eroica symphony (Figure 25) (Beznosiuk) and the Swedish traditional tune by Jöns Persson (Figure 33) (Ralsgård). As explained in 5.3.7, the problem of this fingering combination is due to the sideways movement that is required by either the left-hand little finger or the right-hand ring finger. It is against this background that Beznosiuk brings up the cross-fingered alternative. This solution demands a flute with small holes, such as her French Thibouville flute (FL BL 2) but not her English Rudall & Rose (FL BL 1). Ralsgård's solution to the "perennial problem" was to add an extra G$^{\#}$/A^{b} key (FL RA 2). The choice was informed by the background of the two musicians, Ralsgård refers to his background as a saxophone player as an inspiration for his solution, while the cross fingering is close at hand for Beznosiuk since she is used to play one-keyed transverse flutes.

This is obviously a discussion on fingering, but since the solutions presented are dependent on the size of the finger holes, it is also a discussion about affordances of the column of air and sound. Ralsgård enlarged the holes on his flute (FL RA 2) to modify the tuning and timbre. Nicholson, who advocated for the use of large finger holes (as found on his improved flutes and a factor leading to his notoriously strong sound), argued that a passage containing the "perennial problem" should be rewritten in order to be executed properly (Brown, 2002). This approach is in contrast to Beznosiuk's sensitive approach using the cross fingered alternative on her Thibouville flute (FL BE 2): "It's a question of less air and changing the speed of the air and changing the volume of the air". The difference between my own playing technique and that used by Beznosiuk on her French flute is obvious in the incident recounted in 5.3.1. Beznosiuk relates her approach taken regarding the column of air to the music that she performs, stating that changing the speed and volume of air "is how the music works as well". Ralsgård too, makes a reference to the repertoire he is playing when he states that D major is a very common key in Swedish traditional music (hence it is crucial to modify his flute to fit his sense of intonation). Indeed, even on her large-holed Rudall & Rose (FL BE 1), Beznosiuk considers it necessary to open one or two of the F keys in order to sharpen the F$^{\#}$.

As mentioned in Chapter 2, Bloom (1985) sees the issue regarding hole sizes as a matter of priority: "a trade-off between the ease of execution of the small hole flute with eight keys, and the enormity of […] the sound produced by the large hole flute" (p. 20). This trade-off becomes critical with regards to the fifth finger hole: large holes will make the cross-fingered alternative of F natural too sharp, while small holes will result in a flat F♯. Although this kind of subjective statements regarding temperament and intonation are significant simplifications of the matter (what is too sharp according to what standard?), they are reflected in statements by the musicians in the present study. Also, Tulou, a proponent of the small-holed flute, acknowledged the problem of the flat F natural caused by the small holes, hence his invention of the F♯ key (1835/1995). Boehm's cylinder flute provided one solution to the F/F♯ problem: He devised a system that is both able to produce an F natural with easy fingering and full sonority, and able to produce an F♯ in desired pitch. As discussed above, however, the spatial layout of the instrument is of uttermost importance, and it can be argued the simple-system flute is biased towards D major, while Boehm sought to devise a key neutral system: "a system of fingering by which all scales, passages, and trills in the twenty-four keys could be played, clearly, certainly, and with the greatest possible ease" (Boehm, 1871/1964, p. 59). Even if we assume that Boehm's system actually does allow for a more even performance through all twenty-four keys, this is not an advantage to all flute players in all musical genres. One of the explanations to the favouring of the simple-system flute in Irish traditional music may be the spatial layout, especially the fingering for F♯ [234/2], providing the possibility of producing the ornamentation associated to that particular style of flute playing[53]. The dominant market of Irish traditional music has led to alterations in the design of simple-system flutes and these alterations make the flutes produced (with the Irish traditional flutist in mind), less relevant for a flute player such as Beznosiuk who are oriented towards 19th-century Western art music.

The F♯/F natural issue cuts across the dimensions of the sensorimotor relationship in that it is a question about fingering, but also about the usage of air and sound. Ultimately, the discussion reflects how the topic is embedded in the meeting between different musical genres (in terms of technical demands and aesthetic preferences) and the construction of the musical instrument.

[53] Searching for "Boehm flute" in an internet forum dedicated to Irish traditional music, such as thesession.org, exposes discussions on how to tackle specific technical issues on the Boehm flute, easily executed on the simple-system flute (www.thesession.org, 2018). Some of these issues concerns the fingering for F♯ on Boehm's system.

7.1.9 Acoustical embeddedness

As presented in 7.1.3, sound can be viewed as an extension of the instrument. As such it connects the musician with the surrounding space – sound projects from the instrument and returns to the musician as affected by the environment. This is such a natural part of the musical practice that the anechoic chamber seems unthinkable to the participants of Study B. Embeddedness, as one of the domains of 4EC is a broad concept, and the empirical material of the present thesis exemplifies that one of the ways that musical practice is embedded, is acoustically. The world of sound, as I refer to this embeddedness here, is not any example, but an aspect of a musician's life that is highly relevant, perhaps even more than often is realized.

Since the acoustic properties of the environment always, to some degree, form a part of the sound of the instrument/musician, it may at times be indistinguishable for the musician. However, extreme situations highlight the impact of acoustics. The idea of the anechoic chamber is one such example. Another is provided by Östersjö (2020) where he describes giving a concert in a hall with a reverberation time of thirty seconds. Naturally, this led to the performance being customised to fit the new circumstances. But these extreme situations aside, "analogous processes, in which a piece is modified to the acoustic, takes place in any performance, albeit on a different scale" (Östersjö, 2020, p. 159). Often, a musician intuitively reacts and adapts to the situation without paying attention to it. One such example is described by Teo, when he explains that he played in a room with dry acoustics, and only afterwards realised that it has affected his playing and caused tension in his body. However, at some occasions the situation or the environment may draw attention to itself. Naturally, the situations brought up in the studies of the present thesis are the situations where the acoustic environment demands attention. What is not noticed cannot be reported and formed into a statement. In both studies, statements regarding acoustics generally concern situations that are in some sense troubling to the musician.

The acoustical embeddedness of sound is changes depending on the situation, which has bearing on the technical aspects of playing. For example, Beznosiuk describes how affordances of the spatial network are relative to the situation and may depend on the ensemble setting. Practicing at home, Beznosiuk finds the perfect fingering for a certain passage, only to discover that it did not work in the context since her sound blends with the sound of other instruments in an unpredictable way. In a similar vein, Rikard (Study B) suggests that in the ensemble setting, it is wise to step out from the technical aspects of intonation for a more holistic approach. The practice room and the ensemble situation accordingly demand different forms of attention.

Some statements address situations when the reflected sound is experienced as something separate from the directly produced sound. Veillon values, for instance, how

a skilled sound engineer may attenuate the acoustic environment and give a heighten experience of performing: "You hear your flute on stage and also in the hall, it is like inside and outside, here and there, in some sort of way". Oscar refers to playing in a church with an extremely long reverberance time: "In some way you can hear yourself better. […] But at the same time, you sound less".

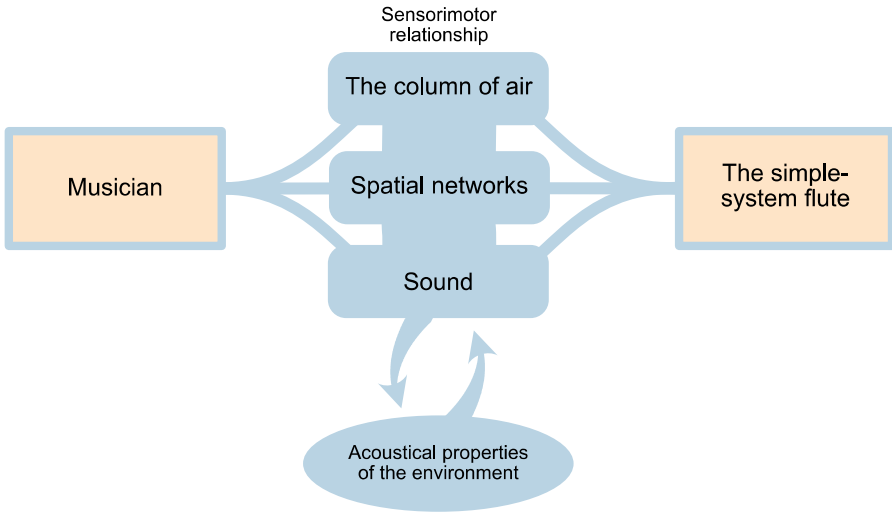


Figure 48
The sensorimotor relationship is affected by the acoustical properties of the environment.

The acoustical milieu of musicians give rise to patterns of acoustical experiences (Figure 48). These patterns are part of what it means to be situated in a certain genre – the conditions of the ecological niche inhabited. The differences between the experiences among various musicians is most clearly articulated in Study A. Beznosiuk descriptions arise, for example, from experiences from playing with orchestras in large concerts halls, while Veillon discusses his experience in different bands and recording studios. Statements in Study B highlights the Irish session as potentially acoustically challenging. Bill suggests that this context is one of the contributing factors to the forming of idioms regarding Irish traditional flute playing, when he says that this may be where the "ideal of the hard, buzzy edge of the flute comes from". Indeed, certain conditions enable and invite certain approaches to sound. As mentioned above, these conditions stand in dialogue with the instruments. That Beznosiuk's French Thibouville flute (FL BE 2) "possess wonderful, lustrous and carrying qualities" that makes the sound "sail out over the orchestra" makes it advantageous in certain

conditions. These conditions, for example, do not seem to match the Irish sessions mentioned above, at least not in the perspective of the musicians contributing to the present thesis. This almost evolutionary perspective also brings the acoustical embeddedness into a wider temporal scale. Through this wider perspective, it is possible to see how debate regarding hole size that engaged Nicholson and the flute makers of the 19th century, is still relevant today.

Playing in an anechoic chamber is a situation which is impossible to imagine for the participating musicians in Study B. Musical practice is always embedded acoustically. No acoustic environment is identical to another and they may, in fact, be miles apart, as the Irish session and the concert hall. Sound is one essential part of what is perceived and hence acted upon by the musician in a performance situation. From this follows that the sensorimotor contingencies change according to the environment. The musician has no alternatives but to try to adapt. These patterns of acoustical experiences are one dimension of the ecological niche (Gibson, 1979/1986). As such, they are part of the conditions that contribute to forming the habits, preferences and playing style of a musician.

7.2 Modes of access

While the first section laid the groundwork by defining affordances of musical instruments and the sensorimotor relationship that these depends on, this section will address issues of perception and cognition. Although both the interviewees in Study A and the participating musicians in Study B played the same type of instrument, as seen in the results, their approaches to the flutes were different. This did not only concern playing technique and aesthetic orientation, but also, as seen in 6.5, in which ways the instrument was present to them.

7.2.1 Constraints and possibilities of attention

It is impossible to pay attention to every aspect of the surrounding environment, and the *perceptual experience* is not the same as the sensory stimuli of the environment. As Gibson (1979/1986) showed, we pick up information that is relevant. As in the example with the car (3.2.2.1) provided by O'Reagan and Noë (2001) we partly react to such information without being aware of it, but also choose to pay attention to certain aspects (as the colour of the car in front), if we so decide. Throughout the results of the present thesis, attention appears to be a limited resource, which can be consciously directed as well as tied up in unfolding events. Attention is a matter of

presence and about navigating in the flow of musical practice, constrained by the skills and habits of the musicians (Magri, 2019).

Attention, in terms of listening, is discussed in Study B. There is a consensus among the participating musicians that it is not possible to be aware of everything at once. Or rather, if the whole musical landscape is in focus, the single voices are no longer as distinct. A technically challenging passage may also limit the ability to direct focus towards other aspects of the music.

Communication is used to scaffold and direct the attention of others. As described in 6.1, communication in Study B was to a large degree a mix between verbal statements and musical demonstrations. In cases where the words did not contain descriptions in themselves, their primal function was to direct attention to some aspect of what was being demonstrated in music. The discussions among the participants in Study B regarding embodied habits showed in similar way that, even when the attention was limited, it could be intentionally directed. Events such as an audible foot stomp or certain passages of music may call for attention. As Rikard suggested the difficult-to-intonate C^2 described in 6.6 also captured attention even though the participants seemed to be unaware of it. His idea is that such unresolved but subconscious issues "steal" attention which, in this particular case, made it harder to remember the passage that was being taught. During the interviews in Study A, and as part of the communication in Study B, the musicians pick up their instruments to demonstrate various aspects of their flutes and/or their flute playing. This is often done through a process of searching on the instrument by playing musical fragments in order to verbalise an explanation. One such example is when Viktor needs to play a section of Tune B in order to answer a question about tonality. Another similar example is when Anton discovered how his usage of ornamentation changed across different tonalities.

A prerequisite for this kind of observation of one's own action is that the skills involved in musical practice are part of the repertoire of sensorimotor schemes (Di Paolo et al., 2017). The participating musicians in the above examples do not need to pay attention to every single action involved but can rely on embodied habits. In the above examples, habitual movements drive the action and the musician can direct the attention to certain aspects such as tonality or ornamentation. This further implies that some aspects of musical practice are always hidden and that it is possible to take a reflective approach to the playing as it unfolds. Developing sensorimotor schemes in terms of technical abilities – what Rikard refers to as movement patterns being etched into the system – thus alters the constraints on the attention. Following from this, aspects of the musical practice may not be present in awareness while other aspects, such as paying attention to other musicians, may be more accessible.

Noë (2012) expands on this when he discusses the Heideggerian idea that aspects of the world (for example, tools) become less present in consciousness when working

properly, which results in an absence. But, as Noë (2012) argues, if it is a hammer that is held in the hand it is, in fact, available to the person holding it, although perhaps not brought into focus. It is an absence that needs qualification, it is "a lively absence, not a dead one" (Noë, 2012, p. 9). Even though the musical instrument might become transparent at times, the instrument is there in the hands of the musician. As such, affordances of the musical instrument can be brought into presence through attention. This can be done through different combinations of modalities.

7.2.2 Attention, perception and cognition

I have described how a flutist and a simple-system flute are bound together through the sensorimotor relationships. Although musical affordances can be understood as "relying on a sub-cognitive, pre-linguistic, intrinsically motor form of intentionality" (Menin & Schiavio, 2012, p. 2010), this should be taken as its building block, not a limit. Such a restriction would create an artificial divide between perception and cognition.

Prompted by the results from the present thesis, I here turn to Noë (2012) urging "that we embrace a different idea according to which perception is itself a kind of thoughtful exploration of the world and thought is […] a kind of extended perception" (Noë, 2012, p. 45). In other words, the divide between sub-cognitive and cognitive is in some ways an unnecessary divide. It is probably more relevant to view this as a continuum, and as a matter of presence of the musical instrument.

This implies that a musician might be cognitively engaged while perceiving and acting upon affordances through the sensorimotor relationships. The use of musical affordances in line with the empirical material of the present thesis is what Folkestad (1996) proposes when he describes one aspect of creativity: "as the ability to perceive new affordances, or old affordances anew, and to elaborate these affordances in each situation" (1996, p. 46). I think "ability" and "elaborate" here should not be understood as merely being sub-cognitive and pre-linguistic. Thinking-through-practice (Östersjö, 2008) and reflection-in-action (Schön, 1983) are other descriptions of such mode of explorative and actively engaged way of playing.

Of special interest here is the result of Study B, concerning the interaction with the instrument, which covers intriguing discussions on how the simple-system flute is available to the participating musicians. The participants discuss their interaction to their instrument based loosely on different modalities: touch, vision and listening. The sensory modalities are not described as discrete from each other. Rather they overlap in order to shape the perceptual experience. The descriptions given are not uniform, but rather different. The instrument does not show up in the same way for all musicians, but it depends on perceptual experience (including extended perception) and hence a mixture of multiple modalities. Inspired by Noë (2012) I call the ways in which the

attention is directed and thus availability is achieved, *modes of access*. The musicians in the study access the same type of instrument – the simple-system flute – with different sets of skills. These skills are used to enable different modes of access.

7.2.3 Modalities

As mentioned previously, the physical position of the flute relative to the flutist mean means that the flute is only peripherally visible for the flutists when it is played. In any significant way, it is out of view. But as Noë (2004) states: "I am visually aware […] of occluded portions of the scene around me, even though they are, strictly speaking, out of view" (Noë, 2004, p. 118). This resonates with statements made by Anton and Teo in Study B, where they describe how they are visually guided by the spatial layout of the instrument even though it is out of view.

The descriptions refer to functions. For Teo an inner vision of the instrument is not only a way to support the melody playing but a point of reference when he improvises harmonies. Alternative melodic lines and chords show up as finger patterns that form spatial networks (De Sousa, 2017). Anton describes his experience in similar ways. He also elaborates on this in his descriptions of learning new repertoire, where the visualization of the spatial layout becomes a part of the "obstacle course" (a spatial conceptualization of the tune) that he creates is his mind. The fact that the spatial layout is physically out of view when the simple-system flute is being played, may allow for even greater discrepancy between what is physically part of the instrument and what it perceived in terms of spatial networks.

Oscar and Rikard most clearly disagree with the account of visualisation of the flute described by Teo and Anton. Rikard refers to feeling when he claims that he cannot relate to the description of visualisation: "What do you mean by seeing? I don't see anything. If you say feeling, I can much more relate to that. But I don't see anything." This brings another mode of access into focus – the tactile. As put forth by De Sousa (2017): "The hand is not just an output device. Rather, information flows in both directions. The hand touches and is touched. Unlike its auditory or visual counterparts, tactile feedback allows for experiences of resistance" (p. 47). Oscar exemplifies how such tactile awareness is shaping the experience when he describes how F [234/234a] has a certain tactile identity.

The tactile mode of access is also the basis for reflection when Rikard compares the spatial layout of the simple-system flute and the soprano saxophone. For him, different tonalities have more distinct tactile identities on the saxophone. This comment is interesting and rooted in Rikard's background as a classically trained saxophonist. On a simple-system flute, where the spatial layout consists both of open holes and keyed notes, the sensorimotor profiles of different tonalities could be perceived as rather

distinct. Except for the mechanistic differences of tone production, there is a significant difference in terms of tactile feedback between the open holes (where the vibrating air can be felt by the fingers) and the keys (through which the fingers are removed from the column of air).

The tactile mode of access brings information that for the musician is not heard, nor seen. As De Sousa (2017) notes, the physical organization of a musical piece may be felt by the musician, while not necessarily heard by the audience, it leaves no "trace" (Windsor, 2016).

Beznosiuk states that the idiosyncratic quality of timbre of different keys is more pronounced on the one-keyed transverse flute, but transfers to some degree to the simple-system flute. However, when it comes to the tactile mode of access, the difference between tonalities is different between the two kinds of flute, but the difference here is of another kind. It is less due to timbre, than of the tactile feedback from notes produced through the use of keys and from notes only dependent on open holes. This aspect of the physical organization is more pronounced to the musician themselves than audible to the audience.

The empirical material also highlights the fact that aural perception of the sound created when playing is also a mode of access. It directs attention toward the sound itself and as such bypasses – but may of course overlap with – tactile and visual modes of access. Talking about learning new repertoire, Oscar says that he prefers to sing (including humming, "singing" in the head, and inner listening) and that when he can do that (repeat the melody "aurally"), he can more or less play it immediately. In situations like that, the flute is "just an accessory".

That aural perception is articulated as a mode of access does not mean that other modes of access exclude hearing. That it is not commented upon as much as the other modes may be because this kind of ear-to-hand relationship that is described by Oscar might be what is taken for granted. Listening is always there, although De Sousa (2017) opens his book with a chapter on the deaf Beethoven. But as pointed out above, listening is also a matter of active engagement and attention.

Aural perception draws upon several sources of sound. Viktor and Oscar refer to inner listening as singing in the head, and O'Grada, in a similar way, refers to "the sound you have in your head". As showed earlier, the environment is also an extension of the instrument and in some way is always affects the sound. Another source of sound is the sound that passes through the cranium as vibrations. Although usually drowned out by the sound carried through air, it is still there, perceivable for the flute player. It becomes especially noticeable in recording situations if the flute player needs to use headphones or has a cold that negatively affects their hearing.

According to Noë (2012), the skilful access to an object is not limited to the physical object, but it can be perceived through thought (as extended perception). While an

object may withdraw into absent presence, as mentioned above, it is also possible for an absent object to be – at least in some important ways – accessed. It is then a matter of what Noë (2012) refers to as "presence-in-absence" (p. 17).

This is a way to understand how Oscar can access the spatial network of the keyboard while playing the flute. As with the visualisation of the flute described above, the spatial network of the keyboard is there as a resource. Certain situations in music may draw attention to certain skills. Teo and Anton refer to the fretboard of a bouzouki or a guitar, in theoretically demanding situations. Although the instrument itself is not available, the affordances of its spatial networks are.

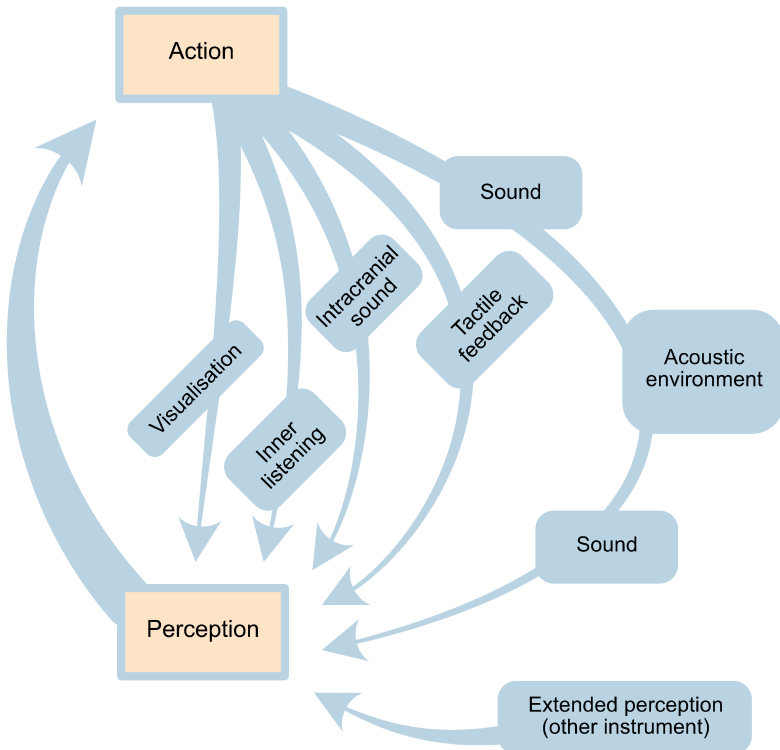


Figure 49
Perception-action loop illustrating the modes of access described in Study B.

This part of the discussion illustrates, what Ryan and Schiavio (2019) labelled as the complementarity principle of the second wave of externalism. The sensory modalities have several dimensions and overlap in different ways for different musicians (Figure

49). Although the descriptions of the perceptual experiences that form the empirical base for this discussion puts emphasis on different modalities – and experiences of these modalities – the nature of musical practice is clearly a cross-modal one. The relationship between the overlapping modalities is not static but changes due to events and structures in the flow of musical practice. Taken together, they form the sensorimotor contingencies of the interaction between the musician and the musical instrument. This is the space in which the musician navigates, consciously and subconsciously with the limited resource of attention. As seen previously, the character of the modes of access, and hence the perceptual content is unique to every musician. From this follows that the affordances perceived are just as unique.

So far, this chapter has discussed affordances of the musical instrument as arising from the sensorimotor relationship of the interaction between the two. This section provided an insight into how this interaction can be understood in terms of perceptual experience. The description provided can also be taken as an illustration of the complementarity principle (Ryan & Schiavio, 2019): the ways in which the musical instrument is accessed by musicians gives rise to qualitatively different ways of playing. In the following two sections of the discussion, the continuous, reciprocal relationship between a musician and the musical instrument will be understood as a coupled system. The dynamic principle will be in focus in a discussion on how this musician-instrument coupling evolves and change over time, through the process of learning.

7.3 Ways of learning

Musical learning, in the perspective presented here, is ultimately about being able to perceive and act upon new affordances, which necessitate the musician to develop technical and perceptual skills. Furthermore, various manipulations of the instrument side of the coupling may also expand and deepen the affordances of the musical instrument. In this way, the musician-instrument coupling dynamically changes in dialogue with the surrounding environment (Figure 50). Although affordances of the musical instrument arise in the moment and do not exist outside of it, the skills and abilities of the musician are multifaceted, and some are more permanent than other. Some of these changes emerge through the course of a lifetime, other changes are more fluid and even instant.

One way of looking at the processes of learning would be to use the model of a Russian doll, where the sensorimotor engagement with the musical instrument constitutes the smallest doll, which is surrounded in the social context, which is in turn encapsulated in conditions of genre and tradition. However, the present thesis

emphasises the ways that these different layers are interwoven with each other. As Clarke (2020) suggest, the Russian doll model would not suffice for a description of the complexity. Rather, a musician's learning processes are embedded in all of this. However, instead of being analytically frustrated that the different layers cannot be easily discerned and treated accordingly, the embedded perspective offers a wealth of potential paths for musical learning. I will here draw from the results of the present thesis to describe such paths.

7.3.1 Learning through manipulation of the instrument itself

The results of the present thesis suggest a number of ways of musical learning that concern the instrument itself. This is done through modifications of the present instrument (Ralsgård) or by developing new models (Veillon and Morvan), or by using different instruments for different musical pieces and in different situations (Beznosiuk). By these activities, the musicians need to adapt to new sensorimotor profiles, thus heightening their sensitivities. Doing this has the potential to open up for new affordances to be perceived.

When Ralsgård adds a new touch for his B^{b} key, he modifies the spatial layout of the instrument. Through this, he explores new affordances of the spatial networks. While this may be quite uncommon on flutes, on other instruments it can be more easily done. De Sousa (2017) gives an account on how jazz guitarist Kurt Rosenwinkel retunes his instrument in order to break the familiar motor patterns of his playing and to loosen up the theoretical awareness of his own actions.

However, these kind of nudges for an alternative perspective on the instrument are not always voluntary but may sometimes be embedded in the situation that a musician finds themselves. Study A includes stories about the availability of flutes across time and geographical places. Roussel was born in Brittany twenty-four years after Veillon. Their respective stories highlight the crucial role of the musical instrument in learning. In some ways, life as a flute player was much harder for Veillon. His early process of learning the flute cannot be separated from the flutes that he managed to get hold of. One aspect of this is how he was prompted to come up with solutions for notes for which he had no keys. He was, in a way, forced to figure out alternative fingerings. Again, the multiple fingerings for B^{b} provides a suitable example. If he had a B^{b} key on the flute that he used at the time, chances are that there would be no problem to solve. Maybe he would have used the B^{b} key, end of story. But instead, the necessity to figure out alternative fingerings and appropriate approaches towards the column of air lead him to explore new musical affordances. These highly developed sensorimotor skills have been foundational for his continued career and, to my ear, it is a trademark of his style.

Related to this are the processes of adapting to other types of flutes. Beznosiuk, with a background of playing one-keyed transverse flutes, describes how this experience informs her approach towards the simple-system flute. This resonates with the therapeutic effect that Ljungar-Chapelon's (2002) project with the *Basse de Traversière* offered him. Common to all are that these processes challenge both the embodied habits and the perceptual awareness of the interaction with the flute. Consequently, a form of recalibration is needed. In fact, this emerge as a method for technical development in terms of a deepened sensitivity towards the instrument. In some cases (historically informed Western art music) this practical experience is also bound up with contextual information regarding the history of the tradition.

Experimenting with other flutes may lead to more than technical development. One example is provided by Veillon, when he recounts how he had to change his way of blowing when he transferred from his Bruce Du Ve flute (FL VE 2) to his Chris Wilkes Rudall & Rose type flute (FL VE 3): "because I started to blow softer, the whole aesthetics [changed]. I started to realise that power is not loudness." This example of learning is interesting because it goes in the other direction than perhaps expected. Veillon had to adapt to the sensorimotor profile of the new instrument, which in turn developed his aesthetic preference regarding flute playing in general.

In summary, changing and manipulating the instrument may thus improve the musical practice in two separate, but interlinked, processes. (i) The new features and properties (for example adding a new touch to the B^b key) of the instrument can open up new affordances. As such, it develops the musician/musical instrument coupling, which in this perspective constitutes a way of learning. (ii) In a longer perspective these processes offer possibilities for musical learning in terms of advancing the sensorimotor skills (deepened sensitivity towards the sensorimotor profile of the instrument and an expanded, finer calibrated repertoire of sensorimotor schemes) that the musician, in more general terms, will bring with him or her to other flutes. Bear in mind that sensorimotor schemes are not merely a "tool" for execution of movements, but also a means of perception (Di Paolo et al., 2017), since information flows in both directions (De Sousa, 2017).

7.3.2 Learning through new instruments and genres

Another way of learning emerges through the experience from playing completely other kinds of instruments. That such experience may influence the approach towards the instrument at hand is exemplified in the above discussion on modes of access. Since another instrument can be accessed through extended perception (for example the piano keyboard by Oscar), becoming more attuned to affordances of spatial networks

of other instruments may potentially inform the interaction with the instrument at hand.

The approach towards the instrument, also at the most detailed level, is embedded in conventions, expectations and values of a genre or tradition (see for example 7.1.8), as Di Paolo et al. (2017), states: "the experiential fact is undeniable that sensorimotor schemes are subject to norms" (p. 78). Thus, broadening the musical horizon through experience from other genres emerges as a way of learning, in terms of developing new approaches towards the own instrument and the repertoire, otherwise in focus for the musician. In the results, this is described in terms of heightened contrast between genres. Roussell's background in Breton music makes her appreciate the tonal range and the longer form of Swedish traditional tunes, while Ralsgård's experience in Irish music sets him on a path of instrument exploration (the projects with his German flutes (FL RA 1, FL RA 2) as part of his practice in Swedish traditional music). It should be noted that these insights emerge from deep experiences, and an artistic longing for another perspective.

7.3.3 Learning through improving sensorimotor skills

Perhaps the most obvious way of learning is to practise playing technique. Such exercises – in which the playing technique is continually challenged – can be understood as aiming to deepen certain aspects of the sensorimotor relationship with the instrument and hence allows for new affordances of the instrument to be perceived and acted upon. The musical instrument, taken as a transformer of movements (Bielawski, 1979) becomes, as the technique develops, a more powerful transformer – the repertoire of gestures that can be transformed from physical to musical expands. A wider repertoire of sensorimotor schemes modifies the constraints of attention, which allows the musician to become aware of other aspects of the musical flow. Another side of technical advancements are the new perceptual experiences of the instrument that open up. Cross-modal perception (as discussed above) includes tactile feedback. New ways of moving will therefore modify the perception of the instrument and this altered perception opens up a path for new affordances to emerge.

7.3.4 Learning through music theory

Technical exercises of scales and chordal patterns also have the potential to open up new affordances of spatial networks. This is further amplified through a theoretical awareness. As Viktor (Study B) points out, learning music theory may sometimes be thought of as primarily concerning propositional knowing, and indeed, music theory has a place in the communication among the participating musicians in Study B. It is

a way of "bringing order into chaos" (Oscar). This competence of theoretical grasping may be isolated to the domain of propositional knowing but may also, through sensorimotor skills, be transferred to practical knowing. As discussed above, learning to integrate concepts from music theory in musical practice can be done through multiple sensory modalities. However, a musical event, such as a chord substitution, can be experienced as a conceptual entity without the musician being able to articulate it. Depending on the sensorimotor skills, such perception may inform the practical knowing and thus be expressed through music without the need to conceptually "label" it. Developing an analytical awareness and consequently learning to identify the chord substitution as such would be to use a "pair of calipers" (Noë, 2012). This analytical awareness may or may not form the basis for further elaborated action (thinking-through-practice). Learning more about music theory as practical knowing can hence change the perception of music. As Clark (2008) argues regarding language, developed understanding of music theory can be viewed as a "a form of mind-transforming cognitive scaffolding" (p. 45), if such learning is closely tied to the musical practice.

7.3.5 Learning through teaching and verbalising practical knowing

According to Schön (1983), problem setting takes place in conversation between practitioners in a field and constitutes an important step of learning in terms of practical knowing. The cooperative inquiry of Study B was an intensified space of problem setting, and from the interviews of Study A, it is obvious that situations of formal teaching can be a space of problem setting, and thereby potentially a method of learning, also for the teacher. Roussel, whose career mainly has involved work as a freelance musician and not so much as a teacher, at one occasion sighs and explains: "you are the only one who has ever asked me these questions." She is also heavily dependent on the interaction with her instrument in the process of formulating her answers. For all of the interviewed musicians, it can be established that the act of flute playing is an essential part of both articulating verbal explanations and providing examples. From this follows that the perceived affordances constitute the basis for the process of reflection-in-action. The process of verbalising the sensorimotor knowledge (perhaps better termed *sensorimotor understanding* (see Noë, 2007) is a process of framing experiential knowing into words (as far as it is possible). This will take the shape of presentational knowing or – in its continuation – propositional knowing. One such example is Veillon's visualisation of the column of air as a blue sausage (Figure 23). As a product of Veillon's own interest in various articulation techniques and his experience from teaching workshops, this propositional statement serves to direct attention to one particular aspect of flute playing. Such statements have the potential to work in two directions, besides instructing the student, they may also highlight the

teachers own practices, habits, and concerns. Ultimately, this will be one of the foundations of the practical knowing.

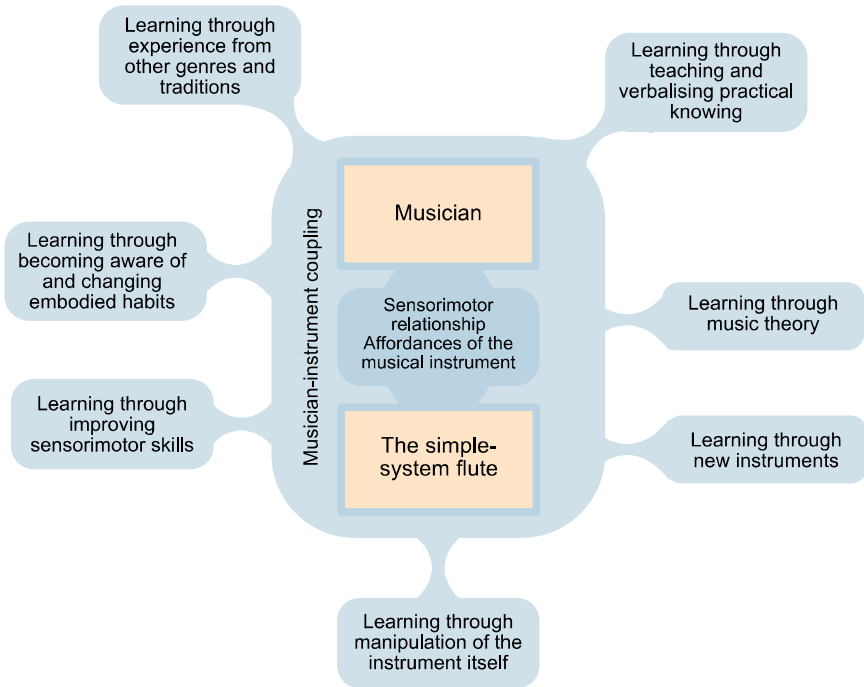


Figure 50
Ways of learning in the results of the present thesis seen as changes to the musician/musical instrument coupling.

7.3.6 The body and the paradox of embodied habits

Perhaps the slowest form of development connected to musical learning concerns body features. Some of these features may seem static, for example hand size[54]. When Roussel received her very first simple-system flute as a child, she discovered that she was, initially, unable to use it since her hands were too small to cover the open holes. But hand size can also be an issue for fully-grown, adult flute players. Then it is an issue about hand-instrument compatibility. Beznosiuk complains about the placement of the

[54] This can however be discussed. The history of music contains stories of musicians trying to alter their bodily properties. Perhaps the most widespread story is about Robert Schumann cutting the webbing of his fingers.

$G^{\#}/A^{b}$ key on her original Rudall & Rose flute (FL BE 1), Ralsgård points at the necessity of extending the C^{2} key in order facilitate a better usage (at least that was his plan at the outset). Furthermore, the anatomic features of the musician are thought of as having impact on tone production. Veillon comments on the palette as being one factor in the personal quality of the sound produced. Ralsgård mentions that his need to alter the tuning may, to some degree, be sprung from his own body features (i.e. the jaw). In study B, the participating musicians discuss how the flexibility of the right-hand thumb, the flexibility of the left-hand finger joints, and the shape of the chin impacts the balance of the flute, and thus learning how to play the flute.

Although the results of the present study explore the role of the body in relation to the musical instrument, the study does not cover changes in any depth. The most profound developments of this kind will probably occur as a child grows up and in the unfortunate event of accidents or illness. Clark (2020) starts the article with a description of guitarist Derek Bailey's last recording, entitled "Carpal Tunnel", where Baily needs to negotiate his musical vision with the emerging problems of controlling his finger movements. Although less dramatic, the results from the present thesis do address issues of pain.

Closely related to body features – and sometimes the line is blurred – are embodied habits of posture and blowing technique. Veillon refers to how years of practice impacts the way he approaches the instrument. In his words: "It's the way you negotiated your embouchure, the way you set your embouchure to play. And probably, what you are aiming at when you play, without knowing [it]." The extent to which this is the case surprised me when I tried Beznosiuk's Thibouville flute (FL BE 2). In the situation described in 5.3.1, I tried to step outside my blowing habits, as they have developed through the playing of a certain flute in a particular musical context. Roussel, also addresses the fact that playing a particular flute for a long time entails adjustments to her embodied habits. She says that, in order to form an opinion about another flute, she would need to play it for months. It is not because the flute itself changes during this time, but rather because it takes time to adjust to the sensorimotor profile of the new flute in order to explore the affordances of that particular interaction.

As the participating musicians of Study B agree, these aspects of embodied habits may be hard to change, or even to become aware of. Viktor points at the music that he first became interested in as a flute player ("fast music") led to his problems of air management. In a similar vein, certain acoustical milieus (for example the Irish sessions mentioned in Study B), can lead to tensions in the body. Although the participating musicians acknowledged the potential of the breathing exercises that Oscar led, the proposed approach towards breathing was described as losing control. Changing such thus demands time, effort and the ability to pay attention to these changes. From this follows that constraints of certain conditions, for example repertoire and performance

contexts need to be limited. Depending on the situations in studies or professional musicianship this can be a challenge. Although problematic, herein lies a potential, yet profound way of learning.

7.3.7 A fragile relationship

While the embodied habits take time and effort to change and develop, they are also – in a positive sense – the most stable of the aspects discussed here. Fragility of the sensorimotor relationship is otherwise a recurring theme in the results of the present thesis. Aspects that are brought up are bodily (health, tensions, injuries), contextual (being nervous, difficult acoustics) and instrumental (cracking flutes, stuck keys, humidity). Musical affordances are always constrained by these kinds of circumstances. One example is given by Anton when he states that being nervous negatively impacts his breathing. This is, according to his description of a downward spiral where the limited affordances of the column of air affects his sound, which in turn increases the tension in the body. Also, since the sensorimotor relationship is sensitive to change, a musician being "out of shape" also have negative consequences, as described by Roussel: "The first thing you lose is your mouth. And the air is all over." Conversely, there are moments where everything works, as illustrated in the dialogue in 6.9. This fragility, combined with the emphasis on the skill of attention, directs the focus to the present moment of musical practice.

While this section presents ways of learning that emerged from the results, the following section will put these findings in a wider discussion on the educational implications of the present thesis.

7.4 Educational implications

In this section, I will highlight the educational implications of the results of the thesis. In line with the previous section, affordances of the musical instrument is here taken as the locus point of learning. A central part of this discussion concerns how the findings – made in studies outside of formal educational settings – can be implemented in formal learning environment. Accordingly, framing this section are research concerning these topics.

In his review of music education research, Folkestad (2006) shows that the distinction between *formal* and *informal* education is often blurred and he highlights the necessity to be explicit about which aspects of the learning process that are discussed in either way. In the article, he discerns four aspects that are in focus in the reviewed

literature, as being described as either formal or informal: (i) the situation, (ii) learning style, (iii) ownership, and (iv) intentionality. Folkestad (2006) argues that it is more relevant to view formal and informal ways of learning, not as a dichotomy but as a continuum, where both approaches exist interchangeably within most practice.

One of the works cited by Folkestad is Jorgensen's (1997) *In search for music education*, where she makes a distinction between five broad approaches to education: (i) schooling, (ii) training, (iii) eduction, (iv) socialisation, and (v) enculturation. Jorgensen describes how these categories have been discussed and described by educators and philosophers throughout history, and also highlights their potential weaknesses. These five categories refer to degrees of formalisation, explicitness of teaching and pre-determined structures of the practice, ranging from the most formal (schooling) to the least (enculturation). This range of educational settings are also represented by the backgrounds of the musicians in Study A, where Beznosiuk, Ralsgard, and Roussel have a background as students in higher music education, while O'Grada, Veillon, and Morvan have taken another learning route of eduction, socialisation and enculturation outside of formal educational institutions. It is however clear that for all of them, the socialisation and enculturation are vital parts of their life-long learning as professional musicians, and that the studies in higher music education that some of them have undergone are one part of a very broad picture.

This section is written from the perspective of the dynamic relationship between the educator and learner. The role of the educator in the context of eduction can be described as having the central task to educe, meaning: "bringing forth and/or developing the capacities, abilities and aptitudes that already potentially exist in the student [and] like a gardener, creating good conditions for learning to take place" (Folkestad, 2006, p. 139). This resonates with the role of the educator described by van der Schyff et al. (2016), in their outline of the implications for music education of an enactive pedagogy.

I hope that this section can spur ideas for the reader with regards to his or her own experience and current situation, be it in educational settings resembling schooling or training or in more open formats of eduction, socialisation or enculturation. Therefore, I use the open terminology of educator, learner, and learning environment.

Also, implications span from beginners' early exploration of their chosen instrument to professional musicians' continuous advancements. In fact, I find this continuity from novice to expert, in a life-long perspective to be at the heart of the perspective taken here.

New musical affordances emerge through changes in the coupled system of musician and instrument. The processes of these changes, developing in continuous relationship with the environment, will be discussed here in terms of self-organization (autopoiesis). Although self-organization is a term with its own complex history, it is a useful concept

in discussions on musical learning, and as stated in Chapter 3, this discussion relies on the principles of self-organization, primarily outlined by Schiavio and van der Schyff (2018). Self-organization processes occur on different time scales and with regards to various functions. They involve a wide range of activities, from the sensorimotor engagement with the world to the sense-making processes connected to social and psychological dimensions of life (Silverman, 2020).

I do not claim that what is being put forth here is original or not already well-established in educational practice. On the contrary, the educational implications of this work are rather to acknowledge the value of certain teaching practices, and to view them from another angle, one which may allow for further elaboration and development. As I will argue, educational practice along these lines necessitates a sense of sensitivity and responsibility towards other people sharing the environment.

First, I will summarise some key points about affordances of the musical instrument as a locus point of learning that have emerged in this study and which are essential to keep in mind in a discussion on learning. Second, I present some thoughts about what I refer to as an exploratory approach to sensorimotor learning. Finally, I discuss the educational implications with regards to the learning environment.

7.4.1 Affordances of the musical instrument as a locus point of learning

In a discussion on educational implications, it needs to be emphasised that affordances of a musical instrument (i) are discovered through changes in the coupling between musician and musical instrument, (ii) are exploratory in nature, (iii), make sense through their embeddedness, and (iv) are unique to every learner.

(i) As shown in the above section, the musician-musical instrument coupling is never fixed, but constantly changing over different time scales. Changes are minute and hardly noticeable as well as profound; they are life long and gradual (for example the aging body or development of complex sensorimotor skills) as well as instantaneous (for example a new instrument or an accident). Furthermore, the changes emerge out of, and stand in relation to, already existing ways of being with the instrument. Changes may occur in the direct sensorimotor interaction, but also in what first might seem more distant and reflective practices, which in turn affect the underlying norms (Di Paolo et al., 2017). Changes can be initiated by the learner as part of an artistic vision or as a response to demands and outer pressure, arising in situations with or without formal teachers involved. Through these changes the learner adapts, and on a meta-level also learns to adapt (the ability to self-organize). Hence, musical learning, includes a multitude of activities where such changes are initiated and sustained, and learning environments are spaces where positive and sustainable changes can be initiated, encouraged and supported.

(ii) In some regards, affordances of a musical instrument seem to be of a special kind compared to affordances of everyday life, primarily discussed by Gibson (1979/1986), such as moving around in the environment. Affordances of an instrument are complex, they intersect with other musical affordances and invite improvement, reshaping, reusing, and recombining. One example of this complexity, explored in this chapter is affordances of guidance which combine the whole range of sensorimotor relationships in a combination with the contextual knowledge of the musician.

Furthermore, in the concept of affordances lies a notion of intentionality and implicit forward movement that is realised through sensorimotor manipulation. Developed sensorimotor relationships provide new approaches towards the musical instrument and thus new affordances emerges. In many ways, it resembles the dialogue with clay that Brinck and Reddy (2019) describes being central in high-quality pottery, in which experts show a greater degree of trust to the material than novices. The instrument opens up, but it only does so because the perception and the sensorimotor relationships develops. Note that perception here refers to the fully-fledged complexity of the cross-modal ways of access that 7.2 gives an insight into. In this way, affordances of an instrument are in themselves open-ended and encompass an explorative quality.

This explorative quality forms a continuity from the beginner to the expert. The musicians in Study A for example, all have an explorative, and in many ways playful, approach to their musicianship, manifest for example in Beznosiuk's experiments with different flutes and historical research, Ralsgård's manipulation of his instruments, and Veillon's innovative playing technique. This supports the open-endedness that van der Schyff et al. (2016) argues should be characterising an enactive pedagogy. This playfulness is an attitude towards the own musical practice that enables change.

(iii) Driving this forward movement is not only the sensorimotor manipulation but the embedded nature of affordances. Any artistic vision (even in the most naïve and intuitive sense of the word) holds an intentionality and is as such directed somewhere or towards something, not just an empty space but a wider perception and understanding of the musical context. This is exemplified in how the interviewed musicians' (Study A) talk about their playing technique, which is never purely instrumental or decontextualised, but always aesthetically framed.

If the embedded understanding is remote or insufficient, then articulating a note on the flute will be like drinking from a glass of water: the note is played, no qualification needed and end of story. As mentioned above, the Russian doll model with surrounding contextual layers is not sufficient for conveying how the contextual parameters are involved in the musical practice (Clarke, 2020). However, this embeddedness can be understood in terms of norms that influence and regulate the sensorimotor actions (Di Paolo et al., 2017). It is against this embedded nature of musical affordances that the sense-making process in everyday musical life has to be understood.

(iv) Affordances of a musical instrument are dependent on both the musician and the instrument. The structure of the perception is cross-modal and is shaped through the history of coupling with the musical instrument at hand, as well as with other instruments and musical knowing across the four kinds of knowing of the extended epistemology (Heron, 1996). Also, the experience and perspective of the (musical) world, and how this is enacted, can never be identical for every individual. Consequently, affordances of an instrument are never the same for two musicians. Even if the outcome (in terms of a sounding musical action) may be identical, the first-person perspective is different, and thus the same action comes about through different means and may occur differently the next time.

7.4.2 An exploratory approach to sensorimotor learning

How then can educators and learners go about shaping a learning around the concept of musical affordances? At the outset it is worth to consider the character of uniqueness mentioned above. Learners will always have a background when they enter a new environment and students within higher music education in particular have a history of coupling with the instrument. Investigating the learners perceptual experience of playing the instrument may open up for unexpected learning trajectories with regards to how affordances of the instrument are perceived and acted upon. Learners may also have musical experiences beyond instrumental practice and potentially a background from playing other instruments. As Di Paolo et al. (2017) states, "we are equipped with a rich repertoire of ready-made, highly organized ways of engaging the world" (p. 82). Thus, there may be modes of access at hand for the learner that an educator is not aware of. One example that can be taken from the present thesis is the different ways that the participants of Study B accessed their instruments, and how their respective experiences from other instruments informed their way of approaching theoretically challenging tasks. Concerning affordances, there lies herein a potential resource that may not even be realised by the learner themselves, eager to adapt when entering a new learning environment.

Another aspect to consider is the difference between thinking about sensorimotor learning in terms of technical development and discovery of musical affordances. To explore new affordances of the instrument is not the same as breaking new grounds of instrumental technique. Although it might be beyond reach for a learner to find completely novel ways of moving on the instrument in terms of technique (for example experimental and extended techniques), explorative ways of interacting with the instrument can open up new affordances. To take a rather drastic example, when Veillon uses a mix of harmonies and alternative fingerings to "create a blast, which to [him] means binioù/bombard", the actions taken might be well documented in terms

of flute playing technique, but in terms of affordances of the instrument it is highly original. The value of taking affordances as a perspective of learning does not reside in ground-breaking virtuosity (although this may be part of it), but rather the nature of ownership of the interaction with the musical instrument, by grounding the techniques in a perceptual experience so that it connects to, and supports the development of, a learner's musical voice. Following from this, affordances of the instrument cannot be isolated from the way they are used in musical situations. But this does not mean that technique should always be introduced through musical pieces and tunes. Etudes are one example of how more or less explicit technical challenges can be addressed in a composition, hence presenting something about the contextual application of a particular technique. More decontextualized and abstract technical exercises can be framed in an open-ended fashion. The learner may for example be encouraged to incorporate new technical skills in a musical situation, such as improvisation, interpretation or composition, and through this explore the potential in terms of affordances. Among other things, I have challenged my students to compose tunes using only keyed notes. The simple instructions force them out of their sensorimotor habits while the outcome may surprise both themselves and me.

Another way to approach exploratory sensorimotor learning may be to encourage the learner to construct their own technical exercises which address issues of particular interest and/or challenge to them. During my own flute studies, I had a teacher who showed me the practice of constructing small, challenging technical exercises which to him were like playing with a Rubik's cube. There was a sense of sheer joy in solving the technical challenges set up by himself, as a form of self-regulated learning (McPherson et al., 2017) at mastery level.

Habit and attention – being building blocks of abilities – are tightly bound together, which means that aspects of the own musical practice are always hidden. Developing technique presupposes that movement patterns (sensorimotor schemes) of different scopes are automatised. The paradox of habits (automatization as being both desirable and frustrating) is formulated by the participants in Study B. Embodied habits are connected to perceptual constraints, as is observed by the participants in Study B, when Oscar comments on Rikards use of articulation, and Rikard responds: "I don't hear it as much as you do probably, since it is what I do." This resonates with Magri (2019), stating that "the perceptual field is held together by habit" (p. 132). A question that follows from this, is what to practise and develop, which may be a not so easily discerned. In other words, self-assessment is not only about evaluation of what is perceived in the own playing, but also perceiving it in the first place. As Windsor (2016) points out, although there is high level of detail in the information available through the first-person perspective of the musician, a listener will not necessarily perceive less, but different information:

> In many ways the listener/observer can observe and listen to the body of the performer in much more detail and freedom, unconstrained by technical limitations and from a distant vantage point. The oddity of seeing and hearing oneself performing on video for the first time bears witness to the privileged viewpoint of the spectator. (Windsor, 2016, p. 61)

An educator or peer-learner can direct attention to the habitual action. Also, the learner themselves can listen back to a recording of a practice session, such as put forth by Teo in Study B. This can be thought of as augmented information (Otte et al., 2020), which is used in ecologically informed sports training. In line with the idea of augmented information, the educator can direct the attention towards certain aspects of what is being performed without prescribing a solution. As noticed in study B, the words used by the participants were in many cases just there to direct attention to details of what was being played. Various ways of approaching the difficulty are explored by the learner themselves. This process has potential of opening up to original approaches to the instrument. As stated by Di Paolo et al. (2017):

> it seems that sensorimotor learning, while constrained by history and biology, is not restricted to a set of species-typical adaptations. In fact, the learning and refinement of action and perception skills in some cases, if not unbounded, at least seems to have no obvious predictable bounds. (Di Paolo et al., p. 109)

Such "unbounded" approach to technical development is probably inherent in many musical traditions that predominantly exist outside academic institutions, depending on educational practices and which aspects of the musical practice that are explicitly or implicitly addressed through teaching. The bedrock for Veillon's original and exceptional playing technique is the many challenges that he faced through the process of adapting the flute to Breton traditional music, to which he had to come up with his own solutions. This process was especially emphasised in ensemble situations and the musical ideas from his fellow musicians, which he had to handle with his one-keyed flute (FL VE 1).

Even if there is a need or desire for a more normative guidance from the educator, such instruction can leave space for self-organization of sensorimotor learning. Regarding sports training, Otte et al. (2020) suggests that analogy learning, through which the instructions take the form of biomechanical metaphors, allows the athletes to find their own movement solution within some given frames. This is common across various traditions of music education through the use of metaphors (Schippers, 2006). Interestingly, musical metaphors are commonly used in order to say something *more* than only the technical instruction, being an instruction that "combines technical instruction with aesthetic intention" (Schippers, 2006, p. 211). But seen from the perspective presented here, metaphors can be argued for by their potential to say

something *less* about the explicit technical solution, and thus create space for self-organization of the sensorimotor learning. Furthermore, instructions in music education can be – and often are – given through music itself. As phrased by O'Grada, he usually tries to "go through the sound" in his teaching. On a more remote level of instructions, even a comment such as Beznosiuk's: "stop trying to make it work", may be enough for the learner to reorganize the approach to the task at hand.

There is a continuum between the poles of explicit instructions and space for self-organization. Where on this continuum a learning process is best situated ultimately depends on the needs of the learner, as well as question of the desired degree of conformity of playing technique and musical expression. However, to be aware of the choices may be a first step to "loosen taken-for-granted attitudes and decenter standard approaches" (van der Schyff et al., 2016, p. 84).

Another path to explorative sensorimotor learning is implied by accounts of changes implemented through the manipulation of the instrument. These kinds of manipulations are not necessarily isolated to personal projects of artistic curiosity – as they are mostly discussed by the musicians in Study A – but provide a means for sensorimotor learning in themselves. As stated by Di Paolo et al:

> There is no predictable end to the variety of social and material couplings offered by the world […] It is not the agent's learning architecture that is open-ended per se, but open-endedness is possible only in virtue of a coupling to an open material world. (p. 106)

As pointed out by Veillon, a new instrument may lead to technical adaptions, through modified sensorimotor schemes which in turn result in an aesthetic reorientation. But learning implemented by material changes can be less dramatic. For example, I have heard stories about simple-system flute teachers disabling the short F key in order to make the learner accustomed to use the long F key, which echoes of constraints-led approaches in sports training (Brymer, 2010).

In the process of shaping and reshaping sensorimotor schemes, such paths may be of interest to explore. However, the exercises chosen ought to make sense for the learner, otherwise it might be that such challenges end up being solely obstacles. How this can be done is therefore ultimately a matter of personhood of the learner and scaffolding of the sense-making process from the educator. Inspiration can probably be found in experimental music, where alterations of the material elements of the musical practice are part of the artistic process.

7.4.3 The learning environment

Two points move the discussion into a focus on the learning environment. The element of self-organization in sensorimotor learning (although allowed various degrees of

space), will probably benefit from a more holistic perspective on the learning environment. Furthermore, musical affordances are always embedded, and sensorimotor schemes can never be detached from the norms that partly constitutes them. From this follows that a perspective of technical development that considers the isolated space of instrumental teaching alone will always only tell half the story of learning.

The above characteristics of affordances of musical instruments, and the discussion on explorative sensorimotor learning poses implications for the learning environment. This environment emerges as a network of educators and/or peer-learners, in which the learner becomes a contributing part. Rather than being a source of information and feedback, an educator becomes "an attractor around whom the pedagogical system organizes itself" (van der Schyff et al., 2016, p. 98). Also, students have – what I choose to call – *an ecological responsibility* – they are constitutive of each other's environment and have an important role to contribute to the learning ecology. The shaping of environmental conditions that support a sustainable musical life, becomes a central task for the educator. The tasks discussed here are: (i) to encourage and support reflective practices, (ii) to facilitate collaborative learning, (iii) to create space for exploration, and (iv) to curate sense-making processes.

(i) Central to the perspective outlined here is to provide tools for self-organization and sense-making, both in the present situation of learning, as well as in a life-long perspective. One way of doing this is through encouraging and supporting various forms of reflective practices: from Socratic dialogues in the instrumental lesson and aesthetic considerations verbalised in the ensemble class, to student projects and written assignments.

Today's academisation of higher music education animates this movement. Georgii-Hemming et al. (2020) explored how leaders within Swedish academies offering performing classical musician degree programmes, views reflection as part of the education. They discerned three ways of thinking about the value of reflection in this context: "reflection for artistic knowledge development; reflection for individual success in the profession; and reflection over the role of musicianship in relation to society" (p. 1). Reflection, in these terms can be understood as ways of cultivating and strengthening the sense-making ability, which lies in the heart of the self-organising process. However, the authors also conclude that reflection is currently justified in relation to the marketisation of higher music education and that this explains why critical reflection is less pronounced. However, stressing the life-mind continuity that is central to the enactive perspective means that the area addressed through reflection also needs to address issues outside of what is traditionally thought of as the profession, such as "philosophical, scientific, historic, cultural, critically reflective, therapeutic, and praxis-based concerns" (van der Schyff et al., 2016, p. 102). These dimensions were

not just part of, but underpinning, the interviewed musicians' ways of talking about their musical lives. The bigger picture was always present, at times explicit and other times as a backdrop of their statements.

(ii) It is important to remember that the domains of reflection cannot be limited to propositional knowing, although being the fundament of traditional academia (Heron, 1996). The four forms of knowing of the extended epistemology, described in Chapter 3, are all approachable through reflective practices. The format of the cooperative inquiry is both a research method and an in-depth process of peer-learning, through which the four-folded epistemology can serve as framework for reflective and practical processes that give credit and value to the individual perspectives, since they all contribute to new ways of thinking about and through music.

Through cooperative inquiries, as well as less structured ways of collaborative learning, peer-learners will be a part of each other's learning processes, in line with the ecological responsibility towards the learning environment, as mentioned above. Peer-learning is just as essential to the musical learning process, as the corpus of propositional knowing (through books and scientific articles) is essential in traditional academic work. Furthermore, through the guidance of educators, there will be no dichotomy between the two, but rather they offer inspiration and input in an open-ended and explorative fashion.

Also, more explicit teaching in formal settings, such as schooling and training, is a way of examining the musical practice. It is apparent that the musicians that have experience from teaching are more precise when articulating details of the technical aspects of their flute playing. Inherent, and often unnoticed in teaching practice, lies the process of problem setting (Schön, 1983), through which aspects of the musical practice becomes explicit and tangible, rather than remaining intangible and tacit (Schippers, 2010). As discussed by the participants of Study B, it is necessary to bring aspects of the musical practice into awareness in order to initiate change. One way of bringing forth occluded and habitual ways of being with the instrument (both positive and negative) is to notice them in others. Successful teaching practice (in broad sense) necessarily depends on an advanced understanding (be it intuitive or articulated) of learning processes, and thereby a meta-perspective on self-organization.

(iii) Critical reflection, mentioned above, can be understood as an explorative stance towards themes of relevance, which resonates with the explorative quality of musical affordances. However, a learning environment that supports exploration in terms of musical practice needs to be committed to open-ended learning processes. This poses educators with certain tasks. As put by van der Schyff et al. (2016): "The role of the educator is to reveal, encourage, and nourish this process. She engages her students by creating rich open-ended environments and projects" (p. 94).

For example, organising a public performance at the end of a learning project should be considered with care. Having an audience, who are recipients of the musical result of the learning process and not otherwise involved in the creative process leading up to the performance, will fundamentally influence the learning process and the learners' ways of engaging. Such final performances may be of value in some cases, and counterproductive in others.

From a larger perspective, an educator cannot foresee all the potential paths that a meaningful musical life may encompass:

> performing, composing, improvising, arranging, conducting/leading, recording, producing, musicing and dancing/moving, […] teach one or more musics to others, whether formally or informally […] write about music, lecture about music, collect artifacts that surround musical ways of being (e.g., recordings, letters from famous instrumentalists), read about music, discuss music, argue about music, and so forth. (Silverman, 2020. p. 8)

Since the musical world continuously evolves, this spectrum of activities will keep changing. Furthermore, in Schippers (2010) investigation of music education across various traditions, there seems to be a general attitude of mistrust among the older generation towards the next generation of up-and-coming musicians. This critical stance may be rooted in misunderstanding and differences in aesthetic values, but perhaps also – and in formal educational environments in particular – a fear of being irrelevant. If educators are focusing on the contents of knowledge (such as in knowledge transmission in a master-apprentice perspective on musical learning), rather than guiding the process of self-organization and facilitating the development of meta-cognitive skills (sense-making abilities), they run the risk of being outdated as aesthetic ideals changes and new ways of performing emerge.

This emphasises that educators are as much part of the learning environment as the learners, and just as learners need to be reflective about their position in a wider perspective, so too does the educator need to be constantly reflective about his or her own role in the environment. This too is part of the ecological responsibility.

(iv) Both reflective practices and the explorative approach can be fuelled in a variety of ways. Fundamentally it is about facilitating overlapping between the learning environment and a wider context, may it be through concerts, exposure to new kinds of music, new performance situations, field trips, exchange studies, unexpected musical meetings, thought-provoking readings, or visiting guest teachers.

Although, and especially for younger learners, it could be expected that too wide and shifting contextual parameters may cause confusion and thus be counterproductive to the sense-making process. The world is enacted and must be within reach of the learner.

Herein lies a task for the educator to be both facilitator and moderator of new experiences.

But also in the case of higher music education, educators have an important role in facilitating the sense-making process. Especially crucial is the transition between the educational environment and other performance contexts in the domains of the life as a professional musician. It is, as mentioned above, critical to scrutinise the role of the education from the perspective of the life-mind continuity.

In the final paragraph of this section, I return to Jorgensen's (1997) notion of eduction. In her book, she argues that eduction, with its emphasis of the naturalistic approach may not suffice when the learning situation is not as ideal as the metaphors of nature implies. Eduction, she states, suffers from a romantic idea and that: "the assumption that children will be motivated to learn anything if teachers present it attractively takes insufficient account of personal and social factors that cause students to choose not to corporate in the eductive process" (pp. 17-18). However, the approach laid out here, and articulated through a 4E (predominantly enactive) perspective, have the potential to consider the positive sides of eduction, while grounding it more firmly in the actual practice. Furthermore, it is of significance to keep in mind that most learning environments, even inside institutions contain both formal and informal learning processes (Folkestad, 2006). Viewing formal and informal approaches as a continuum, encompassing all the characteristics of schooling, training, eduction, enculturation, and socialisation, may open up for educators in all domains to create spaces – small or large – for learning processes underpinned by sustainable self-organization. In education understood this way, it needs to be emphasised that learners are not consumers of education. Rather they are co-creators of the education and constitute each other's learning environment. By actively taking part in each other's learning processes, learners may develop the metacognitive skill of learning about learning. These roles and activities can be framed as parts of the ecological responsibility.

7.5 The interpretation of musical affordances: moving forward

In the following section I will recapitulate some of Gibson's (1979/1986) original writings about affordances. As apparent in Chapter 3, the concept of affordances has been interpreted and applied in various ways by researchers elaborating on Gibson's theories. In the above sections I have presented an interpretation of one kind of musical affordances, namely affordances of musical instruments, which is a result of the analysis

of the empirical material of the present study. While this interpretation may differ from some of the researchers use of the concept of affordance, it is still, as I will show, consistent with Gibson's original ideas.

The chapter on affordances provided in *The Ecological Approach to Visual Perception* (Gibson, 1979/1986), is seventeen pages long. One of the often-quoted sentences in the beginning of the chapter reads: "The *affordances* of the environment are what it offers the animal, what it *provides* or *furnishes*, either for good or ill" (1979/1986, p. 127, italics in original). As Chimero (2003) points out, this explanation of affordances is "deceptively simple" (p. 182). This simplicity is one of the advantages of the concept as it is easy to relate to and is instantly thought provoking. However, the fact that it is deceptive is obvious from the multitude of different approaches taken by researchers inspired by Gibson. One of the most critical points of debate regarding the interpretation of affordances is how broadly the idea of direct perception – and thereby also affordances – can be applied. In order to frame the arguments emerging in this debate, I remind the reader of the following quotations presented in Chapter 3. On the one hand, affordances are: (i) "opportunities for action in the environment of an organism, the opportunities in question include everything the organism can do, and the environment includes the entire realm of potential activity for that organism" (Sanders, 1997, p. 108, in Windsor & de Bézenac, 2012, p. 4). On the other hand, affordances are (ii): "properties of the *intentional relationship* between a musical object and a musical subject" (Menin & Schiavio, 2012, p. 211, italics in original). There is a difference in scope between the positions represented in the two quotations. Since the present thesis concerns affordances of musical instruments, the interpretation of affordances advanced is more related to the latter quotation in that it is closely connected to the flow of musical practice and the musician's concrete, physical interaction with the instrument. However, as is obvious throughout the statements in both studies, the affordances described are reflections of contextual conditions with cultural, social, aesthetic and historical connections. While not taken as affordances in themselves, it is hard to see how any study of musical affordances would benefit from omitting these issues of the interaction.

Another key element in Gibson's original writings on affordances is: "an affordance is neither an objective property nor a subjective property; or it is both if you like. An affordance cuts across the dichotomy of subjective–objective" (1979/1986, p. 129). I return to Chimero (2003), again borrowing from his comments on Gibson's formulation: "This description makes affordances seem like impossible, ghostly entities" (p. 182). However, the empirical material analysed in the present studies points at the concrete nature of affordances. While being neither objective properties nor subjective, they do not appear to be either impossible or ghostly. Rather, the

affordances of instruments presented in this chapter are tangible assets that the interviewed musicians use, explore, develop and discuss in everyday life.

Another critical point is if and how a line should be drawn between perception and cognition with regards to affordances of musical instruments. In the literature, a dichotomy sometimes emerges between the direct, physical and sensorimotor based definition of affordances that I propose here, and the cognitive involvement of the agent. This, I think has to do with the recurring idea that practice, and expert practice in particular, is only bogged down by cognitive processes. This idea is put forth by Dreyfus (2006):

> [T]he expert usually does not need to calculate. If he has had enough experience and stays involved, he will find himself responding in a masterful way before he has time to think. Just as Aristotle, Heidegger and Merleau-Ponty saw, such mastery requires a rich perceptual repertoire – the ability to respond to subtle differences in the appearance of perhaps hundreds of thousands of situations – but it requires no conceptual repertoire at all. This holds true for such refined skills as chess, jazz improvisation, sports, martial arts, etc., but equally for everyday skills such as cooking dinner crossing a busy street, carrying on a conversation, or just getting around in the world. (p. 58)

It should be noted that Dreyfus puts forth this claim as part of a discourse where he advances the notion of direct perception and skilled intuitive, non-conceptual responding to situations. As such he seeks to upgrade practical know-how. However, as a side effect he also advances a rather normative idea of what constitutes expertise. It seems to me that there is an impulse to abstract, unify and explain the nature of expertise (as is true for creativity). Of course, both expertise and creativity are highly desirable notions of human existence and to find the recipe would be of great value for humanity. But I think that any such claim is underpinned by a simplification. Montero (2015) puts it well in the following:

> I am willing to concede that […] athletes enter a mindless zone of optimal performance. My claim is merely that it is generally true that optimal performance coincides with thoughtful performance and thus there may be occasional exceptions. However, once we come to accept that it is possible to think in the zone, some of such comments may call for different interpretations. (Montero, 2015, p. 137)

Along the same line, it is reasonable to ask if there is something fundamentally special about an expert more than he or she is very good at doing something? Is there a whole new level of existence? Such claim runs the risk of mystifying expertise just as creativity has been mystified throughout history. Instead, I argue there is a continuity from being a beginner to an expert. And just as there are numerous ways for a beginner and intermediate learner to cope with new and challenging situations, I think this is true

for an expert. Moreover, I think this is part of what makes an expert an expert, in the sense that he or she contributes with value to their field by doing something at the highest level, yet not necessarily conforming to a certain formula of how it is supposed to be done.

I think one of the misleading ideas is captured in its essence in the two first sentences in the quotation of Dreyfus (2006) above, where he implicitly states that "calculate" is the same as "thinking" and that these are opposed to be "responding in a masterful way". As I have argued here, the line between cognitive and perceptual engagement is blurred, even when it comes to concepts (from music theory, in this case).

Affordances, by its very definition, direct focus to this multitude of approaches, perspectives and understandings (perceptual, cognitive, and sensorimotor) that individual practitioners and educators in a certain field will take. A question to be empirically addressed in detail is how these states of perception/cognition/action unfold throughout various fields of practice, while doing justice to the complexity of its embedded nature.

Chapter 8

Further research and concluding remarks

In this final chapter, I put forth some areas of further research for which the present thesis might serve as a starting point. The first project concerns theoretical research and addresses some of the issues and potentials that come with continued research that combines ideas from ecological psychology and the enactive approach to cognition. The second area outlined here consists of empirical research focusing on the nature of attention and the role of emotion in musical practice. I end this chapter with some concluding remarks.

8.1 Enactive approach and ecological psychology in music – a theoretical project

In this dissertation, I have chosen to put Gibson's concept of affordances (Gibson, 1979/1986) in a framework of ideas found in the 4EC literature, primarily the enactive approach (O'Reagan & Noe, 2001; Noë, 2004; Di Paolo et al., 2017; Froese & González-Grandón, 2019). Affordances and ecological psychology are indeed not strange animals among the diverse approaches that constitute the 4EC fauna. Researchers have even stated that a fifth E should be added to the four E's, the E in Ecological (Rietveld et al., 2018). Other researchers have highlighted the divide between the enactive and the ecological approach (McGann et al., 2020; Heft, 2020). As can be seen in the research topic titled "Enaction and Ecological Psychology: Convergences and Complementarities", hosted by the journal *Frontiers in Psychology*, the relationship between the two approaches is at the forefront of theoretical development at the present moment. While this movement is continuously developing, it is interesting to see what this promising theoretical framework has to offer when applied to music education research. Moving forward in this process, however, directs focus to a number of theoretical questions that can form the basis for a theoretical

research project; a literature review which is undertaken from the perspective of music education research.

One way to approach such a task is to employ some threads that can be pulled from the discussion in Chapter 7. One such thread is the question of *temporality* in musical practice. Affordances are temporally situated, and I use the notion of sensorimotor relationship as a shorthand to acknowledge that the interaction with the instrument and the perception of affordances transcends the confines of an exact moment.

Another thread is the topic of *agency*. As mentioned previously, the concept of affordances, understood as perceived opportunities for action, can be said to incorporate dimensions of intentionality and agency. However, the more precise nature of these topics is more complex than such description can explain. For example, in any given moment multiple affordances may arise and continued research needs theoretical frameworks to also address the choices made.

Combining the enactive and ecological approaches provides a wealth of theoretical perspectives to explore topics such as temporality (Gastelum, 2020) and agency (Segundo-Ortin, 2020). Further topics to investigate in a theoretical research project can be generated from the empirical data of the present thesis. The starting point for this theoretical research project can be articulated in the following research question: *How can ideas from the enactive approach and ecological psychology be conceptualised as a framework, suited to target some crucial aspects of musical practice?*

8.2 Attention and emotion in musical practice – empirical research

Continuing the research on affordances of musical instruments leads into a number of areas, two of which are addressed here: the role of emotions and the nature of attention. Emotional engagement and attention can be understood as processes of perceptual metacognition (Brick & Liljenfors, 2013). Both are central to musical practice and remain underexplored by research. I first provide a brief sketch on the background of these topics and then present some possible methodological approaches.

8.2.1 Emotional engagement in musical practice

While the present thesis explores musical affordances as situated in sensorimotor relationships existing between musicians and their instruments, emotions are largely left aside. Emotions and music have a long history of being associated with each other, and it is clear that emotions form a motivating force for musical engagement, and a

response to musical experience. However, emotions also play another – yet not sufficiently understood – role as constitutive in musical practice.

Previous research, with ties to the theoretical framework applied in the present thesis include Brinck (2018), who explores an understanding of aesthetic experience that is underpinned by two complementary processes: the *perception-action loop* and the *motion-emotion loop*. While the former is at the centre of the present thesis, the latter is absent. Emotions, in Brinck's (2018) perspective are understood as embodied, taking into account the relation between kinaesthetic flow and affect. Van der Schyff and Schiavio (2017) reason along the same lines, when they argue for an approach based in dynamical systems theory, in order to study the role of emotion in relation to music that goes beyond the study of emotional response to music experience.

Another approach to understand the role of emotion in relation to music is taken by Krüger (2014). He combines affordances (Gibson, 1979/1986) with the idea of the extended mind (Clark & Chalmers, 1998). Krüger (2014) argues:

> When we engage in bouts of musicking, we potentially use music to become part of an integrated brain–body–music system – and within this extended system, musical affordances provide resources and feedback that loop back onto us and, in so doing, enhance the functional complexity of various motor, attentional, and regulative capacities responsible for generating and sustaining emotional experience. It is thus sensible to speak of the musically extended (emotional) mind. (Krüger, 2014, p. 4)

Through thinking of emotional engagement in terms of affordances, Krüger (2014) goes beyond the notion of emotions as a form of response to music. Instead, the possibility to actively regulate emotions through music is brought forth.

One way to conceptualise further research regarding the role of emotions in musical practice could be a combination of these two approaches. The explanatory base of musical affordances as a form of emotional extension can be widened by including the motion-emotion loop (Brinck, 2018) to the already established perception-action loop (Gibson, 1979/1986).

Emotional engagement could be studied as part of musical practice and may include self-organising processes (Schiavio & van der Schyff, 2018) internal to the musician or including the instrument, the music being played, the interaction with other musicians, and the performance context.

8.2.2 Attention and attunement in musical practice

As discussed in Chapter 7, attention is constrained and linked to the perceptual experience (Noë, 2012). Attention is possible to consciously direct but may also be "caught" due to events in the musical flow. Since musical practice is cross-modal,

multiple sensory modalities need to be considered. How attention is consciously directed and what events reache conscious awareness is dependent on a musician's perceptual habits. This can be understood metaphorically as a musicians' "gaze" (Brinck, 2007); his or her way of perceiving the music, and the possibilities for action within it, simultaneously.

The paradox is that this gaze is not always realised by the musician, since "the perceptual field is held together by habit" (Magri, 2019, p. 132). A musician's "gaze", understood as underpinned by perceptual habit is one way of addressing the evasive concept of "voice" or "style". This perspective is illustrated in 6.3.4, when Rikard describes himself as unaware of his accentuated way of articulation, which Oscar describes as a trademark of Rikard's playing style. The processes of attention must be approached as multi-layered and partly hidden from the subject. The modes of access outlined in Chapter 7 can serve as one point of departure for the design of further empirical studies.

8.2.3 Methods of studying attention and emotion in musical practice

Studying the role of emotion and the nature of attention in musical practice requires careful methodological considerations. Although attention was addressed in Chapter 7, it was discussed as a finding emerging through the analysis, rather than as a preliminary focus of research. So too, are statements (both verbal and non-verbal) relating to the role of emotion, still underexplored.

Due to the complex nature of these phenomena, it might be fruitful to approach them by means of multiple methods. For the musician-researcher, the first-person perspective is available. Although it is not unproblematic to conduct a study on oneself, the last decades have seen the emergence and maturity of the autoethnographic method. Even though the main body of autoethnographic research can be categorised as evocative (Ellis, 2004), focusing on the production of narrative accounts with literary ambitions, there are possibilities to combine autoethnographic methods with an analytic approach (Anderson, 2006). Autoethnographically grounded and phenomenologically inspired research, conducted by a theoretically informed musician-researcher, could provide insightful pieces of the complex puzzles, which emotion and attention offer.

It is also possible to take a more experimental and technologically advanced approach. Some aspects of metacognitive skills can be observed (Brick & Liljenfors, 2013). For example, eye-tracking technology could be helpful in exploring when and how musicians use their vision when playing. I believe this is a promising point of departure for interdisciplinary research projects involving music researchers and cognitive scientists, sharing a concern for ecological validity and an ambition to explore

these issues without reducing their complex and culturally situated nature. The outcome of research along the above suggestions will have the potential to inform music education practice on all levels.

8.3 Concluding remarks

Through this thesis, I hope I have been able to understand, analyse, and present the individual experiences of the interviewed and participating musicians. By doing so, I also hope I have been able to bring forth their experiences as part of a larger picture, through which important patterns – otherwise not possible to grasp – emerge. I believe this to be one of the main possibilities of Music Education research: to highlight and elevate experiences of the individual level to a space of collective and shared knowledge. This is one way that we, as musicians and educators, can transcend the confines of our own perspective and gain new inspiration, insights, and ideas. Accordingly, for me, the research process has been transformative. It has given me a significantly wider perspective on my instrument, but more so: what it is to learn how to play an instrument and to continue to develop as a musician. During the last phase of the work with this dissertation, I was interviewed by someone who commented about the perspective on learning presented: "So, I guess you could say that an instrumental teacher really is a couple therapist, supporting the relationship between musician and instrument to flourish?" Although stated as a joke, the comment is a perspective on the role of the teacher that is apt. Sometimes, the therapy may be about sensorimotor development or focus on repertoire, while at other times it is about navigating the challenges and possibilities that a life in music affords.

It seems to be a good idea to pay closer attention to the nurturing of skills needed to maintain a sustainable, life-long relationship with the musical instrument. While solid, technical skills are means for musical expression, perhaps just as much effort should be put in to cultivate a disposition of being present in the musical flow, attuned to the possibilities given in the very moment. While sensorimotor skills are at the core of the relationship discussed here, it is inseparable from processes of sense-making (Silverman, 2020), self-organization (Schiavio & van der Schyff, 2018), self-assessment, (van der Schyff, 2019), self-regulated learning (McPherson et al., 2017), and critical reflection (Georgii-Hemming et al., 2020). Considering the fact that all genres have their contextual constraints, as educators we need to ask ourselves how to make sure that such essential dimensions of music making are not sacrificed for the sake of assessment, grading or external expectations that may have little relevance to the learner themselves. A sustainable musician-instrument relationship has the potential to lead to a sustainable

musicianship in a sense that goes beyond entrepreneurial competence, or a musicianship that is simply aligned with the demands of the free market. Music making seen this way is deeply entangled with personhood and may lead to increased recognition and encouragement of a diversity of approaches, also in the confines of formal education.

These are threads of educational philosophy that I will carry with me in the complex, sometimes messy, process that is the reality of both a music teacher and a music education researcher.

References

Abeles, H. (2009). Are Musical Instrument Gender Associations Changing? *Journal of Research in Music Education*, *57*(2), 127-139.

Adams, F., Aizawa., K. (2010). *The bounds of cognition.* Wiley-Blackwell.

Aho, M. (2016). *The tangible in music: The tactile learning of a musical instrument.* Routledge.

Aizawa, K. (2018) Critical note: So, What Again is 4E Cognition. In A. Newen, L. De Bruin & S. Gallagher (Eds), *The Oxford Handbook of 4E Cognition* (1. ed., 117-126). Oxford University Press.

Ali-MacLachlan, I. (2019). *Computational analysis of style in Irish traditional flute playing.* [Doctoral dissertation, Birmingham City University].

Anderson, L. (2006). Analytic autoethnography. *Journal of Contemporary Ethnography. 35*(4), 373-395. https://doi.org/10.1177/0891241605280449

Augustine. (n.d.). *Confessions.* (Albert C. Outler, transl. & ed.). Editor. Retrieved from http://faculty.georgetown.edu/jod/augustine/conf.pdf

Backus, J. (1964). Effect of wall material on the steady-state tone quality of woodwind instruments. *The Journal of the Acoustical Society of America. 36*(10), 1881-1887. https://doi.org/10.1121/1.1919286

Backus, J. (1985). The effect of the player's vocal tract on woodwind instrument tone. *The Journal of the Acoustical Society of America 78*(17), 17-20. https://doi.org/10.1121/1.392556

Baily, J. (1985). Music structure and human movement. In: P. Howell, I. Cross & R. West (Eds.), *Musical Structure and Cognition* (pp. 237-258). Academic press

Baker, M. (2013). More thoughts on breathing. *Pan: The Journal of the British Flute Society. 32*(4), 50-52.

Balosso-Bardin, C., de la Cuadra, P., Vauthrin, C. & Fabre, B. (2017). An interdisciplinary study of the 1832 conical Boehm flute: history, geometry and acoustics. *Musique et Technique, 7*, 11-24.

Bania, M. (2008). *"Sweetenings" and "Babylonish Gabble". Flute Vibrato and Articulation of Fast Passages in the 18th and 19th centuries.* [Doctoral dissertation, University of Gothenburg].

BastaniNezhad, A. (2013). Automatic breathing and flute performance. *Pan: The Journal of the British Flute Society, 32*(3), 32-37.

Bate, P. (1969). *The Flute: A Study of its History, Development and Construction.* Ernest Benn Limited.

Bates, E. (2012). The Social Life of Musical Instruments. *Ethnomusicology, 56*(3), 363-395.

Benade, A. H. (1960). On the mathematical theory of woodwind finger holes. *The Journal of the Acoustical Society of America 32*(12), 1591-1608. https://doi.org/10.1121/1.1907968

Benade, A. H. (1986). Interactions between the player's windway and the air column of a musical instrument. *Cleveland Clinic Journal of Medicine, 53*(1), 27-32.

Bielawski, L. (1979). Instrumental music als trasnformation der menschlichen bewegug. Mensch – Instrument – Music. In: E. Emsheimer, (Ed.). *Studia instrumentorum musicae popularis* (6) (pp. 27-32).

Bigio, R. (2006/2011). Readings in the history of the flute: Monographs, essays, reviews, letters and advertisements from nineteenth-century London. Tony Bingham.

Bigio, R. (2011). *Rudall, Rose & Carte: The Art of Flute Making in Britain.* Tony Bingham.

Bloom, P. H. (1985). Observations on the advantageous use of the 'eight-keyed' flute. *The Flutist Quarterly 1985 11*(1), 18-25.

Boehm, T. (1871/1964). *The flute and flute playing: In acoustical, technical, and artistic aspects.* (D. C. Miller Trans.). Dover Publications

Brinck, I. (2007). Situated cognition, dynamic systems and art. *Janus Head, 9*(2), 407-431. http://www.janushead.org/9-2/Brinck.pdf

Brink, I. (2018). Empathy, engagement, entrainment: the interaction dynamics of aesthetic experience. *Cognitive Processes*, *19*, 201–213. https://doi.org/10.1007/s10339-017-0805-x

Brinck, I., Liljenfors, R. (2013). The Developmental Origin of Metacognition. *Infant and Child Development. 22*, 85–101.

Brinck, I., Reddy, V. (2019). Dialogue in the making: emotional engagement with materials. *Phenomenology and the Cognitive Sciences, 19*, 23-55. https://doi.org/10.1007/s11097-019-09629-2

Brinkmann, S., Jacobsen, M. H., & Kristiansen, S. (2015). Historical overview of qualitative research in the social sciences. In P. Leavy (Ed.), *The Oxford Handbook of Qualitative Research* (pp. 17-42). Oxford University Press.

Brown, R. (2002). *The Early Flute: A Practical Guide*. Cambridge University Press.

Brymer, E., Renshaw, I. (2010). An introduction to the constraints-led approach to learning in outdoor education. *Australian Journal of Outdoor Education, 14*(2), 33-41.

Buchman, N. (2013). Breathing in L'Après-midi. *Pan: The Journal of the British Flute Society, 32*(3), 28-31.

Buckle, M. (2008). *The horn and the alphorn.* Retrived 2013 March 23 from http://www.martinatnewton.com/page4.htm.

Chemero, A. (2003). An Outline of a Theory of Affordances. *Ecological Psychology, 15*(2), 181–195

Chen, J., Smith, J., & Wolfe, J. (2013). The effect of nearby timpani strokes on horn playing. *The Journal of the Acoustical Society of America, 135*(1), 472-478. https://doi.org/10.1121/1.4829533

Clark, A., Chalmers, D. (1998). The extended mind. *Analysis 58*(1). 7–19.

Clark, A. (2008). *Supersizing the Mind: Embodiment, Action, and Cognitive Extension.* Oxford Scholarship Online. https://doi.org/10.1093/acprof:oso/9780195333213.001.0001

Clarke, E. (2005). *Ways of listening: An ecological approach to the perception of musical meaning*. Oxford University Press.

Clarke, E. (2020). The Psychology of Creative Processes in Music. In: N. Donin (Ed.), *The Oxford Handbook of the Creative Process in Music.* Oxford University Press. https://doi.org/ 10.1093/oxfordhb/9780190636197.013.3

Cochrane, L. (2011). Air column. In *The Oxford Companion to Music.* http://www.oxfordreference.com.ludwig.lub.lu.se/view/10.1093/acref/9780199579037.001.0001/acref-9780199579037-e-132?rskey=qwKlvE&result=1

Coessens, K. & Östersjö, S. (2014). Habitus and the resistance of culture. In Crispin, D & Gilmore, B. (Eds.), *Artistic Experimentation in Music: An Anthology* (pp. 333-347). Leuven University Press.

Coltman, J. W. (1966). Resonance and sounding frequencies of the flute. *The Journal of the Acoustical Society of America 40*(1), 99-107. https://doi.org/10.1121/1.1910070

Coltman, J. W. (1971). Effect of material on flute tone quality. *The Journal of the Acoustical Society of America 49*(2b), 520-523. https://doi.org/10.1121/1.1912381

Coltman, J. W. (1979). Acoustical analysis of the Boehm flute. *The Journal of the Acoustical Society of America 65*(2), 499-506. https://doi.org/10.1121/1.382350

Cramer, K. M., Million, E., Perreault, L. A. (2002). Perceptions of Musicians: Gender Stereotypes and Social Role Theory. *Psychology of Music, 30*, 164-174.

Dawe, K. (2001). People, objects, meaning: Recent work on the study and collection of musical instruments. *The Galpin Society Journal,* (54), 219-232.

DeNora, T. (2000). *Music of everyday life.* Cambridge University Press.

DeSousa, J. (2017), *Music at Hand: Instruments, Bodies, and Cognition.* Oxford University Press. https://doi.org/10.1093/acprof:oso/9780190271114.001.0001

Di Paolo, E., Buhrmann, T., Barandian, X. (2017). *Sensorimotor Life: An enactive proposal.* Oxford Scholarship Online. https://doi.org/10.1093/acprof:oso/9780198786849.001.0001

Dogantan-Dack, M. (2015). The role of the instrument in performance as research: The piano as a research tool. In Dogantan-Dack, M. (Ed.). *Artistic practice as research in music: Theory, criticism, practice* (pp. 168-197). Routledge.

Dotov, D. G., Nie, L. & de Wit, M. M. (2012). Understanding affordances: history and contemporary development of Gibson's central concept. *AVANT, 3*(2), 28-39.

Dreyfus, H. (2006). Overcoming the Myth of the Mental: How Philosophers Can Profit from the Phenomenology of Everyday Expertise. *Proceedings and Addresses of the American Philosophical Association, 79*(2), 47-65.

Duggan, B., Cui, Z., & Cunningham, P. (2006). MATT - A system for modelling creativity in traditional Irish flute playing. *Conference paper: Third ECAI Workshop on Computational Creativity*, Riva del Garda, Italy. August 28-29, 2006.

Edlund, B. (2003). The phenomenology of fingering: Structure and ontology in Chopin's 'F-minor Etude' from 'Méthode des méthodes'. In I. Poniatowska (Ed.), *Chopin and his work in the context of culture* (pp. 88-105). Warsaw: Polska Akademia Chopinowska.

Ellis, C. (2004). The Ethnographic I: A Methodological Novel about Autoethnography. Walnut Creek: AltaMira press.

Eriksson, K. (2017). *Sensing Traditional Music Through Sweden's Zorn Badge: Precarious Musical Value and Ritual Orientation.* [Doctoral dissertation, Uppsala University].

Felix, S. & Dalmont, J. (2012). Effects of bending portions of the air column on the acoustical resonances of a wind instrument. *The Journal of the Acoustical Society of America,* 131, 4164-4172. https://doi.org/10.1121/1.3699267

Folkestad, G. (1996). *Computer based creative music making: young people's music in the digital age.* (Doctoral thesis). Gothenburg: University of Gothenburg.

Folkestad, G. (2004). A meta-analytic approach to qualitative studies in music education: A new model applied to creativity and composition. *Bulletin of the Council for Research in Music Education, 161/162,* 83–90.

Folkestad, G. (2006). Formal and informal learning situations or practices vs formal and informal ways of learning. *British Journal of Music Education, 23*(2), 135–145. https://doi.org/10.1017/S0265051706006887

Folkestad, G. (2012). Digital tools and discourse in music: The ecology of composition. *Oxford Scholarship Online.* https://doi.org/10.1093/acprof:oso/9780199568086.003.0012

Frederiksen, B. (1996). *Arnold Jacobs: Song and Wind.* WindSong Press Ltd.

Froese T., González-Grandón, X. (2020). How passive is passive listening? Toward a sensorimotor theory of auditory perception. *Phenomenology and the Cognitive Sciences volume 19*, 619–651. https://doi.org/10.1007/s11097-019-09641-6

Gastelum, M. (2020). Scale Matters: Temporality in the Perception of Affordances. *Frontiers in Psychology, 11*. https://doi.org/10.3389/fpsyg.2020.01188

Georgii-Hemming, E., Johansson, K., Moberg, N. (2020). Reflection in Higher Music Education: What, Why, Wherefore? *Music Education Research.* https://doi.org/10.1080/14613808.2020.1766006

Gibson, E. J. (1991). *An odyssey of learning and Perception*. MIT press.

Gibson, E. J. (2000). Perceptual learning in development: Some basic concepts, *Ecological Psychology,* 12(4), 295-302, https://doi.org/10.1207/S15326969ECO1204_04

Gibson, J. J. (1966). *The Senses Considered as Perceptual Systems.* Hughton Mifflin Company.

Gibson, J. J. (1979/1986). *The ecological approach to visual perception*. Lawrence Erlbaum Associates, Inc. Publishers.

Godøy R. I., Leman, M. (2010). *Musical Gestures: Sound, Movement, and Meaning.* Routledge.

Gomes Dos Santos Junior, O. (2017). *The Flute Inside-Out: Tracking Internal Movements in Flute Playing.* [Doctoral dissertation, University of Sydney].

Gonzalez-Grandón, X., Froese, T. (2018). Grounding 4E Cognition in Mexico: introduction to special issue on spotlight on 4E Cognition research in Mexico. *Adaptive Behaviour, 26*(5), 189–198.

Gorton, D., & Östersjö, S. (2016). Choose your own adventure music: On the emergence of voice in musical collaboration. *Contemporary Music Review, 35*(6), 579-598. https://doi.org/10.1080/07494467.2016.1282596

Goto, S. & Suzuki, T. (2004) The case study of application of advanced gesture interface and mapping interface – virtual musical instrument "Le SuperPolm" and gesture controller "BodySuit". *Proceedings of the 2004 Conference on New Interfaces for Musical Expression (NIME04)* (pp. 207-208), Hamamatsu, Japan, June 3-5, 2004.

Greene, T. (2012). The dreaded E... or beautiful E? *Flute, 31*(2), 41-43.

Hallam, S., Rogers, L., Creech, A. (2008). Gender differences in musical instrument choice. *International Journal of Music Education. 26*(1), 7-19.

Harrison, A. C., O'Neill, S. A. (2000). Children's Gender-Typed Preferences for Musical Instruments: An Intervention Study. *Psychology of Music, 28*, 81-97.

Heft, H. (2005). *Ecological Psychology in Context.* Routledge.

Heft, H. (2020). Ecological Psychology and Enaction Theory: Divergent Groundings. *Frontiers in Psychology*. 11:991. doi: 10.3389/fpsyg.2020.00991

Helgeson Torres, E. (2012). *Flute Articulation Pedagogy: The effect of language-specific consonant pronunciation on a flutist's articulation within the French and English Languages.* [Doctoral dissertation, The Ohio State University].

Heron, J. (1996). *Cooperative Inquiry: Research into the Human Condition. Sage* publications.

Heron, J., Reason, P. (2008). Extending epistemology within a cooperative inquiry. In P. Reason & H. Bradbury (Eds.) *The SAGE Handbook of Action Research.* https://dx.doi.org/10.4135/9781848607934

Houmann, A. (2010). *Musiklärares handlingsutrymme – möjligheter och begränsningar.* [Doctoral dissertation, Lund University].

Houmann, A. (2015). The key to the life-world – Unlocking research questions through expressive obmect. In: L. Bresler (Ed.), *Perspectives in Music and Music Education 10: Beyond Methods: Lessons from the arts to qualitative research* (pp. 125-140). Malmö Academy of Music, Lund University.

Hunt, A., Wanderley, M. M., & Paradis, M. (2003). The importance of parameter mapping in electronic instrument design, *Journal of New Music Research, 32*(4), 429-440.

Huron, D., and Berec, J. (2009). Characterizing idiomatic organization in music: A theory and case study of musical affordances. *Empirical Musicology Review (4)*3.

Hycner, R. H. (1985). Some guidelines for the phenomenological analysis of interview data. *Human studies, 8*, 279-303.

Jensenius, A. R., Wanderley, M. M., Godøy, R. I., & Leman, M. (2010). Musical Gestures: Concepts and Methods in Research. In R. I. Godøy & M. Leman (Eds.) *Musical Gestures: Sound, Movement, and Meaning*. Routledge.

Johansson, K. (2008). *Organ improvisation – activity, action and rhetorical practice.* (Doctoral thesis). Lund, Lund University.

Jorgensen, E. (1997). *In search for music education.* University of Illinois press.

Kara, Z. E., Bulut, S. (2015). Approaches and teaching methods in breathing and vibrato technique in flute education. *The Proceedings of 5th World Conference on Learning, Teaching and Educational Leadership,* (pp. 126-130), Praha, October 29-31.

Keefe, D. H. (1982). Theory of the single woodwind tone hole. *The Journal of the Acoustical Society of America, 72*(3), 676-689. https://doi.org/10.1121/1.388248

Kirsh, D., Maglio, P. (1994). On Distinguishing Epistemic from Pragmatic Action. *Cognitive Science, 18*, 513-549.

Kiverstein, J. (2018). Extended Cognition. In A. Newen, L. De Bruin & S. Gallagher (Eds), *The Oxford Handbook of 4E Cognition* (1. ed., pp. 3-15). Oxford University Press.

Krüger, J. (2014). Affordances and the musically extended mind. *Frontiers in Psychology*, 4. https://doi.org/10.3389/fpsyg.2013.01003

Kvale, S., Brinkmann, S. (2009). *Den kvalitativa forskningsintervjun.* Studentlitteratur.

Kvale, S., Brinkmann, S. (2009b). *InterViews. Learning the craft of qualitative research interviewing.* Sage Publications.

Kvifte, T. (2008a), What is a musical instrument? *STM, Svensk tidskrift för musikforskning 11*(1), 1-12.

Kvifte, T. (2008b). On the description of mapping structures. *Journal of New Music Research 2008, 37*(4), 353–362. https://doi.org/10.1080/09298210902731394

Laverty, S., M. (2003). Hermeneutic Phenomenology and Phenomenology: A Comparison of Historical and Methodological Considerations. *International Journal of Qualitative Methods, 2*(3). 21-35.

Ljungar-Chapelon, A. (1990). *Konsonanter, vokaler och deras inverkan på flöjtspelet.*

Ljungar-Chapelon, A. (2002). Basse de Traversière – ett konstnärligt utvecklingsarbete. In: J. Johansson (Ed.). *Presentation of granskning av några KU-projekt vid sveriges musikhögskolor*. Malmö: Malmö Academy of Music.

Ljungar-Chapelon, A. (2008). *Le Respect de la tradition; Om den franska flöjtkonsten: dess lärande, hantverk och estetik i ett hermeneutiskt perspektiv.* [Doctoral dissertation, Lund University].

Lochridge, K. (2004). *"Where can I get a flute like yours?": Art and material culture in the Irish flute tradition.* [Master thesis, Indiana University].

Love, S. C. (2017). An ecological description of jazz improvisation. *Psychomusicology: music, mind, and brain, 27*(1), 31–44.

Magri, S. (2019). Situating Attention and Habit in the Landscape of Affordances. *Rivista Internazionale Di Filosofia e Psicologia. 10*(2), 120-136, https://doi.org/10.4453/rifp.2019.0011

Malafouris, L. (2018). Bringing Things to Mind: 4Es and Material Engagement. In A. Newen, L. De Bruin & S. Gallagher (Eds), *The Oxford Handbook of 4E Cognition* (1. ed., p. 3-15). Oxford University Press.

McGann, M., Di Paolo, E. A., Heras-Escribano, M., Chemero, A. (2020). Editorial: Enaction and Ecological Psychology: Convergences and Complementarities. *Frontiers in Psychology*, https://doi.org/10.3389/fpsyg.2020.617898

McPherson, G. E., Miksza, P., Evans, P. (2017). Self-Regulated Learning in Music Practice and Performance. In P. A. Alexander, D. H. Schunk & J. A. Greene (Eds), *Handbook of Self-Regulation of Learning and Performance.* Routledge Handbooks Online.

Menin, D. & Schiavio, A. (2012). Rethinking musical affordances. *AVANT 3*(2), 202-215.

Michaels, C. F., & Carello, C. (1981). *Direct perception.* Prentice-Hall, Inc.

Montero, B.,G. (2015). Thinking in the Zone: The Expert Mind in Action. *The Southern Journal of Philosophy, 53.* 126-140.

Mooney, J. (2010). Frameworks and affordances: Understanding the tools of music-making. *Journal of Music, Technology and Education, 3*(2/3), 141–154.

Nederveen, C. (1998). Influence of a toroidal bend on wind instrument tuning. *The Journal of the Acoustical Society of America, 104*(3), 1616-1626. https://doi.org/10.1121/1.424374

Newev, A., De Bruin, L., & Gallagher, S. (2018). 4E Cognition: Historical Roots, Key Concepts, and Central Issues. In A. Newen, L. De Bruin & S. Gallagher (Eds), *The Oxford Handbook of 4E Cognition* (1. ed., p. 3-15). Oxford University Press.

Nicholson, C. (1836). A school for the flute. William, Hall & Son.

Nijs, L., Lesaffre, M., & Leman, M. (2013). The musical instrument as a natural extension of the musician. In M. Castellengo, H. Genevois, & J.-M. Bardez (Eds.), *Music and its instruments* (pp. 467–484). Editions Delatour France.

Nilsson, P-A. (2011). *A Field of Possibilities: Designing and Playing Digital Musical Instruments*. [Doctoral dissertation, University of Gothenburg].

Noë, A. (2004). *Action in Perception.* MIT press.

Noë, A. (2007). Understanding Action in Perception: Replies to Hickerson and Keijzer. *Philosophical Psychology, 20*(4), 531–538.

Noë, A. (2012). *Varieties of Presence.* Harvard University Press.

Oates, B. J. (2002). Co-operative Inquiry: Reflections on Practice. *Electronic Journal of Business Research Methods*, 1(1), 27-37.

Ogilvie, R. & Carruthers, P. (2016). Firestone & Scholl conflate two distinct issues. *Behavioral and Brain Sciences, 39.* https://doi.org/10.1017/S0140525X15002459, e255

O'Reagan, K. & Noë, A. (2001). A sensorimotor account of vision and visual consciousness. *Behavioral and brain sciences 24*, 939-1031.

O'Riordan, N. (2015a). An organic approach to breathing: Part 1. *Pan: The Journal of the British Flute Society, 34*(2), 48-49.

O'Riordan, N. (2015b). An organic approach to breathing: Part 2. *Pan: The Journal of the British Flute Society, 34*(3), 44-46.

O'Riordan, N. (2016). An organic approach to breathing: Part 4. *Pan: The Journal of the British Flute Society, 35*(1), 48-50.

Otte, F. W., Davids, K., Millar, S., Klatt, S. (2020). When and How to Provide Feedback and Instructions to Athletes?—How Sport Psychology and Pedagogy Insights Can Improve Coaching Interventions to Enhance Self-Regulation in Training. *Frontiers in Psychology. 4*. https://doi.org/10.3389/fpsyg.2020.01444

Pace, S. (2012). Writing the self into research: Using grounded theory analytic strategies in autoethnography. *TEXT Special Issue: Creativity: Cognitive, Social and Cultural Perspectives.* 1-15.

Powell, A. (2002). *The Flute.* New Haven: Yale University Press.

Qureshi, R. B. (1997). The Indian Sarangi: Sound of Affect, Site of Contest. *Yearbook for Traditional Music, 29*, 1-38.

Racy, A. J. (1994). A dialectical perspective on musical instruments: The East-Mediterranean Mijwiz. *Ethnomusicology, 38*(1), 37-57.

Reason, P. (2002). The Practice of Cooperative Inquiry. *Systemic Practice and Action Research, 15*(3), 169-176.

Reason, P., Bradbury, H. (2011) Introduction. In P. Reason & H. Bradbury (Eds.) *The SAGE Handbook of Action Research*. DOI: http://dx.doi.org/10.4135/9781848607934

Rice, J. A. (1990). The blind Dülon and his magic flute. *Music and letters*, *71*(1), 25-51.

Rietveld, E., Denys, D., van Westen, M. (2018). Cological-Enactive Cognition as Engaging with a Field of Relevant Affordances: The Skilled Intentionality Framework. In A. Newen, L. De Bruin & S. Gallagher (Eds), *The Oxford Handbook of 4E Cognition* (1. ed., p. 3-15). Oxford University Press.

Ronström, O. (1989). Making use of history: The revival of the bagpipe in Sweden in the 1980s. *Yearbook for Traditional Music, 21*, 95-108.

Ryan, K., Schiavio, A. (2019). Extended musicking, extended mind, extended agency. Notes on the third wave. *New Ideas in Psychology, 55*, 8-17.

Sanders, J. T. (1993). Merleau-Ponty, Gibson, and the materiality of meaning. *Man and World, 26*, 287-302.

Scavone, G, P., Lefebvre, A. & da Silva, A., R. (2008). Measurement of vocal-tract influence during saxophone performance. *The Journal of the Acoustical Society of America, 123*(4), 2391-2400. https://doi.org/10.1121/1.2839900

Schiavio, A., van der Schyff. D. (2018). 4E Music Pedagogy and the Principles of Self-Organization. *Behavioral sciences 8*(72). https://doi.org/10.3390/bs8080072

Schippers, H. (2006). 'As if a little bird is sitting on your finger...': metaphor as a key instrument in training professional musicians. *International Journal of Music Education 24*. 209-217. https://doi.org/10.1177/0255761406069640

Schippers, H. (2010). *Facing the music: Shaping Music Education from a Global Perspective.* Oxford University Press.

Schön, D. (1983). *The Reflective Practitioner: How professionals think in action.* Temple Smith.

Segundo-Ortin M (2020) Agency from a Radical Embodied Standpoint: An Ecological-Enactive Proposal. *Frontiers in Psychology*. 11:1319. https://doi.org/10.3389/fpsyg.2020.01319

Shapiro, L. (2010). *Embodied Cognition*. Routledge.

Shaw, R., McIntyre, M. (1974). Algoristic foundations to cognitive psychology. In W. W. Weimer & D. S. Palermo (Eds.), *Cognition and the symbolic processes* (305-362). Lawrence Erlbaum Associates.

Shaw, R. (2001). Processes, Acts, and Experiences: Three Stances on the Problem of Intentionality. *Ecological Psychology, 13*(4), 275–314.

Shaw, M. (2013). *The "Nicholsonian effect": Aspects of "tone" in early nineteenth-century flute performance practice in England, with particular reference to the work of Charles Nicholson (1795-1837).* [Doctoral dissertation, University of Birmingham].

Silverman, D. (Ed) (2014). *Qualitative Research* (4th edition). SAGE Publications Ltd

Silverman M (2020) Sense-Making, Meaningfulness, and Instrumental Music Education. *Frontiers in Psychology 11:837*. https://doi.org/10.3389/fpsyg.2020.00837

Small, C. (1998). *Musicking: the Meanings of Performing and Listening*, Univ. Press of New England, Hanover, NH.

Solum, J. (1992/2002). *The Early Flute.* Oxford: Oxford university press.

Spissky, P. (2017). *Ups and Downs: Violin bowing as gesture.* [Doctoral dissertation, Lund University].

Sudnow, D. (1978). *Ways of the Hand. The organization of Improvised Conduct.* Routledge & Kegan Paul.

Sæther, E. (2015). Exploring musical research sensibilities. In: Beyond methods. Lessons from the arts to qualitative research. In: L. Bresler (Ed.), Perspectives in Music and Music Education 10: *Beyond Methods: Lessons from the arts to qualitative research*. (pp. 89-104). Malmö: Malmö Academy of Music, Lund University.

The Session. (March 2018). *The Session.* www.thesession.org.

Tullberg, M. (2017). Teaching the wooden transverse flute in Swedish traditional music in the context of higher music education. *Puls – Journal for ethnomusicology and ethnochoreology, 2,* 26-44.

Tullberg, M. (2018a). *Timber and Timbre: Affordances of the simple-system flute.* [Licentiate thesis, Lund University].

Tullberg, M. (2018b). Meanings of tradition in Swedish folk music education. In: B. W, Leung (Ed.), *Traditional musics in the modern world: Identity, transmission, evolution, and challenges.* New York: Springer.

Tulou, J. L. (1835/1995). *A method for the flute.* (J. D. Dockendorff Boland & M. F. Cannon, Trans.). Bloomington: Indiana University Press.

van der Schyff, D. (2019). Improvisation, Enaction, and Self-Assessment. In D. Elliott, M. Silverman & G. E. McPherson (Eds), *The Oxford Handbook of Philosophical and Qualitative Assessment in Music Education.* Oxford University Press.

van der Schyff, D., Schiavio, A., Walton, A.,Velardo, V., & Chemero, A. (2018). Musical creativity and the embodied mind: Exploring the possibilities of 4E cognition and dynamical systems theory. *Music & Science. 1,* 1–18. https://doi.org/10.1177/2059204318792319

Valette, R. M. (2010). The French school: What is so French about it? *Flutist Quarterly, 36*(1), 22-35.

von Hornbostel, E. M. (1938). The Unity of the Senses. In D. Ellis Willis (Ed.), *A source book of Gestalt psychology.* Kegan Paul, Trench, Trubner & Company.

von Hornbostel, E. M. & Sachs, C. (1914/1961). Classification of musical instruments: Translated from the original German by Anthony Baines and Klaus P. Wachsmann . *The Galpin Society Journal, 14*, 3-29.

von Wachenfeldt, T., Brändström, S., Liljas, J. M. (2013). Folkmusikundervisning på fiol och gitarr och dess bakgrund i den tidiga svenska spelmansrörelsen och andra folkmusikaliska traditioner. In S-E. Holgersen, S. Graabræk Nielsen, E. Georgii-Hemming, E. & L. Väkevä (Eds.) *Nordic Research in Music Education. Yearbook Vol. 14*, (pp. 73-89). Norges Musikkhøgskole.

Walton, A. E., Richardson, M, J., Langland-Hassan, P., Chemero, A. (2015). Improvisation and the self-organization of multiple musical bodies. *Frontiers in Psychology, 6:313,* doi: 10.3389/fpsyg.2015.00313

Warren, Jr. W. H. (1990). The perception-action coupling. In H. Bloch & B. I. Bertenthal (Eds.), *Sensory-Motor Organizations and Development in Infancy and Early Childhood*, 23-37

Waters, S. (2011). Charles Nicholson and the London flute market in the early nineteenth century. *The Galpin Society Journal, 64*, 67-78, 184-187.

Wettermark, E. (2016). "Gutting the listener" – the Vietnamese shawn and emotional expression in tuong opera. *Conference paper presented at New Currents in Ethnomusicology.* 14-17 April 2016, University of Kent, School of Music and Fine Art,

Kent, UK. Retrieved 2018 March 6 from https://www.academia.edu/36089686/Gutting_the_listener_-_the_Vietnamese_shawm_and_emotional_expression_in_tuong_opera

Windsor, W. L. (2016). Gestures in music-making: Action, information and perception. In: Gritten, A. & King, E. (Eds.), *New Perspectives on Music and Gesture*, (pp. 45-66). Routledge.

Windsor, W. L. & de Bézenac, C. (2012). Music and affordances. *Musicae Scientiae 1*(19) 1-19. https://doi.org/10.1177/1029864911435734

Zervoudakes, J., Tanur, J. M. (1994). Gender and Musical Instruments: Winds of Change? *Journal of Research in Music Education, 42*(1), 58-67.

Östersjö, S. (2008). *SHUT UP 'N' PLAY!: Negotiating the musical work.* [Doctoral dissertation, Lund University]

Östersjö, S. (2013). The resistance of the Turkish makam and the habitus of a performer. Reflections on a collaborative CD-Project with Erdem Helvacioglu. *Contemporary Music Review, 32*(2), 197–209.

Östersjö, S. (2020). *Listening to the Other.* Leuven University Press.

Appendices

Appendix 1: Interviews of Study A

1. Andreas Ralsgård , 23 Februari 2017
   Smörhålam, Sweden
2. Lisa Beznosiuk, 3 March 2017
   London, Great Britain
3. Anna Roussel, 24 March 2017
   Belz, France
4. Stéphane Morvan, 25 March 2017
   Elliant, France
5. Jean Michel Veillon, 26 March 2017
   Kerhuel, France
6. Conal O'Grada, 2 October 2017
   Ballyvourney, Ireland

Appendix 2: Sessions of cooperative inquiry of Study B

Session #1 1 March 2019

Markus Tullbergs studio in Lund, Sweden. Participants present: Viktor, Anton, Rikard, Bill, Oscar, and Teo

Session #2 8 March 2019

Humanities lab, Lund University.Participants present: Viktor, Rikard, Bill, Oscar, and Teo

Session #3 15 March 2019

Humanities lab, Lund University. Participants present: Viktor, Anton, Bill, Oscar, and Teo

Session #4 22 March 2019

Humanities lab, Lund University. Participants present: Viktor, Anton, Rikard, Bill, Oscar, and Teo

Session #5 29 March 2019

Humanities lab, Lund University. Participants present: Viktor, Anton, Bill, Oscar, and Teo

Session #6 5 April 2019

Humanities lab, Lund University. Participants present: Viktor, Rikard, Bill, Oscar, and Teo

Session #7 26 April 2019

Humanities lab, Lund University. Participants present: Viktor, Anton, Rikard, Bill, Oscar, and Teo

Session #8 3 May 2019

Humanities lab, Lund University. Participants present: Viktor, Anton, Rikard, Bill, Oscar, and Teo

Session #9 10 May 2019

Humanities lab, Lund University. Participants present: Anton, Rikard, Bill, Oscar, and Teo

Session #10 24 May 2019

Humanities lab, Lund University. Participants present: Viktor, Anton, Rikard, Bill, Oscar, and Teo

Appendix 3: Ensembles mentioned in the thesis

Andreas Ralsgård

Ralsgård & Tullberg (quartet)

Swedish folk music flute duo, also recording/performing as a quartet

Andreas Ralsgård – simple-system flute

Markus Tullberg – simple-system flute

Niklas Roswall – nyckelharpa

Alexandra Nilsson – cello

Web: www.ralsgardtullberg.com

Jean Michel Veillon

Kornog

Breton traditional ensemble, originally formed 1980.

Jean Michel Veillon – simple-system flute

Jamie McMenemy – cittern

Soïg Siberil/Gilles Le Bigot/Nicolas Quemener – guitar

Christian Lemaître – violin

Web: http://compassrecords.com/artist/kornog/

Galorn

Breton ensemble, preforming mainly own compositions inspired by traditional music, active late 1970s and early 1980s.

Jean Michel Veillon – flutes, whistles

Gilles Le Biot – guitar

Xavier Harivel – percussion

Bruno Le Masson – bass guitar

Gilles Floury – violin

Veillon's solo and duo recordings

1993: E Koad Nizan – 1993

1995: Pont Gwenn ha Pont Stang (Duo Veillon-Riou)

1999: Er Pasker

2000: Beo ! Live in Belfast (Duo Veillon-Riou)

2017: Deus an Aod d'ar Menez (Duo Veillon-Riou)

Anna Roussel

Nos Honks

Swedish folk music trio

Jonas Knutsson – saxophones

Anna Roussel – simple-system flute

Markus Tullberg – simple-system flute

Web: www.noshonks.com

Skaran

Swedish traditional trio

Anna Roussel – simple-system flute

Emilia Amper – Nyckelharpa

Jonas Bleckman – cello

Conal O'Grada

Raw Bar Collctive

Irish traditional ensemble

Conal O'Grada – simple-system flute

Benny McCarthy – accordeon

Nell Ní Chróinín – vocals

Colm Murphy – bodhrán

Dave Sheridan – violin

O'Grada's solo recordings

The Top of Coom – 1990

Cnoc Buí – 2008

Web: www.conalograda.com

Lisa Beznosiuk

Orchestra of the Age of Enlightenment

Lisa Beznosiuk is one of the founding members of this period instrument orchestra. The orchestra has recorded extensively since it was formed in 1978.

Web: https://oae.co.uk

The English Concert

An orchestra specializing in repertoire of the Baroque and Classical period, in which Beznosiuk has been a member since the 1980s.

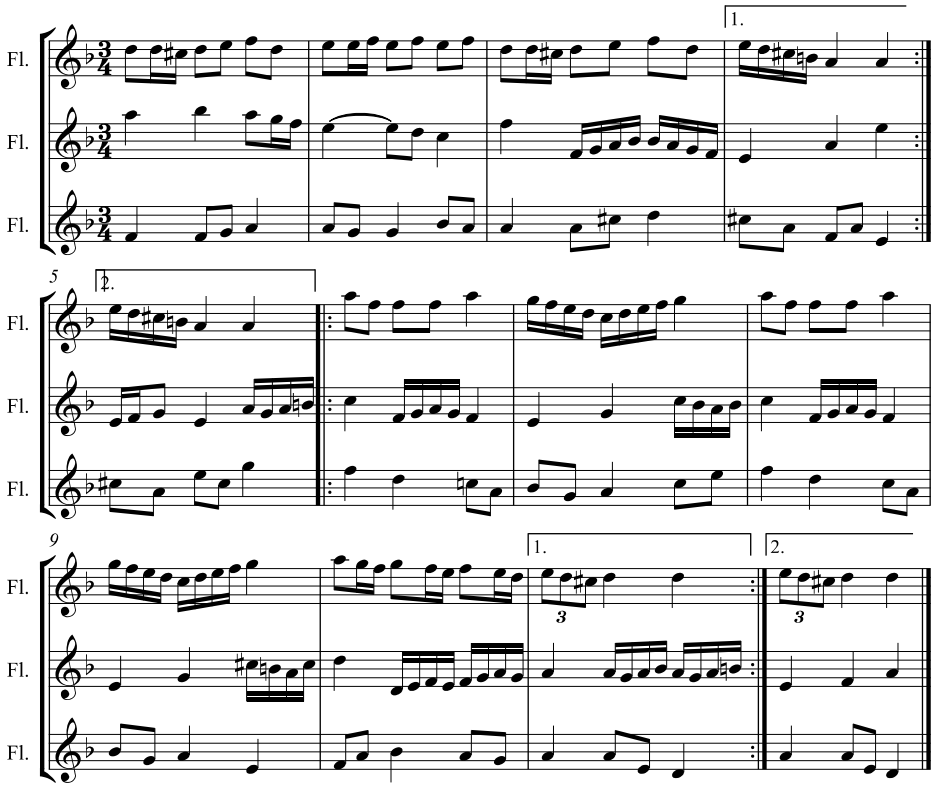
Web: https://englishconcert.co.uk

Beyond her engagement in various orchestras and ensembles, has Beznosiuk done an extensive number of solo recordings through her career, perhaps most notably Handel's and Bach's complete flute sonatas.

Appendix 4: Tunes from Study B

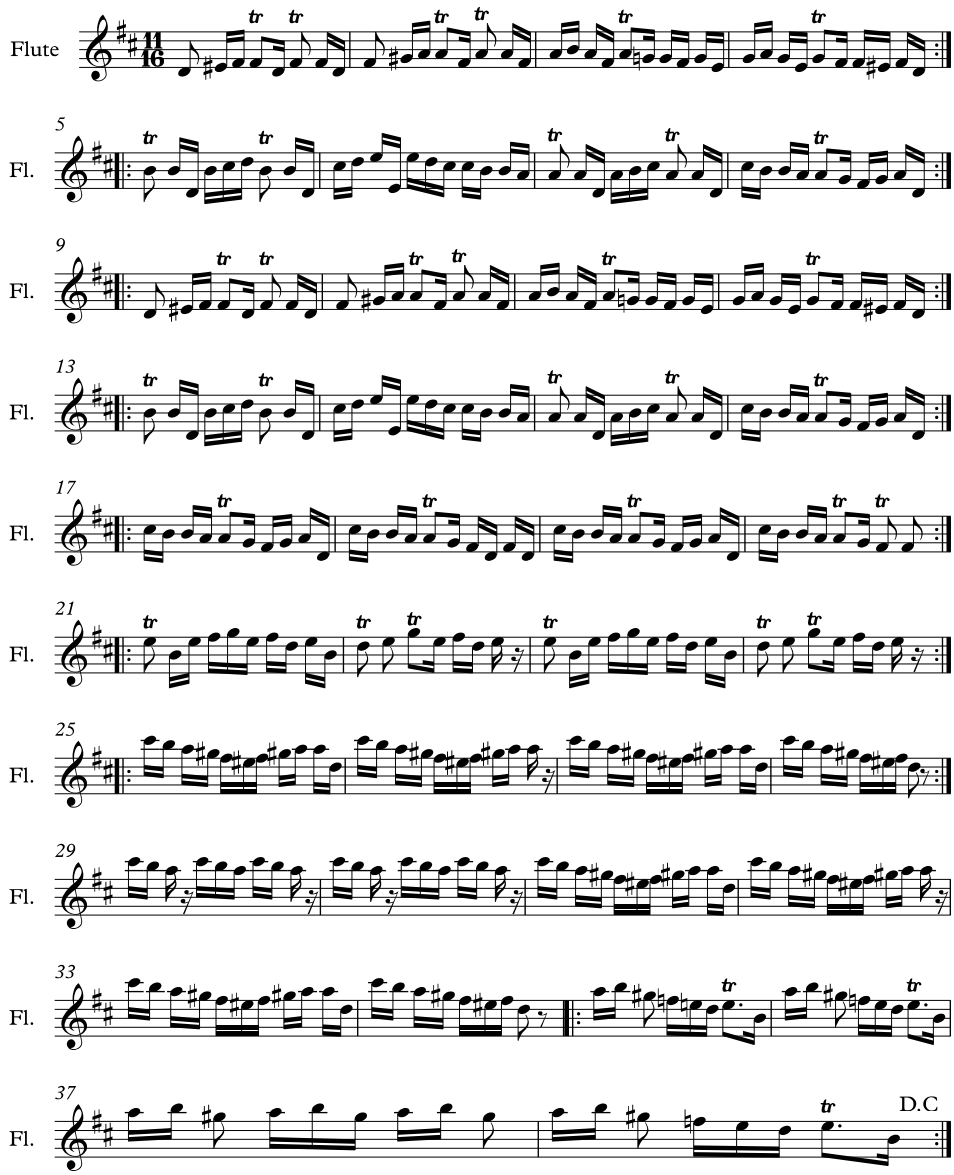
Tune A – Traditional Swedish tune after Johan Jacob Bruun

Harmonies composed by "Rikard" in Study B



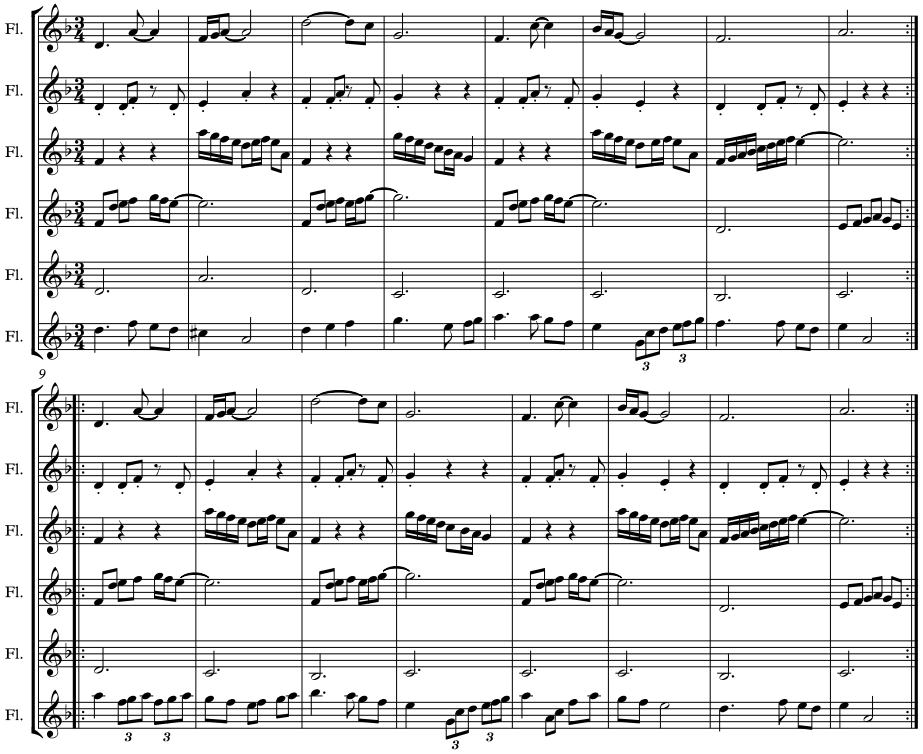
Tune B – Krivo Horo,

as taught by “Viktor” and played by the participants in Study B



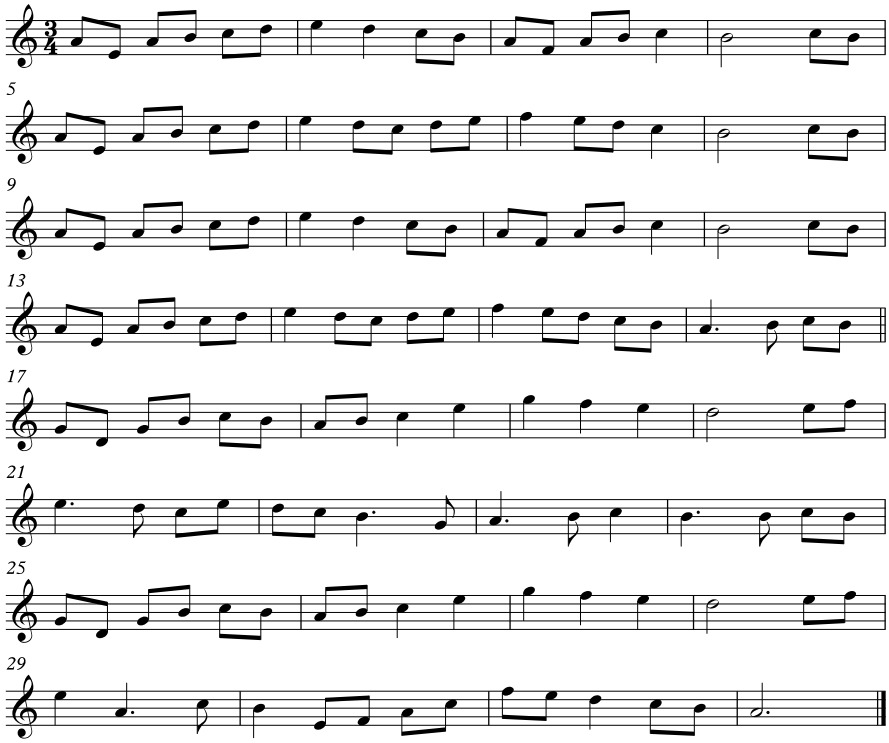
Tune C – Composition based on the harmonic progression of La Folia

Composed and taught by Markus Tullberg as part if the exploration of musical listening in Study B



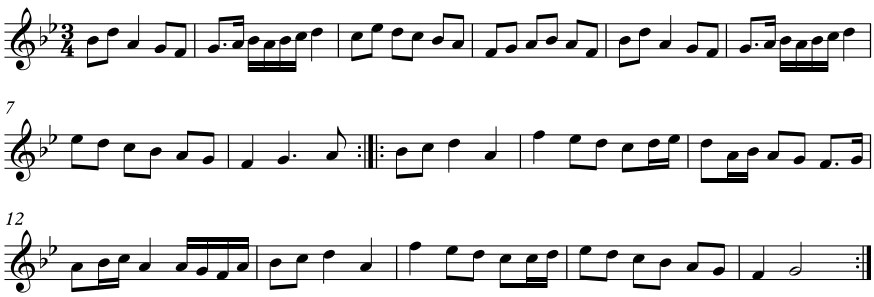
Tune D – Lab-tune

Composed by Markus Tullberg as part of the Lab-tune experiments in Study B



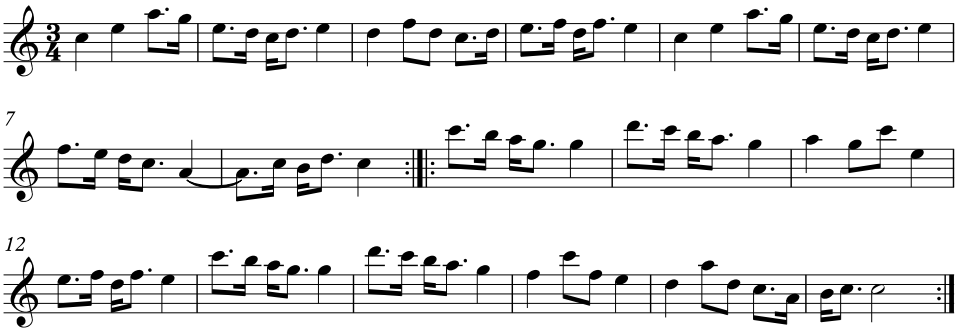
Tune E – Lab-tune

Composed by Markus Tullberg as part of the Lab-tune experiments in Study B



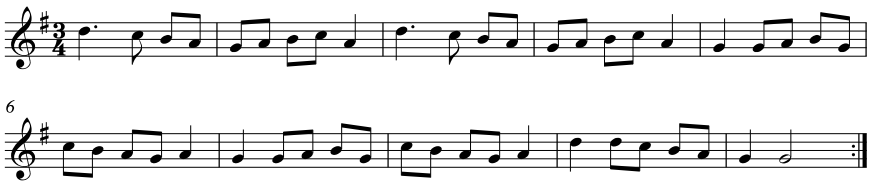
Tune F – Lab-tune

Composed by “Rikard” as part of the Lab-tune experiments in Study B



Tune G – Träskodansen, traditional tune from Skåne, Sweden

Presented by Anton and used as a exercise of transposition in Study B



Appendix 5: List of figures and photos

STUDIES IN MUSIC AND MUSIC EDUCATION

23. Tullberg, Markus (2021). Wind and Wood – Affordances of Musical Instruments: The Example of the Simple-System Flute. Doktorsavhandling.
22. Jonasson, Camilla (2020). ”Jag har också rätt att ljudsätta världen” – Om tjejers och transpersoners tillblivelser som musikskapare i musikteknologiska lärmiljöer. Doktorsavhandling.
21. Zadig, Sverker (2017). Ledarna i kören – vokala samarbeten mellan körsångare. Doktorsavhandling.
20. Bygdéus, Pia (2015). Medierande verktyg i körledarpraktik – en studie av arbetssätt och handledning i körledning med barn och unga. Doktorsavhandling.
19. Asp, Karl (2015). Mellan klassrum och scen – en studie av ensembleundervisning på gymnasieskolans estetiska program. Doktorsavhandling.
18. Lonnert, Lia (2015). Surrounded by Sound. Experienced Orchestral Harpists' Professional Knowledge and Learning. Doktorsavhandling.
17. Bjerstedt, Sven (2014). Storytelling in Jazz Improvisation. Implications of a Rich Intermedial Metaphor. Doktorsavhandling.
16. Houmann, Anna (2010). Musiklärares handlingsutrymme – möjligheter och begränsningar. Doktorsavhandling.
15. Hofvander Trulsson, Ylva (2010). Musikaliskt lärande som social rekonstruktion. Musikens och ursprungets betydelse för föräldrar med utländsk bakgrund. Doktorsavhandling.
14. Holmberg, Kristina (2010). Musik- och kulturskolan i senmoderniteten: reservat eller marknad? Doktorsavhandling.
13. Fridell, Ingemar (2009). Talk on Musical Interpretation. Visual Tools for Perceived Dynamics and Points of Gravity. Doktorsavhandling.
12. Ljungar-Chapelon, Anders (2008). Le respect de la tradition. Om den franska flöjtkonsten: dess lärande, hantverk och estetik i ett hermeneutiskt perspektiv. Doktorsavhandling.
11. Johansson, Karin (2008). Organ Improvisation – Activity, Action and Rhetorical Practice. Doktorsavhandling.
10. Söderman, Johan (2007). Rap(p) i käften. Hiphopmusikers konstnärliga och pedagogiska strategier. Doktorsavhandling.
9. Folkestad, Göran (2007). A Decade of Research in Music Education.
8. Törnquist, Els-Mari (2006). Att iscensätta lärande. Lärares reflektioner över det pedagogiska arbetet i en konstnärlig kontext. Doktorsavhandling.
7. Ericsson, Claes (2006). Terapi, upplysning, kamp och likhet till varje pris. Undervisningsideologier och diskurser hos lärare och lärarstudenter i musik.

6. Sæther, Eva (2003). The Oral University. Attitudes to Music Teaching and Learning in the Gambia. Doktorsavhandling.

5. Nilsson, Bo (2002). Jag kan göra hundra låtar. Barns musikskapande med digitala verktyg. Doktorsavhandling.

4. Ericsson, Claes (2002). Från guidad visning till shopping och förströdd tillägnelse. Moderniserade villkor för ungdomars musikaliska lärande. Doktorsavhandling.

3. Karlsson, Maria (2002). Musikelever på gymnasiets estetiska program. En studie av elevernas bakgrund, studiegång och motivation. Doktorsavhandling.

2. Hultberg, Cecilia (2000). The Printed Score as a Mediator of Musical Meaning. Approaches to Music Notation in Western Tonal Tradition. Doktorsavhandling.

1. Heiling, Gunnar (2000). Spela snyggt och ha kul. Gemenskap, sammanhållning och musikalisk utveckling i en amatörorkester. Doktorsavhandling.

Wind and Wood

This is a thesis about the relationship and interaction between musicians and their instruments. Taking the simple-system flute as a focal point and case study, this is a story about fingers, materials, and sounds; tradition, progression, and aesthetics; performances, rehearsals, and practice sessions. In short, this thesis aims to convey an insight into this fascinating and complex relationship. While focusing on the direct interaction between musician and instrument, this relationship is situated in – and inseparable from – cultural and historical contexts and grounded in the everyday activities of the musicians. As a thesis written from the perspective of Music Education, it implicitly and explicitly focuses on how this relationship can be developed, deepened and enriched.

Photo: Gabriel Judet-Weinshel

Markus Tullberg is a teacher and performing musician. He has pioneered the revival of the simple-system flute in Swedish traditional music, primarily through his work with Ralsgård & Tullberg duo/quartet. During the last decade, he has worked as flute teacher at Malmö Academy of Music and Danish National Academy of Music. Inspiration for the research project of this thesis grew out of curiosity and questions spurred by these experiences.

Printed by Media-Tryck, Lund 2021 NORDIC SWAN ECOLABEL 3041 0903

LUND UNIVERSITY

Malmö Academy of Music

Lund University, Faculty of Fine and Performing Arts
Studies in Music and Music Education
ISBN 978-91-88409-26-3
ISSN 1404-6539