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‘Screaming yellow’:

An exploratory study of how speakers gesture
and speak about colour and colour theory

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Abstract

The abstract subject of colour is a widely studied subject in spoken languages. However, very little is known about colour in relation to gesture. A substantial part of the literature on gesture and abstract content is concerned with referential gestures and especially metaphorical mapping. Less is known about gestures performed in relation to abstract content that is not metaphoric and even less about abstract content and pragmatic gestures. This paper investigates how people with expert and novice knowledge of colour theory speak and gesture about colour using Danish as the example language. The functions and the distributional patterns of the gestures that occur with talk about colour as well as the semantic relationship between speech and gesture is also examined. A structured interview was used as the elicitation procedure and the gestures were coded as either referential or pragmatic in function. The results showed 1) that during colour talk, almost half of the speech consisted of colour naming terms, and most of these were instances of the basic colour terms; 2) The colour novices predominantly produced gestures with a pragmatic function, whereas the experts did not differ much in their amount of referential and pragmatic gestures; 3) There was a semantic overlap between the referential gestures and co-occurring speech for the concrete content, but for the more abstract content, metaphorical mappings were often used to structure the subject, which were then expressed in the co-occurring referential gestures; 4) For the colour novices, the remaining pragmatic gestures often occurred in relation to disfluency of speech commenting on the breakdown of speech, whereas the experts were more prone to keep the hand in a hold during disfluencies. The findings suggest that gesture should also be investigated in relation to abstract subjects and that familiarity with a subject might have an influence on gesture production.

Keywords: *gesture, colour, abstract content, metaphor, familiarity*

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1. Introduction

1.1 Aim and motivation

A substantial part of the literature on gesture is focused on gestures performed in relation to concrete descriptions of things, which means that less is known about gestures for the abstract. An exception is the research on metaphor in speech and gesture where gestures have been investigated in relation to abstract concepts in speech such as time (Núñez & Sweetser, 2006), grammar (Mittelberg, 2008), and mathematical functions (Herbert, 2018). These studies have primarily been concerned with gestures with referential functions, that is, gestures that represent content of speech, and less with gestures with other functions such as pragmatic functions (Cienki & Müller, 2014).

In the current study, I am also interested in the gestures performed in relation to an abstract subject in speech, but not in relation to metaphor. The aim of this study is to investigate how speakers with novice and expertise knowledge of colour and colour theory speak and gesture about this topic, using Danish as the example language. The abstract notion of colour has been substantially investigated in linguistics in spoken language (Berlin & Kay, 1969/1991; Hardin & Maffi, 1997; MacLaury, Paramei, & Dedrick, 2007; Plümacher & Holz, 2007), less in signed languages (Nyst, 2007; Woodward, 1989), and never, to my knowledge, in relation to co-speech gesture¹. The reason for investigating language and gesture in relation to colour, apart from the novelty, is that colour is an abstract subject without being metaphorical. Therefore, it is not clear how speakers gesture in relation to speech about colour and colour theory.

In order to explore this, I will investigate the gesture functions that go along with colour talk, and then look at the semantic relationship between speech and the established gesture functions. In order to assess the effect of content knowledge on speech and gesture, I will compare the gesture and speech production of participants with expert and novice expertise in colour theory.

1.2 Structure of the paper

The thesis consists of six sections. First, a background chapter providing the context for the study, second, a section comprising the research questions for the study and predictions. The

¹ In this paper I will use the term *gesture* to refer to co-speech gestures.

third section consists of a description of the method used for data collection as well as the analysis of the speech and gesture data. The fourth section comprises a description of the results which are summarized and discussed in the fifth section, ending with a conclusion.

2. Background

2.1 Language about colour

In the physical sense, colour is a property of light; different wavelengths are perceived as different colours by the eye and the brain (W. Hansen, 1967). Our visual system can distinguish between millions of shades of colours, but the languages of the world only have lexicalized names for a limited number of shades. Colour denomination and conceptualization is a widely studied subject in linguistics and therefore, this part of the background/literature review will not be exhaustive. The first part will describe the study of universal colour categories by Berlin and Kay (1969/1991) and present the criticism of their approach to colour denomination and the concept of colour. The last part will focus on patterns of colour naming in the European culture as explained by Plümacher (2007).

2.1.1 Basic colour terms

One of the most famous and influential studies on universal colour terms is that of Berlin and Kay (1969/1991). Based on their intuitive experience, the hypothesis of Berlin and Kay was that some form of universality could be expected in the way that the languages of the world segmented and named the colour space and that it was not arbitrary. The goal was to investigate the basic colour terms in languages across the world and how they divided the colour space. Berlin and Kay defined basic colour terms by four criteria: The expression should be monolexic, its appearance should not be covered by any of the other colour terms in the language, it should be applicable to a wide number of objects, and it should be used by most native speakers.

The material for the study consisted of a set of 329 colour chips differing according to the Munsell colour system in terms of hues and brightness, which were mounted in an array on a cardboard (Berlin & Kay, 1969/1991; Munsell Color, n.d.). The procedure was straightforward: For each informant, they elicited the basic colour terms in their native language. They then asked the informant to point out the most typical example of each of the basic colour terms on the colour array and delineate all the colour chips that could be referred

to by the term. Informants from 20 genetically different languages participated in the study and the procedure was repeated weekly at least three times for each informant.

The analysis of the collected data resulted in 11 universal colour categories denoted by white, black, red, green, yellow, blue, brown, pink, purple, orange and grey in English terms. These categories were analysed as the perceptual colours that could be encoded in the basic colour terms of a language. Berlin and Kay also discovered a partial order in the distribution of the basic colour terms based on the number of colour terms in the language. The order was used to predict the evolutionary order of emergence of the basic colour terms, and the languages were divided into seven stages based on the number of terms. Every language in the study included at least a term for dark and for light, which was termed a stage I language. A stage II language should have three basic colour terms, and these would then be black, white and red. The order of basic colour terms has been modified based on an improvement of the methodology in several subsequent studies (Hardin, 2016).

2.1.2 Sign language and colour

Sign languages also have various strategies for colour naming in the visual modality. Based on a study on colour term lexicalization across sign languages by Woodward (1989), Nyst (2007) lists five possible ways of creating signs for colours terms: Derivation of the term from another sign for an entity of a specific colour, pointing to an object in the environment, mouthing the word from spoken language, fingerspelling the initial letter of the colour term of a spoken language, or an arbitrary connection between sign and referent. Not all possible strategies are present in a single sign language. According to a pilot study on colour terms in Danish sign language (DSL) by Bakken Jepsen (2014), speakers of DSL use the three strategies derivation, mouthing, and arbitrariness to refer to colours.

Criticism

The study by Berlin and Kay has been criticized for reducing the study of languages and their lexicon to a mere labelling of objects and entities in the world (Dubois & Grinevald, 2000/2009; Lucy, 1997). According to Dubois and Grinevald (2000/2009), the denotation of objects in the world consists of complex cognitive processes, such as categorization and lexicalization, which can be influenced by the practices they are used in. To examine how a difference in use might be reflected in the denoting of colours, Dubois and Grinevald (2000/2009) analysed several paint colour charts presenting samples of paint colours for decorative or artistic purposes. They found that the colour charts for the two practices differed both in relation to the lexical

constructions and the semantic principles behind the name of the colours. The decorative charts mostly made use of object-based references in the names such as *vert pomme* ('green apple'), whereas the artistic charts rarely used this strategy, but mostly referred to the pigments and their property such as *vert oxyde de chrome* ('chromium oxide green'). The way that colour naming was influenced by practice, was analysed as an illustration of how colour denomination is the result of more complex processes than labelling of clearly defined categories in the world.

The method applied by Berlin and Kay has also been criticized for being based on cultural assumptions about colour conceptualization in other languages by Lucy (1997) and Plümacher and Holz (2007), among others. According to Lucy (1997), the colour charts that was used as stimulus did not reflect the everyday appearance of colours in many cultures because it was artificially made and only reflected the three colour attributes hue, brightness and saturation. Furthermore, it was problematic that the context of the basic colour terms was not examined. In the Western society, colour is generally perceived as an industrially produced material used to cover things and colour chips are often experienced for example when choosing paint or fabric (Plümacher & Holz, 2007). But this industrialized way of conceptualizing colour is not universal, which, for example, can be exemplified by a study on the colour categories in the Hanunóo language spoken by the Mangyans in the Philippines (Conklin, 1986). While the elicitation procedure in the Berlin and Kay study mostly had consisted of a labelling task, Conklin (1986) used both artificial colour-card stimuli for a labelling task and recorded descriptions of natural and artificial objects in the surroundings. Based on the labelling task, the Hanunóo language seemed to discriminate between four mutually exclusive colour categories which he termed *black*, *white*, *red*, and *light green*. However, the recorded descriptions meant that he was also able to examine the context of use of the colour terms he had collected as well as their references in the environment. This enabled him to discover that the terms initially identified had meanings that were related to non-linguistic properties of the environment such as 'dryness' and 'wetness'. Conklin renamed the four colour categories accordingly to *lightness*, *darkness*, *wetness* and *dryness* as this seemed to be more on par with their use. Because Conklin also assessed the colour naming of things in the environment, he discovered that the speakers of Hanunóo conceptualized colours in a sense that could not be represented by colour-chip stimulus such as the Munsell colour chips.

In their search for universal patterns of the division of the colour space Berlin and Kay (1969/1991) assumed a mapping between the colour terms they collected in the study and the stimulus colour chips. The property of colour is, however, not a discrete or bounded entity in

the world, and it does not exist as a concrete object in the same way as a *dog* or a *teapot*. According to Dubois and Grinevald (2000/2009) “the concept of color (in the singular) is not a perceptual primitive to be ‘extracted’ from a world where it would pre-exist, but an abstraction which results from a number of cognitive processes...” (p. 243). Colour can be perceived visually, but the property of colour only exists because of how our brain perceives the world (Lakoff, 1989). Colour concepts are a result of our neurophysiology and the cognitive processes that happens when different wavelengths of light activate the receptors in the human eye (Fahle, 2007), but they are also determined by our culture and speech community, because that is where we learn the colour terms and how they can be applied.

In the terminology of Berlin and Kay (1991), Danish is a ‘stage VII’ language, which means that it has eight or more basic colour terms. The Danish language society is an industrialized society, and the vast number of basic colour terms might reflect that the conceptualization of colour in Danish simply fit the one presented in Berlin and Kay’s study. The crucial thing to be aware of in relation to the current study then (and any study on colour), is the way that colour is conceptualized in the culture. In my case, I am concerned with an Indo-European language in an industrialized culture, and by doing this study I am investigating this certain conceptualization of colour². Therefore, I will now move on to a description of colour naming strategies in relation to an industrialized culture of colour.

2.1.3 Strategies for colour naming in relation to the culture

In most cases, it is sufficient to use the basic colour terms of the language such as *red*, *blue* and *brown* to refer to a colour, but if a language user needs to refer to a specific shade of colour, without it being present, the communication about the colour can become almost impossible (Plümacher & Holz, 2007). Imagine that you were describing the look of a particular flower to a friend, but you did not have a picture of it or the actual flower. Without a referent, the task of describing the colour of the petals and the leaves becomes difficult, if you can only rely on colour terms and modifiers. To overcome this problem, humans have developed common strategies for talking about specific colours. Plümacher (2007) outlines four strategies for

² Exceptions to the notion of basic color terms are found even within the Indo-European language family. Greek has two terms referring to different shades of blue that both meet the criteria for being basic color terms in Greek; the terms *galazio* and *ble*, which translate to ‘light blue’ and ‘dark blue’ respectively and thus refer to non-overlapping areas of the color space. This distinction between light and dark blue in basic color terms is also found in for example Russian and Turkish (Androulaki, Pestaña, Lillo, & Davies, 2001).

denoting colours beyond the use of basic colour terms that is used in the European culture³. The strategies differ in the way that colours are categorized, but they all provide an order or a naming pattern that makes it easier to communicate about a particular shade. In the following section I will describe the four strategies as well as give examples of how they are used and the societies that typically make use of them.

The first strategy is to use object-based names for denoting a specific colour. This approach takes advantage of our common knowledge about the world and our knowledge of prototypical shades of objects. One can refer to *lemon-coloured*, *grass-green*, *post-box-red* or simply *olive*, *violet* or *salmon* when describing a shade and these words will evoke images of the objects and their prototypical colours. It gives the listener a concrete idea of the colour that is being referred to, at least if the interlocutors share the same prototypical colour of the object that was mentioned. A disadvantage of this strategy is that there might be cultural differences in the general knowledge of the interlocutors and the reference will therefore not be effective in evoking a prototypical colour for the listener.

Another strategy for colour naming is to include the pigments and dyes that are used in the production of the colour in the name. Examples include the colour names *ochre* and *burnt umber*, which stem from pigments that are made from types of earth. The colour names *Indian yellow* and *indigo* both refer to East India, which is the location of the production of the dye. Unfortunately, the listener would have to know the typical colour denoted by these pigment colour names, which make them less productive especially today, when most of the colours are chemically produced.

A third strategy is to use a relational ordering of the colour space, such as the colour circle or colour sphere, as a background for communication. According to Plümacher (2007), the systematic orders of colours “is a cognitive model that enables us to speak about colors and shades without using color names that derive from objects” (p. 73). The model provides an effective model for communicating about colour because of the possibility for identifying specific shades by using characterizations that go beyond the commonly used modifiers *light* and *dark*. By specifying features such as *saturation*, *brightness* and *luminosity* the task of describing an exact colour becomes easier, as long as the interlocutors share the same cognitive model for speaking about colour. As a tool for denoting colours, it is acquired through

³ Plümacher (2007) does not clearly define what she means by the term ‘European culture’. In my understanding, the European culture that is referred to covers industrialized countries, which is also the way it will be used in this paper.

instruction or training, which is why it is most widely used among artists and other specialists. The disadvantage of this strategy is thus that it is difficult to use for people who are not familiar with the particular cognitive model, and therefore it might not be an effective colour naming strategy outside of professional contexts.

The fourth strategy is a hybrid form where a colour is denoted both in terms of an object-based name and by using the relational order of colours as described above. This is especially employed for so-called tertiary colours⁴ where the names are not established in the same way as they are for the primary and secondary colours. Examples of this strategy include *olive green with a tinge of grey*, *a greenish pale yellow*, or instances where shine is described with reference to metallic shimmering such as *metallic red*. This colour naming strategy thus also relies on knowledge about the relational order of colours as well as knowledge about colours of prototypical objects.

2.1.4 Familiarity and speech disfluency

As can be seen from the four colour naming strategies described above, especially within the context of colour specialist or artistic societies, it has been necessary to develop an order of colours, that make it easier to communicate about colours. Expertise on a subject - such as for example colour theory - influence the way people talk about it. Knowledge of a topic implies strengthening of processing pathways in the brain and this strength of activation facilitates an increased processing fluency and thus faster activation and retrieval in memory (Reisberg, 2013) and less time needed to search for a word or concept.

Speakers less familiar with a subject can produce filled pauses such as “uh” and “um” to indicate word retrieval (Clark & Fox Tree, 2002) and they produce slower responses and filled pauses when they are uncertain about the answer to a factual question (Smith & Clark, 1993).

The topic of discourse can influence speech fluency on different aspects. A less factual subject allows for less possible words to choose from resulting in less filled pauses from lecturers in academic disciplines (Schachter, Christenfeld, Ravina, & Bilous, 1991). Familiarity with a topic might influence oral descriptive discourse and such that speakers express less attributes when describing an unfamiliar topic compared to a familiar topic (Merlo & Mansur, 2004).

⁴ Tertiary colours are produced from the mixing of primary and secondary colours and they usually do not have set names in the same way as the primary and secondary colours (tertiary color, n.d.).

2.2 Gesture

2.2.1 Defining gesture

When engaged in a conversation, our bodies perform all kinds of movements such as adjusting the position of a limb or the body, manipulating an object such as touching a button on one's shirt, or behaviour such as scratching. These self-adapting and practical movements might inform the listener about the aim or emotional state of the speaker, but they are not considered as intentions to communicate or a part of the actual discourse (Kendon, 2004). Gestures on the other hand, are recognized as expressing meaning, because they are distinguishable among these other bodily movements. According to Kendon (2004, p. 15) this is because they "have the features of manifest deliberate expressiveness". Even though gestures are spontaneous and less conventionalized than language, they are intended to communicate meaning, and they are perceived as such by the interlocutors. Whether an action is perceived as intentional and deliberate often is contingent on the context and therefore the bodily movements perceived as gestures are difficult to define.

David McNeill and Adam Kendon are two of the most influential contemporary scholars in the field of gesture studies and they both have provided frameworks for studying gestures that are both similar and differ on some points.

According to McNeill (1992) gestures are spontaneous and symbolic movements of the hands performed in relation to speech. Gestures and speech are closely connected in one integrated system, and together they provide a window into the thought, mental images and memories of the speaker. The integrated system of gesture and speech work together in an active way that motivates speech and thought (McNeill, 2005).

The framework provided by McNeill (1992) and McNeill (2005) is primarily concerned with spontaneous co-speech gestures (performed in relation to speech), the images they exhibit, and the interplay between speech and gesture.

Kendon (2004) defines gestures as visible bodily actions that are used as part of an utterance or as an utterance itself. Gestures that are not co-occurring with speech and emblematic gestures that are used to replace speech, as for example when a speaker holds the hand in a clenched fist with the thumb pointing upwards to express approval⁵, are thus also considered part of the framework. A lot of the research on gestures has focused on the

⁵ The meaning of the 'thumbs up' gesture form can vary, but the meaning is 'approval' in the US and East Asia (Matsumo & Hwang, 2013).

movements performed by the hands and arms, but the shoulders, head and face can also express meaning and be part of the utterance according to Kendon (2004).

Whereas McNeill's framework has for the most part focused on co-speech gestures that exhibit images and represent the referential parts of speech in narrative, the framework developed by Kendon is less focused on the referential aspect of gestures but focus on the function of the gestures in the utterance, be that pragmatic, referential, or interactive.

2.2.2 Speech and gesture as an integrated system

According to McNeill (2005) gesture, speech, and thought are integral parts of the same system, although they differ in the way they are structured and how they convey meaning. Speech is analytic and consists of a linear sequence of segments whereas gestures are non-linear, and the meaning is not segmented.

According to McNeill (1992) gestures are global, synthetic, non-combinatoric and context-sensitive. That they are global implies that the meaning of the whole gesture and the context it appears in, determines the meanings of the parts of the gesture such as the shape, placement or movement of an articulator. As an example, imagine a speaker saying "he grabs a big oak tree and bends it way back" while performing a movement with the right clenched fist moving in an arc backwards in front of the forehead of the speaker. In this example borrowed from McNeill (1992, p. 12), the hand in the gesture is understood as the hand of the person performing the action, the motion performed by the hand is understood as the bending motion performed by the character performing the action and so on. This way of understanding the meaning of the smaller parts of the gesture stems from our knowledge of the meaning of the whole gesture (McNeill, 2005).

Gestures are also synthetic, which means that a single gesture can combine several meanings in one symbolic movement. Because speech is analytic, the speaker in the example above had to use the words "he" to refer to the actor of the sentence and "grabs" and "bends" to refer to the actions performed, while all of this information could be expressed in a single gesture.

According to McNeill (1992), gestures are also non-combinatoric, which means that multiple gestures cannot be combined to make larger gestures as is possible when a speaker combines words and sentences. Although it should be noted that this statement holds for gestures co-occurring with speech, some communities have developed a 'language' of gestures to replace speech in environments where speech is prohibited or impossible (Kendon, 2004).

Gestures are also context-sensitive, which means that different gestures can be used to refer to the same entity in different contexts. If the speaker in the example talked about the character bending the tree again, he might gesture about the same situation in a different way and use a different gesture to refer to the person bending the tree. Additionally, gestures do not have to live up to any standards of well-formedness to be considered gestures, while speech can be judged not to be Danish or Swedish, if it does not comply to the linguistic standards. This exemption from standard form means that gestures are free to express whatever part of the utterance the speaker finds important.

In spite of these differences in linguistic properties, language and gesture are working together to convey meaning through language and there is now substantial empirical evidence for this claim. Gesture and speech are synchronized in meaning in that speech gesture can express information that is the same or complementary to the information in speech or it can perform the same pragmatic function (Kendon, 2004; McNeill, 2005). As children's speech passes through the stages of referential, descriptive to discourse structuring, so does the function of their gestures (Goldin-Meadow, 2015). In the case of language impairment disorders such as aphasia, gesture and speech break down together, although there are differences in how it affects gesture production and comprehension, depending on the type of aphasia (Rose, 2006). There is also evidence that co-speech gestures are a universal phenomenon, with cross-cultural variation (Kita, 2009) and from neurocognitive studies supporting the interaction between speech and gesture in the brain (Willems & Hagoort, 2007).

2.2.3 Gesture functions

Different ways and criteria for classifying gestures exist, and they all reflect the different ways gesture has been viewed both in terms of its relation to speech and as different ways of communicating. In this paper, I will follow Kendon (2004), who distinguishes between gestures based on the different functions employed by the gestures in the utterance in relation to speech. Utterances consist of a gesture and a speech component, and the gesture component can relate to speech in different ways. Gesture with a referential function relate to the referential content of speech and gestures with a pragmatic function relate to the non-referential or non-propositional parts of the utterance.

Referential gestures can represent the content of an utterance as, for example, when a speaker uses the hands to depict the size of an object that is mentioned in speech. But they can also be used to indicate the object of reference in an utterance by pointing with the hand (head

or other body parts), as for example when a speaker points at a location to specify a place that is mentioned in speech. Gestures with referential functions can refer to both abstract and concrete content. The distinction lies in the way the content is being represented by the gesture. The referent of concrete content is represented iconically, but for abstract content the referent in gesture inevitably becomes another object or entity that is then used to characterize the abstract content (Cienki, 2008) (see further section 2.2.5). Kendon (2004) distinguishes between two forms of referential gestures: representational and pointing gestures. In some part of the gesture literature ‘representational gesture’ is used interchangeably with ‘referential gesture’. In this paper, will use the term ‘referential gesture’, as I am not referring to pointing gestures.

According to Kendon (2004), referential gestures can contribute to the referential meaning of an utterance in six different ways: They can express the same meaning as in speech achieving a sort of ‘semantic redundancy’; they can express a different meaning than the one in speech and that way add content to the utterance; they can also be used to specify the meaning of speech for example by enacting an action, illustrate or create a representation of an object; they can represent the size or shape of an object or action; or they can be referred to by a deictic expression such as “as long as that” while the hands are showing the size. These different ways of contributing to speech are neither exclusive nor exhaustive, as gestures may add more than one contribution to speech at a time.

Gestures with a pragmatic function on the other hand, help carry out the social action performed by the utterance and relate to the non-propositional part of the utterance. Kendon (2004) distinguishes between three kinds of pragmatic gesture functions: modal, performative and parsing. Gestures with a modal function operate on a stretch of speech and indicate how a segment of speech is to be interpreted. For example, a flat open hand that is facing downwards and ‘sweeping’ laterally and horizontally outwards from the speaker can function as an indicator of negative evaluation of speech (Bresse & Müller, 2014a). Gestures with a performative function indicate the speech act the speaker is engaged in. An example is when the hand is held open with the palm-up and directed towards the listener to indicate that the content of speech is being offered as a proposal or given as an example to the listener. Gestures with a parsing function can be used to punctuate or structure the discourse or mark important stretches of speech. Examples include beat-like movements of the hands or head, which emphasizes segments of speech, that are deemed important or gestures that indicate that the speaker is done talking about a subject. For example, the same lateral sweeping away gesture

described above can have a punctuating function and mark that the speaker is done talking about a subject (Kendon, 2004, p. 225).

In Kendon (2017) a fourth operational function is added to the pragmatic gesture functions. Gestures with an operational function comprise of so-called operators, that indicate how the spoken meaning of the utterance should be interpreted. For the purpose of this paper I will not distinguish between modal or operational gesture functions, as I will let the operational function be subsumed under the modal gesture function.

Lastly, gestures can also perform an interactive function (Bavelas, Chovil, & Lawrie, 1992; Kendon, 2004). Interactive gestures can be employed during turn-taking in a conversation, for example to indicate who will be next speaker. They can also function as a way of indicating the addressee of an utterance, or as a way to ‘hold the floor’ to make sure that no one else interrupt, even if the speaker has a pause in the speech stream.

2.2.4 The ‘anatomy’ of gestures

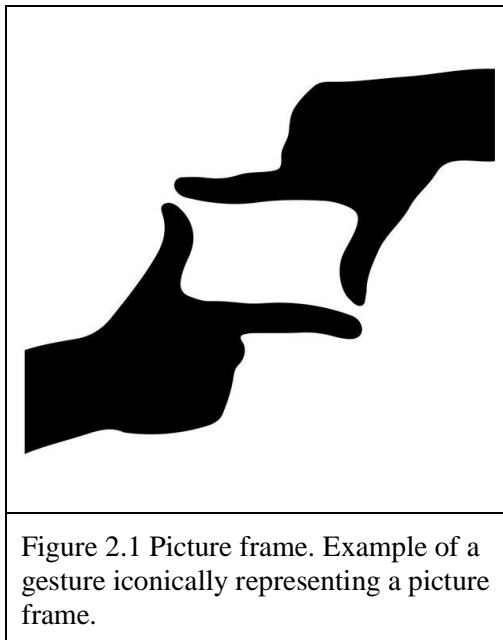
Kendon (2004) defines a gesture unit as a phase that starts from the moment the articulator is moved from a resting position, performs an excursion and then moves back to a resting position. The articulator can perform one or more excursions before returning to the resting position and a single gesture unit can therefore contain one or several excursions. Each of the movement excursions can be divided into a number of phases, that can be identified on the basis of the movement and position of the articulator. All movement excursions of a gesture unit contain a certain phase where the articulator reaches its peak position and shape. It is in this phase that the hand shape is most clearly defined and usually the point where the articulator is furthest away from its resting or starting position. This phase is called the gesture stroke and it is recognized as the part where the expression of the gesture is performed with most clarity. The phase before the gesture stroke is known as the preparation, and the phase where the hand is relaxed and retracted after a stroke is known as the recovery phase. The stroke and the post-stroke hold collectively define the meaningful part of the gesture phrase also known as the *nucleus* (Kendon, 2004).

Gesture units are rarely a matter of a ‘there and back’ movement from one relaxing position to another. Speakers may hold the articulators still before they perform the stroke, which is known as the pre-stroke hold, or they may pause their hands in the position they landed in after the stroke, which is known as the post-stroke-hold.

The preparation, the stroke and the pre- and post-stroke hold are known as the *gesture phrase*. A gesture phrase always contains one single stroke, but the rest of the phases are not obligatory. Each of the movement excursions that are identified as segments in a gesture unit are thus recognized as gesture phrases and a gesture unit can contain one or several gesture phrases. The recovery phase where the articulator is returned to the resting position marks the end of the gesture unit.

2.2.5 Abstract information and gesture

Gestures can refer to both concrete and abstract content, but the strategy for referring to abstract content is different because of the lack of structure in the referent. Gestures referring to concrete content, such as a picture frame, can depict the object in an iconic way with the fingers depicting the shape of the object, as can be seen in Figure 2.1.



Abstract content, however, has no structure that can be represented manually and therefore, the speaker cannot represent a direct image of abstraction in the same way as for concrete content. In the following section I will describe how reference to abstract content in gesture has been outlined, and how it has been examined in relation to metaphor and especially conceptual metaphors.

According to McNeill (1992), gestures can represent abstract content such as ‘language’ or ‘love’, with the use of *metaphoric* gestures. In a metaphoric gesture a concrete domain is used to refer to an abstract subject. The content is pictorial and refer to a concrete event or idea, but the content being depicted stands for an abstract idea. Since the speaker cannot represent a

direct image of an abstract idea, s/he performs a gesture that refers to a concrete idea, that is used to structure the abstract content. McNeill (1992) illustrates how metaphoric gestures are employed in the utterance with an example of a speaker saying, “It was a Sylvester and Tweety cartoon” (p.14), while his hands rise, with open hands and his palms facing. The gesture is depicting a bounded object, and the speaker is showing it to the listener, yet he is actually referring to the genre of the cartoon, which is an abstract subject. The speaker is thus able to represent to the cartoon genre iconically in gesture, by referring to another concrete object that stands for the abstract concept.

The example above, and most of the other examples of metaphoric gestures described by McNeill are in fact gestural expressions of the *conduit* metaphor in gesture. The conduit metaphor is a collection of metaphors where ideas, genres arguments, knowledge, etc., are conceptualized as containers, and communication about these is conceptualized as passing the container on to a listener along a conduit (a channel). In the example described above, the speaker creates an image of him holding and presenting a container and that way he depicts the act of presenting an idea, in this case the genre, to the listener. McNeill interprets the function of the gestural conduit metaphor as pragmatic because it relates to the content of speech and helps structuring speech.

Although McNeill also describes how abstract information can be referred to by non-imagistic gestures, such as simple rhythmic gestures named beats, and pointing gestures (deictics), it is the metaphoric gestures, and especially the conduit metaphor, that receives the most attention on this subject. According to Cienki and Müller (2014), the research on gesture and the conduit metaphor in McNeill and Levy (1982) and in McNeill (1992) made the conduit metaphor the primary example of metaphoric gestures in research on gesture and cognitive psychology for many years. Most of the examples in McNeill (1992) were taken from retellings of cartoons or comic books, and therefore, the metaphoric gestures were mostly examples of gestures used in narrative. Research on metaphoric gestures produced in other contexts has later shown that the conduit gesture is just one example among other uses of metaphor in gesture, which will be elaborated on in the next section.

The subject of abstract content in gesture has been extensively examined in relation to conceptual metaphors. According to Cienki and Müller (2008), metaphor and metonymy play a crucial role in motivating the meaning of gestures and can be present in gestures expressing abstract content with all kinds of communicative functions. Unlike McNeill, they are also

concerned with more conventionalized gestures and how their meaning can be understood in relation to metaphors.

Cienki (2009) uses terms from conceptual metaphor theory (Lakoff & Johnson, 1980) to describe how metaphoric gestures contain a mapping between two domains. Conceptual metaphors are used to understand or structure an abstract or conceptual target domain in terms of another, usually more concrete source domain. Imagine a speaker performing the same handshape as in Figure 2.1, but the content of speech is abstract such as the organization of a theory. The image created by the hands of the speaker are still depicting a frame, but the frame is the concrete source domain which is used to stand for the framework of a theory, the target domain.

According to Cienki (2008), the conceptual metaphors expressed in speech and gesture can share certain commonalities. The source domain of a metaphor might be expressed in the two modalities at the same time, for example if a speaker talks about her grades going up while performing an upwards motion with the hand. It is also possible that a metaphor that is known in verbal form can be expressed solely in gesture, if, for example, the speaker in the example above had only mentioned that her grades got better, while performing the same upwards motion with the hand.

It is also common to experience differences between the metaphoric expressions in speech and gesture. Speakers often talk without co-occurring gestures, and therefore one can experience metaphoric expressions in speech that are not accompanied by a metaphoric gesture. On the other hand, it is also possible to experience metaphoric expressions in co-speech gesture that do not exist in speech. This can, for example, be seen when English speakers use the left-right axis to gesture about time, although there are no conceptual metaphors that suggests this spatial conceptualization of time in the English language (Casasanto & Jasmin, 2012). Lastly, speakers can express two conceptual metaphors with the same target domain, but with two different source domains expressed in speech and gesture. Cienki (2008) exemplifies this with a speaker who talks about traditional ‘black and white’ morality vs. contemporary ambiguous morality standards, which are grey. While she speaks about morality being black and white, “she [...] makes a gesture as if dividing up the space in front of her with hands flat in the vertical plane, but for ‘gray’ she uses a loosely held, claw-shaped hand, as if to show the unclear demarcation between the different moral spaces” (p. 15). In this case, morality is the target domain of both metaphors, but the source domains are different as speech uses a colour metaphor and gesture uses a spatial metaphor. According to Cienki (2008):

This gestural behavior makes sense, given the difficulty of trying to use hand shapes or movements to depict the variety of colors we can discern visually. But this also means more generally that we can have metaphors expressed in words which cannot be expressed in gestures, namely if the source domain cannot be iconically represented in terms of shape, position, and/or movement. This contrasts with sign languages, which have conventional forms to symbolically refer to colors or black and white. (p.15)

The colours used as the source domain in speech are difficult to express iconically in gesture, and therefore the source domain is different for the metaphor in gesture. The assumption is that the abstract domain of colour cannot be iconically represented in gesture because of its lack of structure.

This inability to represent colour in gesture, is different from sign language, that also uses the visual modality. As it is explained in the paragraph on colour and sign language above in section 2.1.2, sign language has managed to find several ways of using the visual modality to represent the abstract subject of colour.

Based on the focus on the use of metaphoric (and referential) gesture in representing abstract content, it might seem as if gestures that refer to abstract content almost always are metaphoric. The abstract content being examined in a lot of the studies on gesture and metaphors easily lends themselves to spatial or positional representations in gesture, such as opposite concepts (Hostetter & Alibali, 2008; Parrill & Stec, 2017), and time, which is conceptualized spatially in a vast number of languages (Sweetser, 2007). However, there is no empirical evidence for a connection between metaphorical expressions and the representation of abstract content in gestures (Cienki, 2008).

3. The current study

The aim of the study is to investigate how people gesture when they talk about colour in Danish. The following three research questions and their sub-questions are asked in order to investigate this:

RQ1: *How do people talk about colour in Danish and are there any differences between subjects with expert and novice knowledge?*

RQ2: *What are the functions and what are the distributional properties of the gestures that occur with talk about colour in Danish, and are there any differences between subjects with expert and novice knowledge?*

RQ3: *What is the semantic relationship between speech and gesture during talk about colour, and are there any differences between subjects with expert and novice knowledge?*

3.1 Predictions

The following section contains the predictions for the three research questions. Some of the predictions are formulated in quite general terms, since there are no studies on gesture functions and colour talk and few regarding expertise and gesture use, to my knowledge. The predictions are therefore based on more general literature on gesture use and functions.

In line with the research by Berlin and Kay (1969/1991) and Plümacher (2007), it is predicted that the colour talk and colour naming, will primarily consist of the basic colour categories as they appear in Danish (*sort* ('black'), *hvid* ('white'), *rød* ('red'), *grøn* ('green'), *gul* ('yellow'), *blå* ('blue'), *brun* ('brown'), *lilla* ('purple') and *grå* ('grey')) as well as modified basic colour terms. The experts will be using more terms that require a knowledge of colour mixing and colour theory than the novices, since they have been trained to use these terms to specify colours.

According to Cienki (2008), the abstract subject of colour has little structure that can be represented iconically in gesture, therefore it is predicted that the gestures with a referential function will be less frequent and the gesture function will predominantly be pragmatic.

Even though there are no studies on gesture functions in relation to knowledge about a subject, a general prediction about the distribution of gesture functions between experts and novices can be made, based on the expectation about the content of speech. In line with the research on subject knowledge and speech disfluency it is expected that the novices will produce more speech disfluencies than the experts. The function of gestures performed during speech disfluency have been classified as commenting or towards difficulties in the speech production (e.g. commenting on the break-down of speech) (McNeill, 1985; Stam & Tellier, 2017). Therefore, it is predicted that the novices will perform more pragmatic gestures than referential gestures. It is thus also predicted that the pragmatic gestures performed by the

novices will mainly be referring to the speech disfluency or word-searching (e.g. wrist-twisting (Gullberg, 1998)). I have no predictions regarding the distribution of the gesture functions for the experts, but as the experts will not experience the same amount of disfluency in speech, the pragmatic gestures they perform will mainly be referring to other aspects of the utterance.

In line with Kendon's (2004) definition of referential gestures, I predict the semantic relationship between referential gestures and co-occurring speech to consist of a 'semantic overlap' for both novices and experts. This implies, that the gestures with a referential function will refer to the semantic content of co-occurring speech, for example by representing or specifying the content of the speech.

4. Method

4.1 Participants

Six participants took part in the study, 2 were male and 4 were female and the age ranged from 25 to 38 years ($M = 29.0$, $SD = 4.65$ years). All of the participants were native speakers of Danish and had lived in the Copenhagen area most of their life. The geographical background of the participants was kept as similar as possible, to avoid regional or dialectal differences in their expressions. I chose speakers from Copenhagen as the geographical focus of the study partly as a convenience sample, as the participants were recruited through my acquaintances in Copenhagen, but also because it would extend the external validity of the study. The variety of Danish that is spoken in the Copenhagen area is perceived as a form of 'standard Danish' and even served as the model for the written and spoken Danish ("Københavnere taler ikke dialekt," 2007). The participants were distributed into a novice and an expert group based on their educational background.

4.1.1 Colour novices

The participants in the novice group counted one male and two female participants (Age $M = 31.0$, $SD = 6.24$ years). None of the participants in the novice group had been educated in any form of colour theory beyond what they were taught in primary and lower secondary school and none of them had any professional experience working with colours. Two of the novice participants were graduate university students in humanities and IT, and one had a further education of medium length.

4.1.2 Colour experts

The expert group also counted one male and two females (Age $M = 27.0$, $SD = 1.73$ years). Besides from the aforementioned inclusion criteria, the participants in the expert group were only included if they had an educational background in graphic or multimedia design, art or something similar to this. Two of the expert participants had a bachelor's degree in graphic design, and one had a bachelor's degree in animation. All of the experts were studying a Master's degree in some form of design at the time of the interviews.

4.1.3 Ethical considerations

Several precautions were taken to address the ethical considerations involved in making a study with human subjects. Before the interview began, the participants read through and signed a consent form (Appendix 2). It stated that they were informed about the overall purpose of the data collection, that their participation would be anonymous and that I could use the material in my thesis paper and presentation. The participants were fully aware that they were being video-recorded and they could withdraw their participation at any time. They knew that the interview was going to be about colours, but other than that I did not give them any information before the interview was finished.

4.2 Data collection

4.2.1 The interview

Based on a number of pilot studies, I decided to carry out the elicitation task in the form of a structured interview about colours. The form of a structured interview is fixed and the wording and the order of the questions are the same every time (Edley & Litosseliti, 2010). The reason for organising the elicitation procedure as a structured interview were twofold: First, it gave me full control over the topic of the interview. Second, I could collect the gesture data without the participants being aware of what I was interested in.

The interview consisted of four parts: A briefing, a warm-up phase, a questioning part, and a final part (the interview + questions can be seen in Appendix 3). During the briefing, the interviewer explained the procedure, the purpose of the experiment, and had the participant sign the consent form. The warm-up phase was a short phase with two easy questions about colours to get the participant acquainted with the interview situation and the interviewer. The questioning phase consisted of eight questions about concepts from colour theory. All eight concepts were acquired from a Danish book about colour theory (W. Hansen, 1967). The

difficulty of the questions increased over the course of the interview, based on the concepts that had been the easiest and hardest to explain by the participants in the pilot studies. The questions all included a request for the participants to give examples of colours when they answered, as in Example 4.1

Example 4.1
<i>Kan du forklare hvad primærfarver er, og kan du komme med nogle eksempler?</i> (‘Do you know what primary colors are, and can you give some examples?’)

If the participants had not provided any examples of colours, the interviewer would ask them again before moving on to the next question.

The concluding section consisted of five personal questions about age, occupation, language, hobbies, and what the participant thought the interview was about. I chose to place these questions at the end of the interview because I did not want risk confusing the respondents by starting with the questions that was not relevant to the informed topic or make them self-conscious from the beginning (Bryman, 2012; Schilling, 2013).

To reduce the risk of experimenter bias (Gonzalez-Marquez, Becker, & Cutting, 2006), I had a person who was naïve to the hypotheses and research questions perform the interview. A 28-year old male friend kindly took on the role as the interviewer to reduce the variability between interviews. He was instructed to strictly follow the interview guide and only diverge from the task and guide the participants back if they started pointing, moving or looking away from the interview situation. The interviewer was not trained beforehand as suggested by Bryman (2012), but the pilot interviews functioned as a great opportunity to correct the interviewer’s behaviour and thus acted as training situations.

4.2.2 Equipment

A SONY α NEX-7 camera equipped with a SONY F3.5-5.6/18-55 lens and mounted on a tripod was used for filming. I used the ELAN (ELAN, 2018, December 12; Wittenburg, Brugman, Russel, Klassmann, & Sloetjes, 2006) software for segmenting, coding, and transcribing speech and gesture.

4.2.3 Procedure

The interviews were carried out in a small room located at the Copenhagen University library at the South Campus in Copenhagen during December 2018-February 2019. The room had white walls and ceilings and a dark, grey floor, and the number of different colours in the room

were kept to a minimum to prevent the participants from pointing in the direction of any coloured items. The furniture in the room were white and black. A window in the room provided a view of a mostly unicoloured grey and sand-coloured construction site. The only disadvantage of the neutral appearance of the room, was that it could appear clinical or lab-like, which was mentioned by the participants when they were describing the room in the pilots. This could make the participants feel like they were part of an experiment, which could make them nervous or self-aware. The interviewer and I compensated for this by trying to establish some form of rapport between the participant and the interviewer by making small-talk and explain what was going to happen (Bryman, 2012).

The participant and interviewer were sitting approximately 1.5 meters apart, facing each other, with nothing between them. There was a table to the left of the interviewer and the video-camera was positioned to the right a little behind him in the corner of the room. That way, it captured a small part of the right side of the head and back of the interviewer as well as the participant's body from the knees and up from the front.

I was present during the briefing part of the interview to collect the consent form, but I turned on the camera and left the room before the onset of the warm-up phase. I was not present during the interview, because my experience was that it made the participant self-aware if I was sitting in the room without having a task to carry out. After the concluding phase, I entered the room again and turned off the camera, and the participant was free to ask any questions about the purpose of the interview.

The interviewer assured the participant that there was no right or wrong answers to the questions when introducing the questioning phase. This was to ensure that they would not prevent themselves from answering if they were not sure of the accuracy of their answer. He was also instructed not to interrupt and to give the participant plenty of time to answer. He was allowed to give feedback by saying *ja* ('yes'), *nej* ('no') or nodding.

At the end of the interview the participants were asked about what they thought the study was about. None of them guessed that the topic was gestures.

4.3 Data analysis

4.3.1 *Speech or gesture - where to start?*

Although speech and gesture are working together in conveying meaning, it is necessary to separate the two when conducting a gesture analysis. Both because they operate in different modalities but also because they can have a strong influence on each other in terms of meaning

and how they are interpreted. According to Gullberg (2010), the focus of the investigation determines whether the analysis takes speech or gesture as its point of departure. Since the aim of this study was to investigate the gestures performed during utterances about colour, my starting point was to identify relevant speech segments, analyse the co-occurring gestures, and lastly to examine the two together to look for any relationship between speech and gesture.

A standardized scheme for gesture analysis does not exist, which makes it very important to thoroughly explain the coding procedure when analysing speech and gesture as this helps to secure the replicability of the study (Gullberg, 2010). The coding procedure was carried out in a step by step manner for each of the eight participants and the report of the procedure follows the same order. First, the speech was segmented, transcribed and translated into English. Then, the meaningful part of the gestures performed during the speech segments were identified. Next, I coded the articulator of the gesture and identified the movement and the handshape. I then transcribed the speech co-occurring exactly with the meaningful part of the gesture.

4.3.2 Segmenting, transcribing, and coding speech

The parts of speech that contained target expressions were segmented using the ELAN software (2018, December 12; Wittenburg et al., 2006) without the video being visible. The target expressions were all colour terms denoting the visible sensation of colours, both the basic colour terms as identified by Berlin and Kay (1969/1991), and any other expression thought to be denoting colour. Since the interview questions were primarily about terms from colour theory, I included these terms as target expressions as well. Each segment contained at least one target expression and included as much of an utterance to get the context, except for the target expressions, that were uttered in isolation. The segmentation was also done such that the segments did not stop in the middle of an utterance, but generally lasted from one pause in the speech stream to the next. This meant that the size of segments ranged from a single expression as in Example 4.2a to longer utterances, where several sentences were included as in Example 4.2b.

Example 4.2 Example of two speech segments
a) <i>rød</i> ('red')
b) <i>primærfarverne det er sådan de farver som man ikke kan blande altså det vil sige dem som er sådan grundfarverne</i> ('the primary colours they are like the colours you cannot create the basic colours that is')

The segments were then transcribed using conventions following standard Danish orthography. I also transcribed the filled pauses such as *øh* ('eh') or *øhm* ('uhm') and the contraction *f.eks.* ('for example').

Next, I looked at all the speech in the colour-talk segments and categorized all of the colour-related speech based on a number of target speech categories. The categorization of colour-related speech targeted specific speech categories which were as follows:

- *Colour-naming terms* were all the terms referring to colour hues.
- *Colour theory* was defined as expressions that contained a colour theory term.
- *Adjective* contained the adjective that were used to describe colours such as *klar* ('clear') or *stærk* ('strong').
- *Actions* were verbs denoting actions.
- *Disfluency* referred to two things: General interruptions of the speech flow such as filled and unfilled pauses, repetitions, suspension of speech and utterances expressing doubt such as *jeg ved det ikke* ('I don't know').

The expressions in the *Colour naming terms* category were further divided into five subcategories based on Berlin and Kay's (1969/1990) basic colour terms and Plümacher's (2007) patterns for colour naming:

- *Basic colour terms* were as defined by Berlin and Kay.
- *Object-based names* were used if the colour term referred to an object (Plümacher, 2007).
- *Modifier* comprised both instances of a modifier and a basic colour term such as *mørk rød* ('dark red') and compounds such as *lyseblå* ('light blue), as the modifier has the same attributive meaning in these cases in Danish.
- *Pigment* comprised colour names that stemmed from the plant dye that was originally used to create the colour or from the geographical origin as described by Plümacher (2007).
- *Relational forms* were a combination of Plümacher's two strategies relational order and hybrid forms, as I found it difficult to distinguish between the two categories. Relational forms counted instances of a basic colour term or an object-based name that was specified using a colour theory order term, such as *intens gul* ('intense yellow').

4.3.3 Identifying and coding gestures for articulatory features

The next step of the gesture analysis was to distinguish the gestures performed during the speech segments as opposed to self-regulators and other 'self-correcting' movements (Ekman

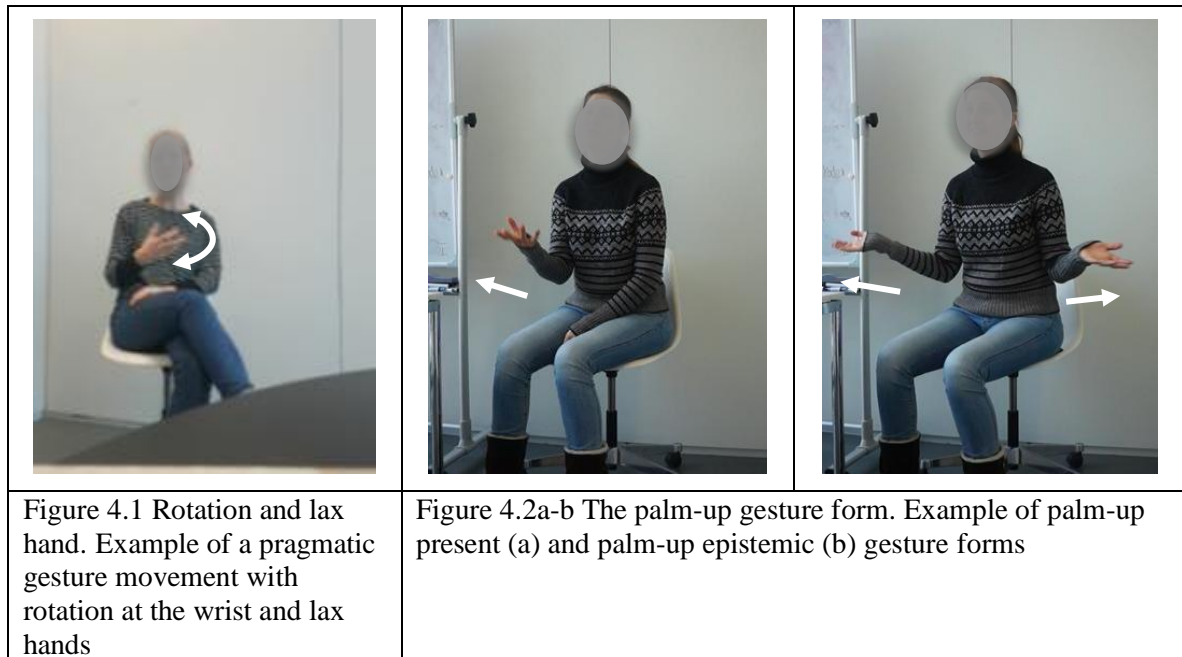
& Friesen, 1972). First, I identified the gesture units, by following the first of the descriptive criteria as described in Kita, van Gijn, and van der Hulst (1998), this time with the sound turned off and the video being visible. The beginning of a movement unit, which corresponds to a gesture unit, is defined as the moment the articulator leaves its resting position. The end of a unit is defined as “the moment at which the hand makes the first contact with the resting surface” (p. 29) and the time it takes for the articulator to settle in the actual resting position is not part of the gesture unit. To identify each of these exact moments, I watched the video clip in ELAN and identified the frame where the hand had moved out or into the resting position.

I chose to focus on gestural nuclei, and therefore identified the strokes and possible post-stroke holds within the gesture units. Identifying the beginning and end of a stroke is a difficult task. Kita et al. (1998) defines a phase as a sudden change of direction of the hand and a variation in the velocity of the movement before and after the direction change. A stroke could thus consist of several movement segments where only one of these changes took place. For example, if the hand was tracing the shape of an object, it may have made a series of direction changes, but as long as the speed remained the same, the entire movement was identified as one phase. A movement repeating the same segment was also defined as one phase. A phase after a stroke, where the hand was held still in the air was identified as a post-stroke hold. The hands were rarely completely frozen or motionless, and for that reason I identified drifting, and other motions with no target position as post-stroke holds as well.

The next step was to code the structural features - articulator, handshape and movement - of the strokes and post-stroke holds, still with the video sound turned off. For the coding of the articulator, I distinguished between right or left hand, the fingers, both hands or asymmetrical forms where one hand was held still and away from recovery position while the other hand was moving. The reason for the attention to symmetry for the coding of the articulators, was that asymmetrical gesture forms are rare in gestures with a pragmatic function, and it would thus be useful when determining the gesture function. For the handshape, attention was especially at the orientation of the palm (e.g. up, down, right, left) and the configuration of the hand (for example lax hands vs. hands performing a cupped form or a grip). For movement, the gesture strokes were coded for example as horizontal/lateral, medial/caudal or up/down movements as well as repetitive, if the movement pattern was repeated. The combination of these structural features was used for the coding for gesture function, which is described in the section below.

4.3.4 Coding for gesture function

For the coding of gesture function, I distinguished between a pragmatic and a referential function. A number of structural properties have been associated with the pragmatic gesture function in the literature on recurrent and spontaneous gestures (Bressem & Müller, 2014b; Cooperrider, Abner, & Goldin-Meadow, 2018; Gullberg, 1998; Kendon, 2004; McNeill, 1992), and therefore I first identified the gesture strokes with a pragmatic function. Based on the descriptions of handshape and movement in the literature, I established a number of criteria for determining the gesture function as pragmatic. Shapes and movements such as lax hands with circular movement at the wrists (Gullberg, 1998), and instances of the palm-up gesture form (Cooperrider et al., 2018) were identified as exhibiting a pragmatic function. Examples can be seen in Figure 4.1 and Figure 4.2a-b.



Bi-phasic movements such as back and forth or in-out movements of lax hands as can be seen in Figure 4.3 were also coded as pragmatic gestures.



Figure 4.3 Bi-phasic movement. Example of an 'in-out' bi-phasic gesture movement

The remaining gestures that were not coded as having a pragmatic function, were coded as either referential or were excluded if I was in doubt about their function. Gestures are multifunctional and therefore they can perform more than one function at the same time, which meant that there were cases where I was unsure of the function. These gestures were left out of the analysis.

4.3.5 Categorizing temporally aligned co-gesture speech

The last step was to turn on the sound and transcribe and categorize the speech co-occurring exactly in time with the strokes and post-stroke holds. I used the same speech categories as identified for the colour target speech above, with the addition that if the co-gesture speech did not fit any of the target categories, it was categorized as *Other*.

4.4 Statistics

For practical reasons it was not possible to secure a secondary coder to code or transcribe the gesture and speech data. Therefore, it was not possible to compute inter-coder reliability, and I recognize that this will have an effect on the reliability of the study.

Further, because of the small sample size, no inferential statistics were computed. Instead, the data is presented using descriptive statistics. Mean (M) and standard deviation (SD) was computed for the gesture rate. Aggregated proportions were calculated for the speech and gesture data.

5. Results

5.1 Overview of the data

The six participants produced a total of 3,074 words (including filled pauses) about colour, and 272 gesture strokes distributed over 146 colour-talk segments. Twenty-one of the gesture strokes were left out of the analysis, because I had not been able to determine the function based on the structural features during the coding procedure. Table 5.1 presents an overview of the data for the six participants. Unless otherwise noted, tables and figures show the mean gesture rate per 100 words.

Table 5.1 Overview of the speech and gesture data. The mean gesture rate is shown in gestures per 100 words.

Group	Participant (gender)	# Colour words	# Colour talk segments	Duration of colour talk segments (mm:ss)	# Gesture strokes	Mean gesture rate (stroke/100 words)
Novice	A (F)	527	20	02:53	33	6.26
	B (M)	473	22	02:50	51	10.78
	C (F)	403	20	02:29	12	2.98
Expert	D (F)	644	36	03:33	71	11.01
	E (M)	541	26	03:17	69	12.75
	F (F)	486	22	03:20	36	7.41
	Total	3074	146	18:20	272	8.85

Participant C from the novice group had a lower gesture rate than the rest of the participants in the novice group, whereas participant B had a much higher gesture rate than the other novices. This shows that there was a big difference in the amount of gestures performed by the participants in the novice group.

5.2 Speech

5.2.1 Distribution of speech categories

Table 5.2 shows the distribution of the target speech categories as mean proportions on all the speech data related to colour. The data is shown for each of the groups (novice and expert) in the first and second column and for the entire data set in the last column.

Table 5.2 Mean proportion of target speech categories for colour talk

<i>Target categories</i>	<i>Novice</i>	<i>Expert</i>	<i>Both</i>
Basic colour terms	29.1%	30.0%	29.5%
Modified terms	8.3%	9.5%	8.9%
Object-based names	8.5%	2.2%	5.4%
Relational names	0.5%	0.7%	0.6%
Pigment names	0.8%	0.7%	0.7%
Colour theory terms	15.2%	20.0%	17.6%
Adjectives	9.1%	11.1%	10.1%
Action (verb)	6.9%	10.3%	8.6%
Disfluency	19.5%	10.3%	14.9%
Total	100.0%	100.0%	100.0%

5.2.2 Colour naming strategies

The Basic colour terms, Modified terms, Object-based names, Relational names and Pigment names in total represented almost half of all of the colour-related talk for both groups (44.6%). Both the novices and the experts frequently used the basic colour terms, and it was the category that was used most often to denote colours. All of the basic colour terms in Danish, *rød*, *blå*, *gul*, *grøn*, *lilla*, *orange*, *grå* and *brun* ('red', 'blue', 'yellow', 'green', 'purple', 'orange', 'grey' and 'brown') were mentioned at least one time during the interviews, but especially *rød*, *blå* and *gul* ('red', 'blue' and 'yellow') were mentioned often.

The second-most used of the colour naming categories was Modified colour terms and the participants in the two groups did not differ in their use of this colour naming strategy either. The category included different kinds of modifiers, mostly instances of a basic colour term and a modifier with an attributive function such as *lys blå*, *lys rød* ('light blue', 'light red'), or in compounds such as *mørkerød* ('dark red') and *lyserød* ('light red')⁶. The adjective *intens* ('intense') was often used to modify a colour term, but other attributive modifiers were also used to describe the intensity of the colour in expressions such as *stærk gul* or *kraftig gul* ('strong yellow') and *dyb rød* ('deep red'). One of the expert participants used the term *skriggul* ('bright yellow', literally 'screaming yellow'), where the noun *skrig* ('scream') was used as an

⁶ The Danish language does not have basic colour term for the shade that is denoted by the word 'pink' in English, instead the modified term *lyserød* (literally 'light red') is used. The English term *pink* is used in Danish to denote more intense pink shades than *lyserød*. This expression, however, did not occur in the data.

enforcer of the colour term. The adjectives *varm* ('warm') and *kold* ('cold') were also used as modifiers of colour terms in expressions such as *varm gul* ('warm yellow') and *kold rød* ('cold red'). Pronominal adjectives such as *noget* ('some') and *lidt* ('a little') were also used as modifiers of colour words.

The participants in the novice group used more Object-based names than the participants in the expert group. The object-based names were used to denote particular shades of colours, for example by saying *skovgrøn* ('forest green'), *laksefarvet* ('salmon colored'), or *sandfarvet* ('sand colored'). Names for shades of blue were often related to the ocean in expressions such as *havblå* ('ocean blue') or *marineblå* ('navy blue'), but the term *kongeblå* ('royal blue') was also used. Terms with a more historical background included *bordeaux* ('burgundy') and *beige* ('beige') owing their names to the colour of red wine and the French term for the natural colour of wool respectively. One of the participants referred directly to the actual object when mentioning colours by saying *frisk græs* ('fresh grass') to refer to a shade of green, but this only occurred this one time in the data.

The pigment names *cyan* and *magenta* were mentioned once by one of the novices and one of the experts. Both times, the pigment names were mentioned in relation to the CMYK colour model, which is mainly used in colour printing.

The relational order names included *gråtonede* ('grey toned') and the term *key-colour*, which is also part of the CMYK colour model.

5.2.3 Colour theory terms

The theory terms represented 17.7% of the speech categories. The experts used slightly more theory terms than the novices. The most used theory terms were *intensitet* ('intensity'), *nuance* ('nuance') and *varm/kold farve* ('warm/cold colour'). The notion of warm and cold colours is actually a metaphor used to describe shades, but as these terms were a part of the first question in the interview, they were coded as theory terms, unless they were used to modify a basic colour term. The participants also used terms such as *farvecirklen* ('the colour circle'), *primærfarve* ('primary colour'), *komplementærfarve* ('complementary colour'), *kontrast* ('contrast') and *mættethed* ('saturation'). The term *valørskala* ('value scale') was only mentioned once because it was included in one of the interview questions, and only one of the participants could explain the meaning of the term.

5.2.4 Verbs denoting actions

The speech data contained 9.2% verbs denoting actions related to colours, and the experts used more than the novices. A great deal of the verbs denoted actions related to the processing of colours as substances, such as *blander* ('mix'), *male* ('paint'), *lave* ('make'), *skabe* ('create'), *putte i* ('put in') and *tilføje* ('add'). Some of the verbs also described how colour could influence sight in a metaphorical sense in expressions such as *skærer (i øjnene)* ('glaring light', literally 'cuts in the eyes'), *irritere mine øjnene* ('irritate my eyes'). Some of the verbs described the physical property of colours as in *kaster lys på* ('cast light on') and *skinner igennem* ('shine through'). Other expressions were related to how the colours contrasted as in *stå ud* ('stand out'), *skærer mod hinanden* ('grating against each other') and *stikker ud* ('peep out').

5.2.5 Adjectives

The adjectives represented 10.1% of the data. The adjectives were used to describe colours, often indicated how the colours influenced the speaker with powerful expressions such as *kraftig*, *stærk* and *bastant* ('powerful, strong, solid') or adjectives indicating a lightness such as *svag*, *ren* and *frisk* ('faint, clean, fresh').

5.2.6 Disfluency

The category *Disfluency* accounted for 14.2% of the total number of speech categories, and the participants in the novice group exhibited more speech disfluency than the participants in the expert group. Expressions marked as disfluency included filled pauses such as *æhm* ('ehm'), repetitions of words and expressions denoting doubt such as *jeg ved det ikke* ('I don't know').

5.3 Gestures

5.3.1 Gesture functions

Table 5.3 shows the mean gesture rate for gestures with a referential and pragmatic function for the expert and the novice group respectively.

Table 5.3 Distribution of gesture functions. Mean gesture rates for referential and pragmatic gesture functions in relation to group. The last column 'Both functions' refer to the summarized functions. Gesture rates are shown as number of gestures per 100 words.

Group	Pragmatic		Referential		Both functions	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Novice	4.92	2.58	1.92	1.36	6.84	3.92
Expert	5.33	2.31	5.21	0.41	10.53	2.73
Both groups	5.14	2.20	3.71	2.02	8.85	3.64

As can be seen from the table, both groups performed gestures with both referential and pragmatic functions. In total both groups performed more pragmatic gestures than referential gestures. However, the table also shows a number of things about the distribution of the gesture functions when comparing between and within groups.

First, comparing the gesture rates between groups shows that there was not a big difference in the mean gesture rate of the pragmatic gestures for the two groups, whereas the gesture rate for the referential gestures was much higher for the experts than for the novices. As can be seen in the last row of the table, the mean gesture rate for both functions was lower for the novices (6.84) than for the experts (10.53), which implies that the participants in the expert group performed more gestures per word than the participants in the novice group.

Second, a comparison of the gesture rates within groups shows a slightly different pattern. For the expert group, the distribution of pragmatic and referential gestures is almost the same as the gesture rates for the two gesture functions are almost the same (5.33 and 5.21). However, the standard deviation is much lower for the referential (0.41) than for the pragmatic gestures (2.31), implying that the participants did not differ as much in the number of referential gestures per word. The distribution of gesture functions for the novices was much different, as the mean gesture rate was higher for the pragmatic gestures than referential gestures. In fact, the gesture rate for gestures with a referential function was very low for the participants in the novice group (1.92), and the standard deviation was high (1.36), showing a great deal of variability in the referential gesture rate between the novice participants. As an example, one of the participants in the novice group only had a mean gesture rate of 2.48 gestures, and her mean gesture rate for referential gestures was only 0.5 gestures per 100 words. The standard deviation of the referential gestures in the expert group (0.41) was smaller compared to the novices (1.36), which indicated that the differences in the gesture rate among the expert participants was smaller than for the novices.

5.3.2 Examples of gesture functions

The following two figures illustrate gestures with referential and pragmatic functions, respectively. Figure 5.1a-c shows an example of a referential gesture performed by one of the participants in the expert group (for an explanation of the gesture transcriptions see Appendix 1). The participant was explaining about the complementary colours in relation to the colour circle, and as she mentioned the colour circle, she made a circle with both of her hands in front of her head, repeating the gesture two times (which is marked by ‘/’ in the transcription). The gesture is repeated long enough to be timed with the entire utterance *den der cirkel af farver i farveteori* (‘that circle of colours in colour theory’). That way, the gesture is co-occurring exactly with the referent in speech.

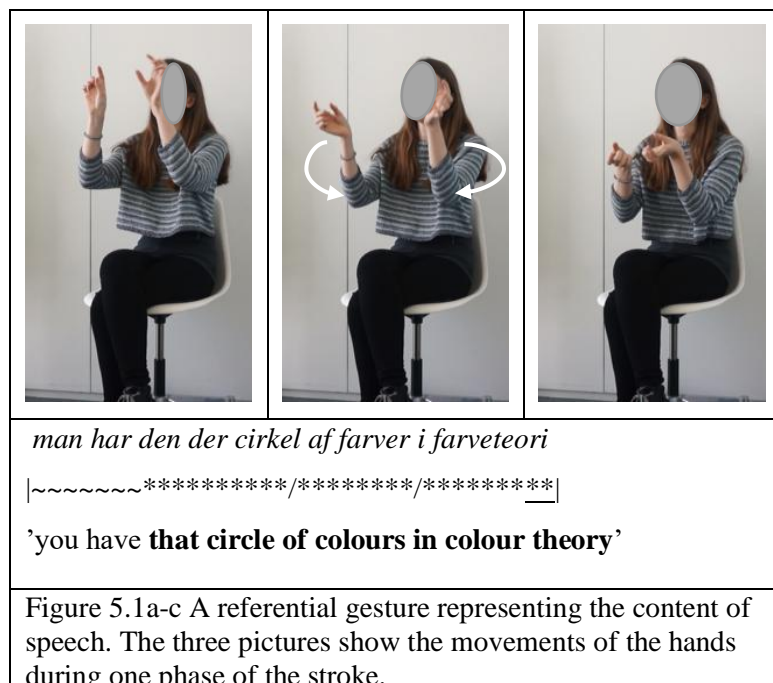
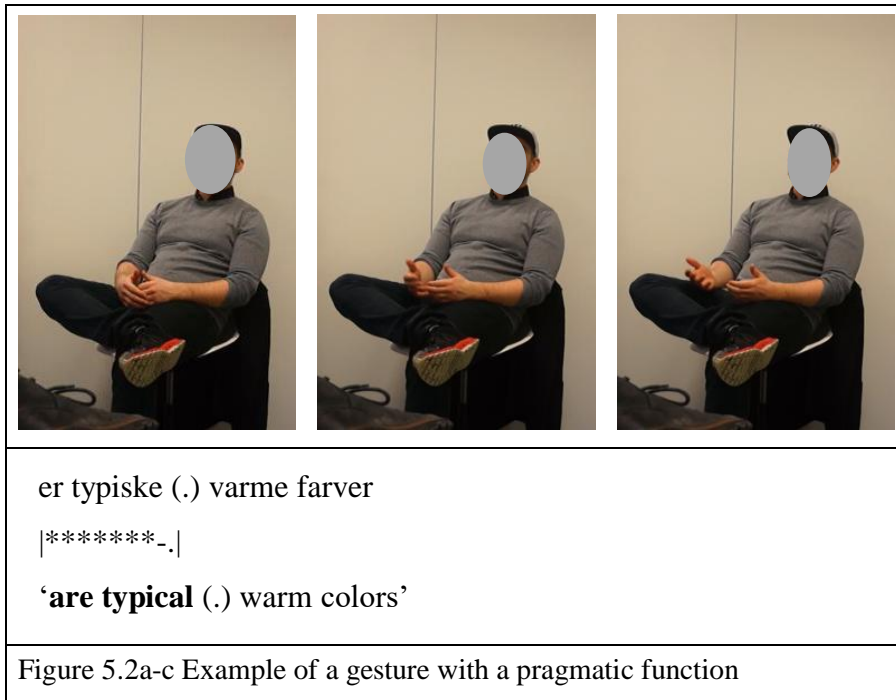


Figure 5.2 shows an example of a gesture with a pragmatic function. The movement of the gesture was small - a simple turn at the wrists, but the form was the characteristic palm-up open hand. The participant was explaining the concept ‘warm colours’ and he had just listed a number of colours as examples. Just as he uttered the first part *er typiske* (.) (‘are typical’) he flipped his hands from resting position to a palm-up orientation. Then he returned the hands to rest, paused for a bit, and uttered the remaining part *varme farver* (‘warm colours’). In this example, the participant is timing speech and gesture, such that the first part of the sentence is timed with the pragmatic gesture.



In the following sections, I will present more examples of the two gesture functions and elaborate on their relationship with speech.

5.4 Gesture and speech

5.4.1 Referential gestures and speech

Figure 5.3 shows the aggregated proportion of referential gestures and the kind of information expressed in speech during the strokes (and post-stroke holds) for novices and experts, respectively. The category *Other* contained the co-gesture speech that was not related to colour, and the category is quite large for both groups, meaning that a substantial part of the speech that did occur with referential gestures, was not related to colour talk.

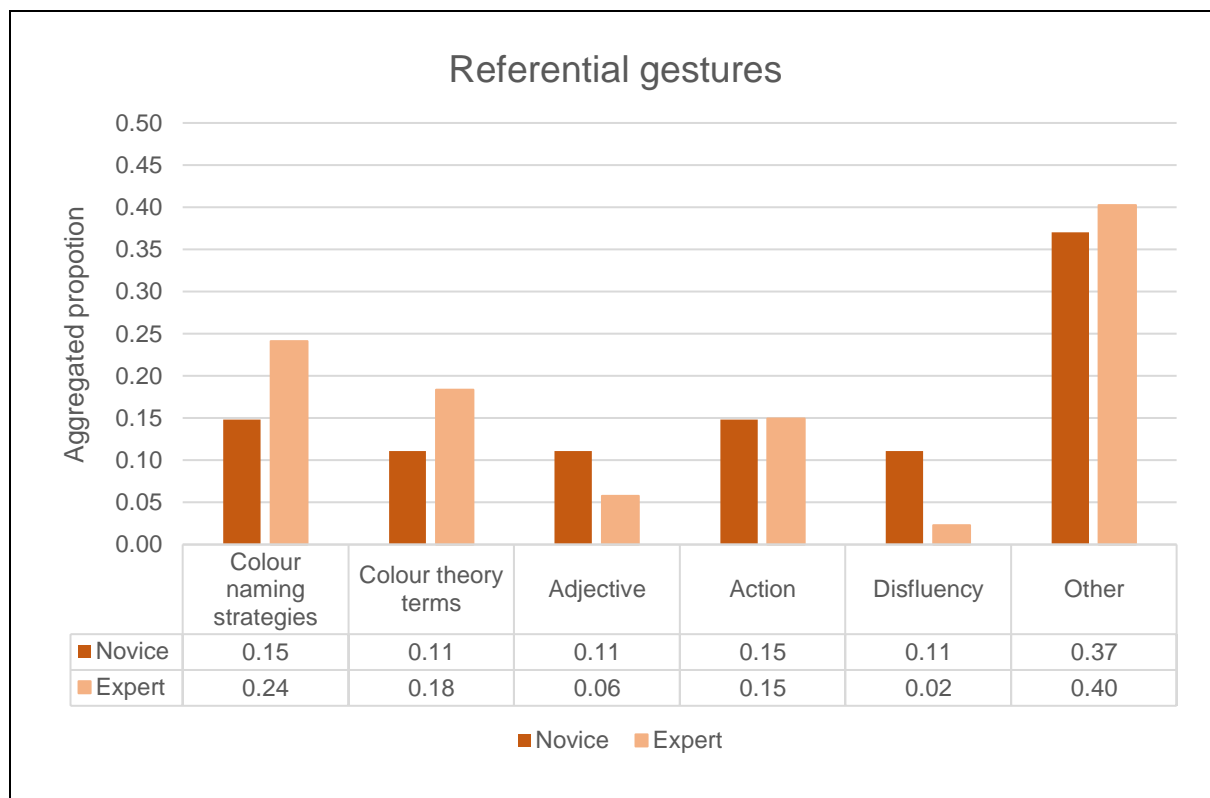


Figure 5.3 Aggregated proportion of referential gestures distributed over the speech categories for novices (dark bars) and experts (light bars).

Apart from the Other category, the two groups differed in the kind of speech that co-occurred with the referential gestures. For the experts, the referential gestures most often occurred in relation to Colour names, Colour theory terms and Verbs describing actions. The expert group almost did not produce any gestures during speech disfluencies. For the novices, there was not a big difference between the speech categories that occurred in relation gestures. They produced substantially more referential gestures during disfluencies than the experts.

Semantic overlap between speech and gesture

For the gestures with a referential function it was predicted that there would be a semantic ‘overlap’ between the semantic content of speech and the referential content of the gestures. This semantic relationship between speech and gesture was achieved in different ways. In some cases, the same information was expressed in speech and gesture, which meant that the relation between the two was characterized by a semantic redundancy. This was especially observed for colour theory terms. The concept of the colour wheel was represented iconically in gesture several times, typically with a motion that formed a circle as can be seen in Figure 5.1a-c above. This was the case for both novices and experts.



Figure 5.4 A 'specifying gesture'. A referential gesture that specifies the meaning of the verb *lave* ('make').

The referential gestures were also used to specify the content of speech. An example was the use of the verbs *lave*, *blande*, and *tilføje* ('make', 'mix' and 'add'), where the form of the action was specified in gesture. Figure 5.4 shows a participant talking about making a colour palette. While he said *hvis man skal lave en farvepalet* ('if you are going to make a colour palette') he moved his right hand in a circular motion at the wrist, holding his hand in a grip, while the left hand was held in front of the right, with the palm up and cupped. Thereby, the participant specified that the making of a palette consisted of a mixing action, which was not mentioned in speech.

Concepts from colour theory expressing opposition such as *contrast* ('contrast'), *kolde/varme farver* ('hot/cold colours') and *komplementær* ('complementarity') were often represented in gesture as situated on either side of the speaker.

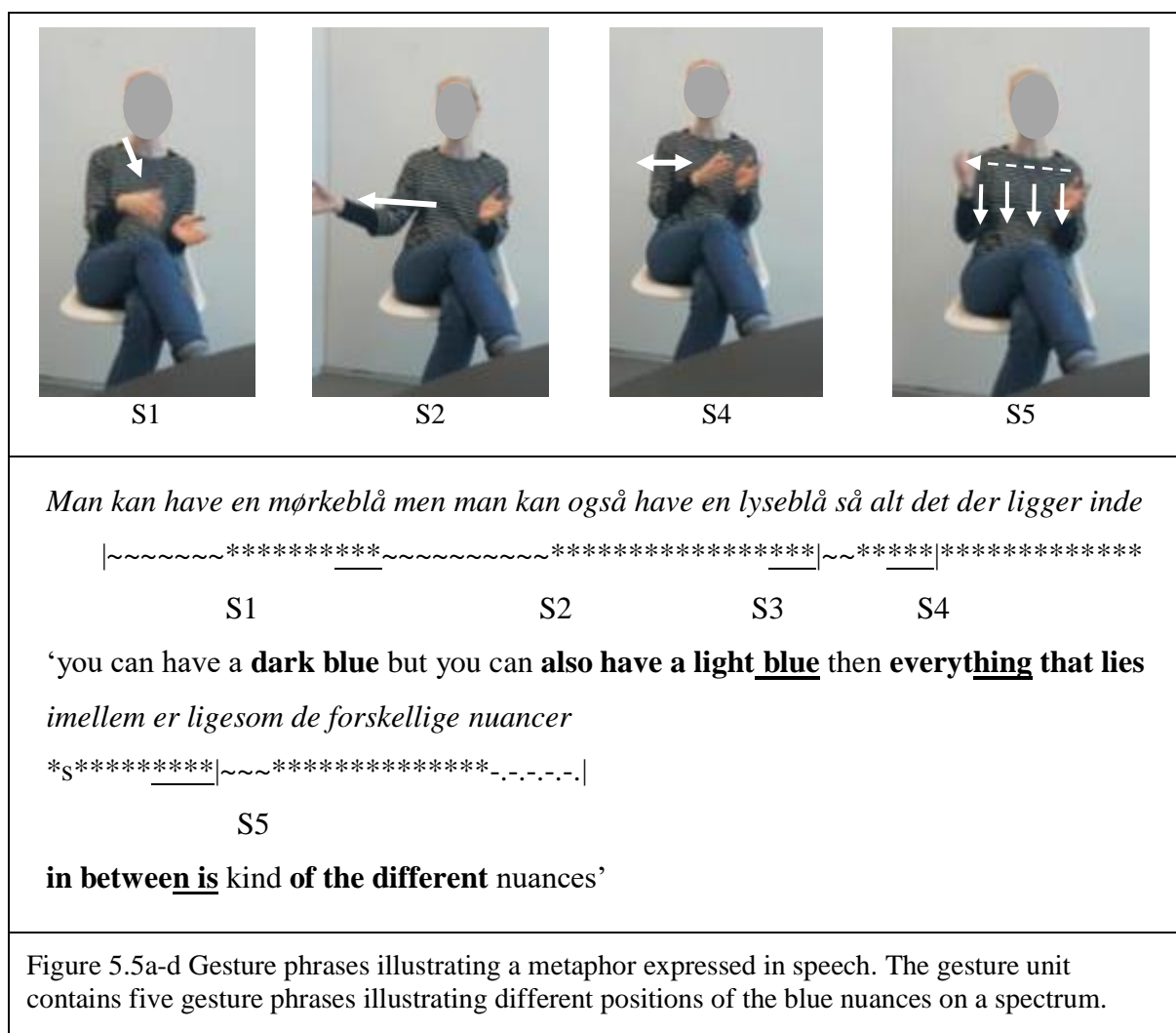
Expressing abstract content in speech and gesture

For the referential gestures that co-occurred with the colour terms for novices and experts, the gestures did not refer to the actual colour term, but to another aspect of speech.

Some of the images represented or created by the referential gestures were used in a metaphorical way. The referential gestures did not directly represent the abstract content they were referring to, but instead represented a different domain that was used to structure or stand in for the abstract concept. As such, a source domain was used to structure or stand in for the abstract target domain in speech, and this was instances of metaphor in speech and gesture.

The conduit metaphor was sometimes used to refer to the colour term, but a special case was seen in gestures expressing a spatial relationship between colour hues. Figure 5.5a-d shows an example of how a metaphor that was mentioned in speech was also represented in gesture. The participant was describing the concept of nuance in speech and using a metaphor that described the position of a light and dark shade of blue on a spectrum to illustrate the concept. The example consisted of five gesture phrases in a single gesture unit. When she mentioned the first colour term *mørkeblå* ‘dark blue’, she moved both her hands with palms facing to her left side (S1). Then she mentioned the second colour term ‘light blue’, and moved her right hand with palm lateral to the right while keeping the left hand in the same place (S2). Now she had created the image of a spectrum from the dark blue on the right to the light blue on the left in front of herself. During the third stroke (not pictured), she said *alt det* (‘everything’), while she moved both her hands up in front of the head with the palms facing upwards and a little wider than before, which represented everything on the spectrum she had just created. When she moved on to say *der ligger inde imellem* (‘that lies in between’) she moved her right hand horizontally back and forth in front of herself, referring to all the shades on the spectrum that lied in between the light and dark blue. During the last stroke (S5) she mentioned *de forskellige nuancer* ‘the different nuances’ while she made a chopping motion with the right hand, while moving it horizontally sideways. This last gesture represented all the different shades on the spectrum.

In the beginning of the gesture unit, she used gesture to illustrate and set up the spectrum, before she mentioned the placement of the colours in speech in ‘everything that lies in between’.



The data also contained examples of referential gestures expressing a metaphor that was not expressed in speech. In Figure 5.6 the participant was describing two shades of yellow. In the first stroke, he performed a small beat-like motion and placed his right hand with a pointed index finger as in the first picture while saying *varm gul* (‘warm yellow’). During the second stroke he moved his hand horizontally to the right just as he uttered the term *skriggul* (‘bright yellow’, literally ‘screaming yellow’). The form of the gesture did not directly represent the semantic content of speech, but instead it illustrated how the two modified colour terms were conceptualized as points on a spectrum from the warm yellow on the left to the bright (‘screaming’) yellow on the right.

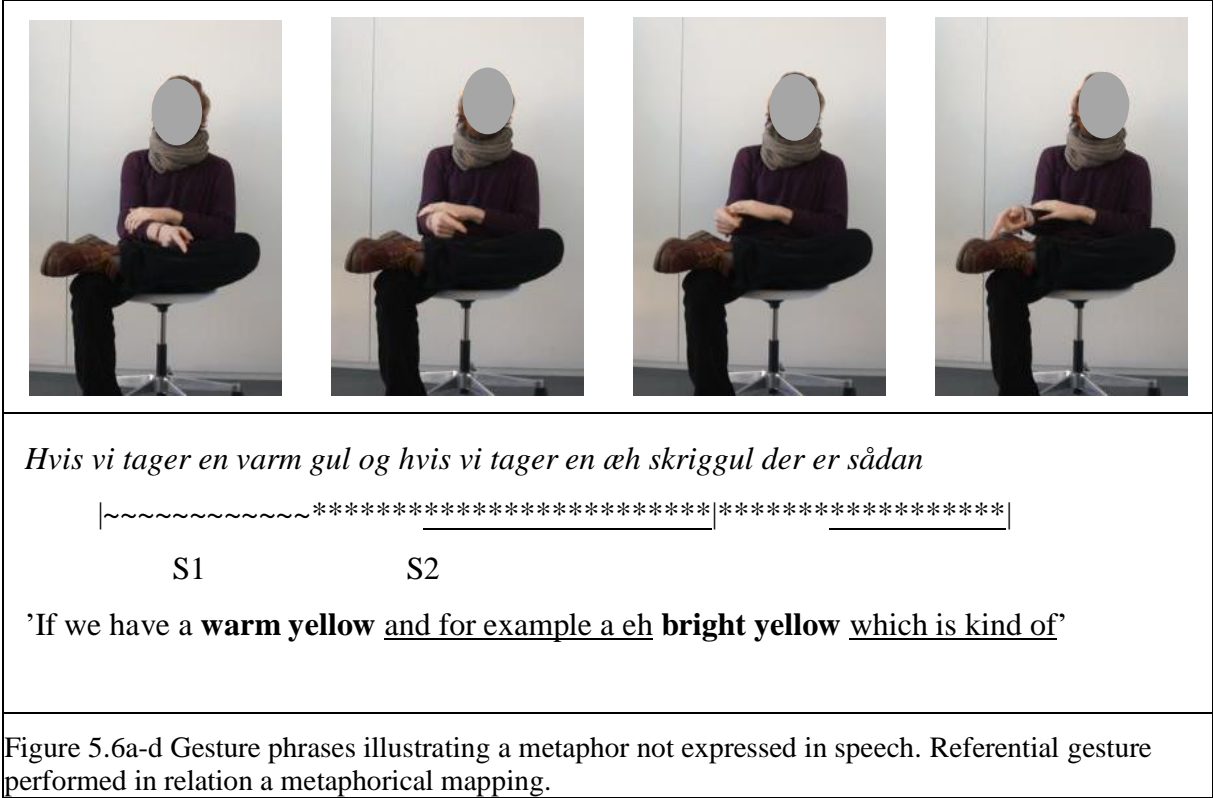


Figure 5.6a-d Gesture phrases illustrating a metaphor not expressed in speech. Referential gesture performed in relation a metaphorical mapping.

Most examples of metaphors expressed in speech and gesture were performed by the experts, but some examples were also found among the novices.

5.4.2 Pragmatic gestures and speech

Figure 5.7 shows the aggregated proportion of pragmatic gestures and the kind of information expressed in speech during the strokes (and post-stroke holds) for novices and experts, respectively. The category *Other* contained the co-gesture speech that was not related to colour, and as for the referential gestures, the category is quite large for both groups, meaning that a substantial part of the speech that did occur with referential gestures, was not related to colour talk.

The experts most often aligned pragmatic gestures with colour naming terms, colour theory terms and adjectives, and they also had very few disfluencies. The novices on the other hand, for the most part aligned gestures with a pragmatic function with colour naming terms, colour theory terms, and speech disfluency.

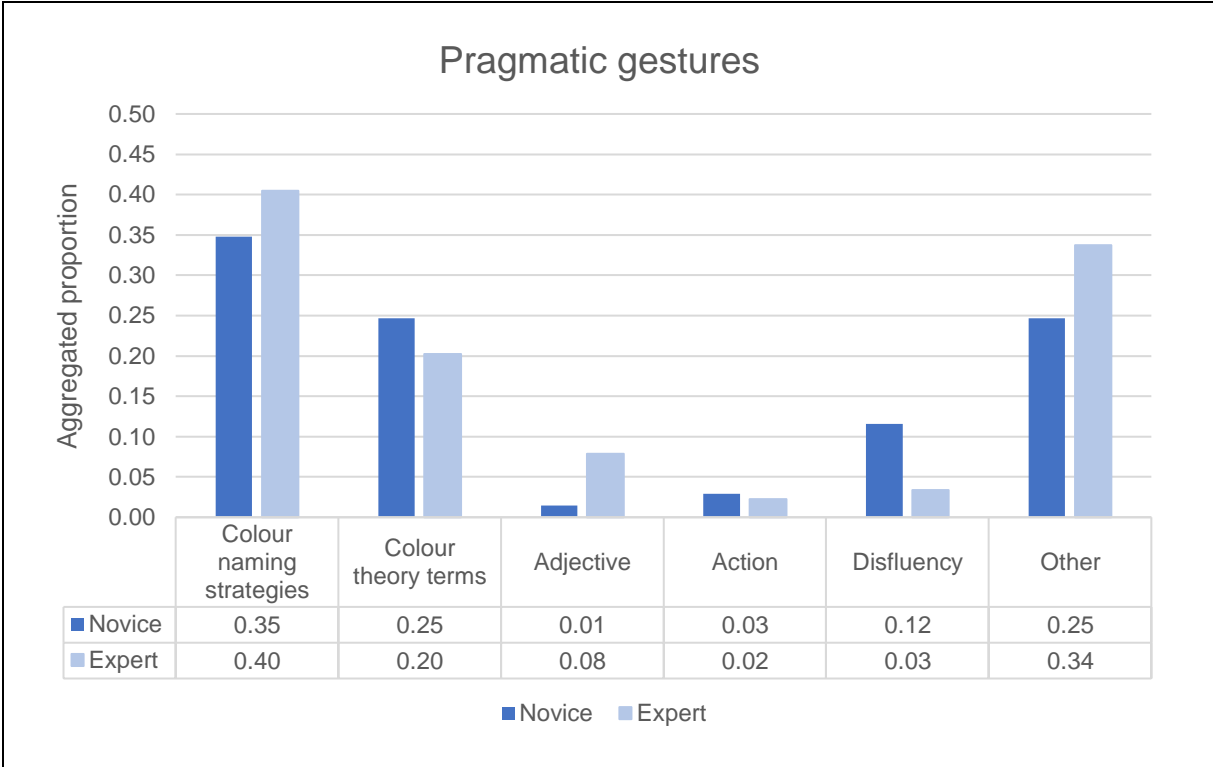


Figure 5.7 Aggregated proportion of pragmatic gestures distributed over the speech categories for novices (dark bars) and experts (light bars).

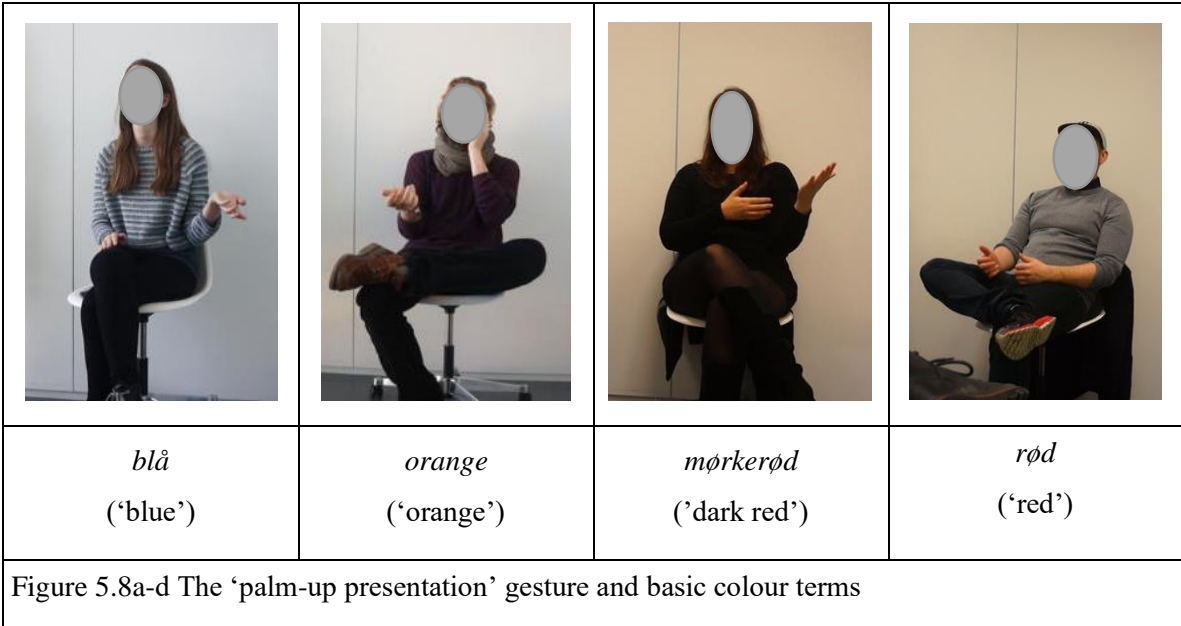
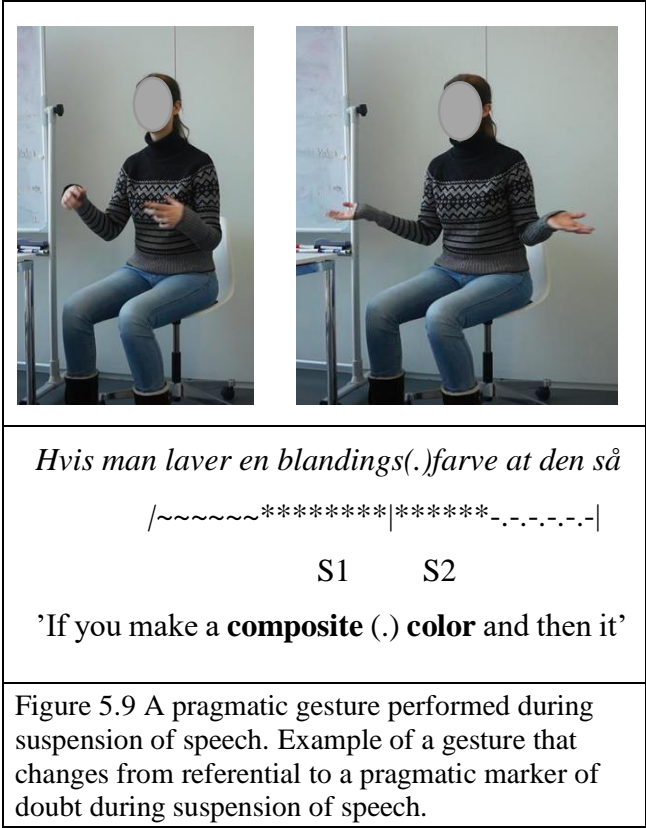


Figure 5.8a-d The ‘palm-up presentation’ gesture and basic colour terms

The semantic relationship between gesture and speech was different for the gestures with a pragmatic function compared to the gestures with a referential function. As can be seen from the graph, a large proportion of the pragmatic gestures occurred in relation to colour naming

terms. The form of the co-occurring pragmatic gestures were often cases of the ‘palm up’ gesture for both groups. Examples can be seen in Figure 5.8a-d.

The proportion of pragmatic gestures performed during disfluency was very low for the participants in the expert group. For the novices, the pragmatic gestures performed during disfluency often expressed the same content as in speech. That is, they were unsure of the content of speech or that they were struggling with their answer. This can, for example, be seen in Figure 5.9 where one of the novice participants was trying to describe the theory term *blandingsfarve* (‘composite colour’, lit. ‘mixed colour’) there was a short suspension of speech and she changed the form of the gesture. During the first part of the word (*blandings-*) she had made a referential gesture that represented the act of mixing with hands that formed a grip and rotation at the wrist (S1), then she stopped speaking, and as she uttered the rest of the term (*-farve*) she moved her hands to palm up position (S2). The suspension of speech suggested doubt about what she was saying, and this was also expressed by the co-occurring pragmatic gesture.



Pragmatic gestures with a bi-phasic movement of the hand(s) or arms, such as in-out, up-down often functioned as emphasize of the co-expressed segment of speech. This was evident for both groups.

6. Discussion

6.1 Summary of results

This study examined how Danish speakers with novice and expertise knowledge of colour and colour theory speak and gesture about this topic by investigating the functional distribution of gestures and the semantic relationship between speech and gesture during ‘colour talk’. The key findings of the study can be summarized in four points:

First, during ‘colour talk’, almost half of the speech consisted of colour naming terms in both groups (novices and experts). As predicted, it was the basic colour terms (e.g. *gul* (‘yellow’), *blå* (‘blue’), *rød* (‘red’)) and modified basic colour terms (e.g. *mørkerød* (‘dark red’), *lyseblå* (‘light blue’)) that were used most often to denote colours. Contrary to the predictions, other colour naming strategies were used sparsely, and there were no major differences between the experts and the novices in relation to the use of relational based terms. The subjects with novice expertise used considerably more object-based names (e.g. *kongeblå* (‘royal blue’)) than the experts, which was not predicted. Both groups used colour theory terms (e.g. *farvehjulet*, (‘the colour wheel’), *komplementærfarver* (‘complementary colours’)) frequently, but the experts used them more than the novices. The prediction concerning disfluency was also confirmed, such that the novices produced more speech disfluencies than the experts.

Second, the distribution of the functions of the gestures that occurred with colour talk followed the predictions. The function of the gestures produced by all the participants was predominantly pragmatic, as predicted, and the novices produced more pragmatic gestures than referential gestures, as was also predicted. In addition, the results showed that there was almost no difference in the number of pragmatic and referential gestures during colour talk for the expert group, which was not predicted.

Third, the overlap between referential gestures and the semantic content of speech during colour talk was in line with the predictions. The referential gestures often represented the same semantic content as expressed in speech, and they were also used to specify the meaning of the content of speech as for example a verb. Additionally, abstract notions such as colour theory terms, colour hues and their conceptualization that were sometimes expressed metaphorically in speech were also represented metaphorically in the co-occurring gestures, and sometimes the metaphors were even expressed in gesture alone. This use of metaphor in gesture occurred more often for the experts than for the novices.

Fourth, for the semantic relationship between speech and gestures with a pragmatic function, as predicted, the pragmatic gestures often occurred in relation to speech disfluency. This happened most often for the novice participants and especially during the breakdown of speech. The form of gestures performed by the novices during disfluency were lax and repeated as predicted, whereas the experts more often positioned their hand in a hold during speech disfluencies. The ‘palm up open hand’ gesture was often used for both groups in relation to speech that, for example, presented a colour name or a colour theory term.

6.2 Speech

The finding that both groups primarily used basic colour terms for denoting colours followed the first prediction and all the basic colour terms in Danish were mentioned at least once during the interviews. The primary colours *rød*, *blå* and *gul* (‘red’, ‘blue’ and ‘yellow’) which are also basic colour terms in Danish, were the colour terms that were used most often. This may be due to the subject of the interview and that the participants were asked to name the primary colours in one of the interview questions. According to Plümacher (2007), using basic colours is the most common way of referring to colours in everyday situations. The frequent use of these terms thus corroborates the notion of some terms being more basic or frequent than others, at least in a culture where the speakers’ colour conceptualization is equal to the one represented by the Munsell colour chart used in the study by Berlin and Kay (1969/1991).

As was also predicted, the second most common way of referring to shades of colours for both groups was a combination of a modifier and a basic colour term. Many of the modifiers had an attributive function both in compounds such as *lyserød* (‘pink’ lit. ‘light red’) and in phrases such as *mørk blå* (‘dark blue’). This way of modifying with attributes such as ‘light’ or ‘dark’ is a standard way to modify colour terms in everyday language according to Plümacher (2007). Some of the modifiers did not have an attributive function but were used in the sense ‘non-individuated’. These modifiers (pronominal adjectives) such as *lidt* and *noget* (‘a little’ and ‘some’) meant that the colour was referred to as a substance or object (e.g. *lidt rødt* (‘a little bit of red’)). This way of modifying is a case of a special use of semantic gender, in Danish (E. Hansen & Heltoft, 2011) and the meaning can be interpreted in the same way as the category named ‘colour words used as nouns’ in a study of colour terms used in painting descriptions in English by Anishchanka (2007).

The rest of the colour naming strategies/terms were used sparsely. The finding that object-based names such as *marineblå* (‘navy blue’) were mostly used by the novices can be explained

by the way they described colour terms and theory terms. The novices mostly used their knowledge of the world and an everyday life to answer the questions in the interview. Therefore, they would mention or describe the object that carried the colour they were referring to, such as an orange vest or traffic cone, when asked to come up with examples of colours. The experts also used examples from everyday life to illustrate colours and concepts, one of the experts for example used the camera and the white walls as an example when explaining contrast. However, they also talked more about how to handle colours as substances, which was exemplified by the finding that they used higher proportion of verbs denoting actions.

Plümacher (2007) defines this object-based colour naming strategy as “pointing to the prototypical colour of a well-known object” (p. 66). In Plümacher’s case, the pointing that is being referred to is most likely a function of speech and not the manual action performed by a gesture. In the current study, the participants only had the option to use speech to denote prototypical colours, since the environment was as ‘colourless’ as possible. In future studies, it could be interesting to see if this pointing function that is embedded in object-based names would also be evident in pointing gestures, and how the relationship between speech and gesture would be, if the participants had access to colours in the environment.

Some of the colour names, such as *bordeaux* or *beige*, were coded as object-based because they originated in French object-based colour terms. In Danish, these colour names seem to be more lexicalized than referring to prototypical colours of objects, as there are possibly very few people who think of the prototypical colour of undyed wool when mentioning *beige* in Danish (*beige*, n.d.). These lexicalized, non-basic terms present an example of how object-based names can be both lexicalized and borrowed from other languages. This lexicalization of colour names is not mentioned in any of the different strategies mentioned by Plümacher (2007), but it seems reasonably to include it.

The remaining strategies for naming colours were rarely used by either group. Contrary to the predictions the expert participants used very few relational order terms (e.g. *gråtonede* (‘grey toned’)). This was surprising, since it was expected that they would have used their knowledge of the relational order of colours, maybe even in instances where the novice participants used object-based names. Most of the relational-based names in the data referred to the CMYK-model - a colour model used for printing with expressions such as *cyan* and *magenta* (‘cyan’ and ‘magenta’). This very likely reflected that two of the expert participants had a background in graphic design, and even though the expert participants had all been trained in the classical colour theory during their education, the focus of their education had mostly

been on graphics and computer-related subjects. Another possibility is that the relational based terms are more ‘technical’ and therefore they are used to specify colours in contexts where the interlocutors are sure of each other’s knowledge of the colour model that is referred to. This could for example be investigated by examining the discourse between professionals talking about colours.

As predicted, there were more cases of speech disfluency in the novice group, which is in line with the literature on familiarity on a topic and speech disfluencies (Smith & Clark, 1993)

6.3 Gesture



6.3.1 Referential gestures and speech

The research question probed the semantic relationship between speech and referential gestures. The investigation of gestures in relation to colour is a challenge because colour is a very abstract subject and therefore has no structure or content that can be referred to. Especially the semantic relationship between speech and gestures with a referential function during colour talk is interesting, since colour terms have no structure that can be represented iconically or referred to as one would expect from referential gestures.

For the gestures with a referential function it was predicted that the semantic relationship between speech and gesture would consist of a semantic ‘overlap’ between co-occurring speech and gesture. For most of the referential gestures the relationship was as predicted, and the semantic overlap consisted of iconic representations or specifications of the semantic content of speech. This use of referential gestures to represent or specify the propositional content of speech, is in accordance with the contributions that referential gestures can make to the utterance as described by Kendon (2004). Importantly, such content was not typically basic colour terms, but rather of concrete notions or actions. An example of a gesture illustrating co-occurring speech can be seen in Figure 6.1-b. One of the expert participants was describing how they had to add white paint to red paint to create a value scale. Her right hand is shaped as a downwards facing *grappolo*⁷ hand, as if she was holding precisely onto something, and as she uttered the verb phrase *putte lidt hvid i* (‘add some whitee’, lit. ‘put some white in’), she moved her hand down. The precise grip illustrated by the handshape can be interpreted as an indication

⁷ I have borrowed the term to refer to the gesture form from Kendon (2004, p. 229), who describes this ‘purse-shaped’ finger bunch.

of the meticulousness involved in gradually adding a small amount of white paint. As such, the gesture did not represent any of the colour shades expressed in speech, but rather specified the action described by the co-occurring verb.

	
<p><i>hvis vi havde en rød farve så skulle vi hele tiden putte lidt hvid i</i> ~~~~~ ***** . - ‘if we had a red colour then we gradually had to add some white’ (literally ‘put some white in’)</p>	
<p>Figure 6.1a-b A referential gesture illustrating the meaning of speech</p>	

For some of the more abstract content of speech and gesture, such as colour hues, the relationship with gesture was less straightforward. It was not possible to represent the colour terms and most of the theory terms and adjectives expressed in speech iconically in gesture, because of how abstract they were. Nonetheless, the results showed, that some of these abstract concepts were co-occurring with referential gestures. A closer look at these instances revealed that for some of the referential gestures, the speakers used metaphors to help structure the abstract content of the utterances. The semantic relationship between speech and gesture with a referential function was thus also characterized by the expression of metaphor. According to Cienki (2008), the referential gestures and speech have different ways of relating to each other, which was also the case in this data. The metaphor could be expressed concurrently in the two modalities, where a source domain, such as a spatial ordering of colours on a spectrum was expressed in speech and the gesture represented an image of the source domain, the spectrum.

as colour terms, colour theory terms and adjectives than the novices. They thus had more possibilities for producing metaphors in gesture. A study by Holler and Wilkin (2009) showed that speakers produce more gestures representing the content of speech when the interlocutors share common ground. A part of the large proportion of referential gestures performed by the experts could then be explained by a feeling of common ground or shared knowledge with the interviewer, causing the experts to represent some of the semantic information in gestures instead of in speech. This explanation is tentative, and further research in how expertise might influence gesture use is needed.

6.3.2 Pragmatic gestures and speech

For the most part, the semantic relationship between speech and pragmatic gestures was as predicted. However, the finding that colour names and colour theory names often occurred with gestures characterized as ‘palm-up open hand’ gestures, where the open hand is presented to or addressed at the listener, was not predicted. Examples of the palm-up open hand gesture can be seen in Figure 6.2a-c. The movement of the gestures were all directed towards the interviewer and the handshape was somewhat lax but facing upwards. As can be seen from Figure 6.3c, the gesture could also be performed with both hands. The gestures all occurred with stretches of speech that presented an explanation or a theory term.







		
<p><i>den er behagelig modsat</i> ~***** 'it is pleasant <u>contrary to</u>'</p>	<p><i>så er det jo også en nuance</i> ~*****.-. 'then that is also a nuance'</p>	<p><i>er sådan ligesom grundfarverne</i> ~***** 'are kind of like the primary colors'</p>

Figure 6.2a-c Three examples of the palm up open hand gesture.

The frequent use of the palm up gesture might be explained by the form of the elicitation task and the interpretation of the function of the gesture form. The task was structured as an

interview, where the participants had to explain colour terms and come up with examples of colours. Sometimes the interview could almost appear similar to an examination, where the interviewer was demanding answers to questions about colour theory from the participants. A substantial part of the utterances thus consisted of explanations or clarifications of colour terms or listings of colour names and these performative utterances were often accompanied by palm up open hand gestures. According to Kendon (2004) and Cooperrider et al. (2018), the gesture form characterized as the palm up open hand can function as an offering or presentation of the co-occurring speech segment and the use of this gesture form thus was in line with how it is described in the literature.

The finding that speech that contained disfluency or hesitation often occurred with pragmatic gestures confirmed the predictions. During instances of suspension of speech, the novices were most likely to keep gesturing whereas the experts often kept the hands in a hold during speech suspension or hesitation. This finding is in line with the literature on speech disfluency and gesture (Graziano & Gullberg, 2018; Seyfeddinipur & Kita, 2001). The pragmatic gestures produced by the novices during disfluencies often consisted of a repeated motion that continued a short while after the suspension of speech before the gesture was also suspended. An example of this can be seen in Figure 6.3, showing a speech disfluency. The suspension of speech happened during the second stroke, but the participant proceeded with the gesture stroke for a little while until he dropped both hands on the lap (Fig. 6.4c) and then finished the sentence without gesturing. This prolonging of the gesture stroke is not supported by the studies on disfluency and gesture, which claim that suspension and resumption of speech and gesture is temporally coordinated (Seyfeddinipur & Kita, 2001). However, according to Graziano and Gullberg (2018), the gestures occurring during disfluencies can be interpreted as a comment on the breakdown of speech. Alternatively, they can also be interpreted as production-oriented, signalling a process of ongoing word-searching as suggested by McNeill (1985). Although, in the context of the current study, the latter seems unlikely, since none of the gestures were repeated until the resumption of speech. Instead, they were quickly abandoned after the suspension of speech.

		
S1	S2	'breakdown'
en brun f.eks. sådan en en der er sådan (...) ja (.) tæt i det ***** ~*****-_ S1 S2 'a brown for example one one that sort of is (...) yeah (.) dense in a way'		
Figure 6.3a-c Pragmatic gesture during suspension of speech. Example of how a pragmatic gesture continues but then stops during the breakdown of speech.		

The finding that pragmatic gestures were used as intensifiers or co-occurring with segments of speech such as negative statements is supported by the description of pragmatic gestures functions by Kendon (2004) as well as the bi-phasic gestures described as *beats* by McNeill (1992).

The gesture and speech data in this study suggest that the gesture functions produced while speaking about a very abstract subject can be influenced by the speaker's knowledge of the subject of the conversation. If speakers have more expertise on a subject, they produce more referential gestures, and when they have no expertise on the subject they are talking about and the subject is very abstract, speakers may be more prone to use gestures with a pragmatic function. This result can be explained by two things: First, the lack of structure in the abstract subject of colour makes it difficult to represent in gesture, which means that there will be less semantic information that can be referred to in gesture during colour talk (Cienki, 2008). The referential gestures that *do* occur in relation to abstract colour talk are often representing a conceptual metaphor that might also expressed in speech at the same time. Second, the pragmatic gestures that are produced during colour talk often seem to emphasize or present the co-occurring speech to the listener, irrespectively of the expertise of the speaker. If a speaker has no expertise on the subject, the pragmatic gestures performed are often used to comment

on the speech disfluency. Nonetheless, both groups produced disfluencies and hesitations which shows that colour is difficult to talk about, even if you have been trained to do so.

6.4 Generalizability

The generalizability of the study was influenced by three major factors: The elicitation task, the language used by the participants in the study, and the small sample size. In the following section I will discuss all three factors, before moving on to the implications of the results of the study.

In order to keep the gesture elicitation procedure as similar as possible for all participants, it was carried out as a structured interview. This kind of conversation produces a certain type of discourse, mainly because the interviewer is not allowed to engage in a proper conversation and must follow a script. According to Beattie and Aboudan (1994), the social context, and especially dialogue, has a positive effect on the frequency of gestures, and the limitations on the discourse setting might have had an influence on the dialogue and the gesture rate. Therefore, it will be necessary to investigate the use of gesture in relation to colour talk in different settings in future studies. This could, for example, be lectures on colour-related subjects or conversations between two or more subjects in an experimental setting, to still be able to control for extraneous variables. It will also be necessary to discuss/define what constitutes ‘colour talk’ in future studies, since it is a property that is present in many forms in the surroundings. In the present study, the main subject of the task was ‘classical’ colour theory terms and examples of colours in relation to the terms. If the questions of the study had focused on paint terms or technical colour terms used for printers, the results of the study had most likely been different.

The language used in the study as well as the colour conceptualization of the Danish culture also has an effect on the generalizability of the study. The Danish language has 10 basic colour categories, and therefore the results of the study might be generalizable to other ‘high level’ language communities on this aspect. The conceptualization of colours in the language community is most important in terms of the generalizability of the study. I do not expect the results of the study to be replicable in communities where colour is conceptualized in less industrialized terms.

The small number of participants also needs to be mentioned, because it has an effect on the generalizability. The small sample size meant that individual gestural behaviour for each participant had a bigger effect on the results than it would have had if the sample size had been

larger. The mean gesture rate among the novices for example, varied greatly because of their different behaviour. The small sample size also meant that I was not able to infer anything about the distribution of the results and I was not able to perform any form of inferential statistics, since the size was even too small for any non-parametric test to yield any significant results.

7. Conclusion

The aim of this study was to investigate an abstract subject that had not been investigated in gesture before and look at gesture functions and expertise which are not usually included in studies on abstract subjects and gesture. The findings show that people perform gestures with both referential and pragmatic gesture functions during talk about an abstract subject, which challenges the ‘neglect’ of referential gestures in research on abstract content and gesture.

The finding that metaphors were used to express organization of colours in speech and gesture suggests that gestures should also be taken into consideration when studying language about very abstract topics, because they can help reveal or illuminate the conceptualization of the seemingly structureless or immaterial content of abstract subjects. Likewise, linguists who study colour naming, should consider incorporating gestures into their research, in order to be able to fully investigate the use and context of the terms they are assessing.

The findings also showed that the speaker’s knowledge of the topic might have an influence on the functions of the gestures that are performed, which also suggests that the expertise of the participants should be assessed especially in gesture studies, but also in colour studies and linguistics in general.

In conclusion, this exploratory study has shown that it is possible to investigate gesture and speech in relation to a very abstract concept such as colour, which presents a valuable contribution to research on gesture and abstract subjects.

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Appendix 1: Transcribing gestures

When transcribing gestures, I follow Kendon (2004, p. 363). | marks the boundaries of a gesture phrase, ~~~ marks a preparation phase, *** marks a stroke, -.-. marks the recovery phase, an underlined section (~ or **) marks a hold and / marks two phases within a stroke. The gesture strokes are numbered S1, S2 Sn...

The gesture strokes are lined up with the accompanying speech in Danish and the co-occurring speech is marked in boldface in the English transcriptions.

Appendix 2: Consent form

(Original version)

Erklæring om samtykke

Jeg erklærer hermed, at jeg giver mit samtykke til at deltage i et interview i forbindelse med Thit Leonora Amsens speciale. Interviewet er en del af en empirisk indsamling der skal bruges til Thits speciale på en kandidatuddannelse på Lunds Universitet.

Jeg er informeret om og indforstået med:

1. At min deltagelse i interviewet er frivillig, og at jeg til enhver tid kan trække mit samtykke tilbage og udgå af undersøgelsen.
2. At interviewet er anonymt, og det betyder, at jeg ikke nævnes ved navn eller på anden måde kan genkendes i interviewet eller i det materiale, der bruges i specialet.
3. At interviewet vil blive filmet med henblik på transskribering, og at optagelsen vil blive opbevaret sikkert og forsvarligt.
4. At alt materiale udover selve specialet og transskriberinger brugt som bilag, destrueres efter anvendelse.

Jeg har modtaget både skriftlig og mundtlig information om undersøgelsen.

Dato: _____

Underskrift: _____

Venlig hilsen

Thit Leonora Amsen

Stud.cand.mag

(English translation)

Consent form

I hereby declare, that I give my consent to participate in an interview in connection with Thit Leonora Amsen's Master thesis. The interview is a part of the data collection for Thit's thesis paper for her MA in Language and Linguistics at Lund University.

I have been informed about and I agree to the following:

1. That my participation in the interview is voluntary, and that I can withdraw my consent at any time.
2. That my participation in the interview is anonymous, which means that my name will not be mentioned and that I will not be recognizable in the material that will be used in the thesis paper.
3. That the interview will be video recorded and transcribed and that the recording will be kept securely.
4. That all of the data obtained from the interview, apart from the material that is used in the thesis paper, will be destroyed after use.

I have received both written and oral information about the interview.

Date: _____

Signature: _____

Best regards

Thit Leonora Amsen

Stud.cand.mag

Appendix 3: Interview guide

(Original version)

Interview guide

Indledning

(Thit er i rummet)

Respondenten bliver budt velkommen. Der sørges for at respondenterne sidder behageligt i stolen og at intet skygger for kameraets udsyn til personen.

1. Velkomst

Først vil jeg give lidt information om, hvordan det hele skal foregå, og emnet vi skal tale om:

2. Kort info om interviewet og emnet

Jeg vil stille dig nogle spørgsmål om farver og du kan svare som du har lyst. Det vil tage ca. 15 minutter at gennemføre, men du kan frit stoppe interviewet og trække din deltagelse tilbage, hvis du har lyst.

3. Kort info om baggrunden:

Interviewet indgår som en del af dataindsamlingen i forbindelse med Thits afsluttende opgave på hendes kandidatuddannelse på Lunds Universitet.

4. Info om optagelse

Interviewet vil blive optaget, men filmen vil ikke blive udgivet og din deltagelse vil være anonym. Alt materiale vil altså blive slettet efter afleveringen af specialet. Er du underforstået med dette?

5. Samtykkeerklæring

Nu vil jeg bede dig om at gennemlæse denne samtykkeerklæring og derefter skrive under, hvis du er indforstået med det, der står.

6. Spørgsmål?

Har du nogle spørgsmål, før vi går videre?

Opvarmning

Afslappende opvarmning hvor kameraet ikke er tændt (smalltalk for at få personen til at slappe af)

- Vejret (regn, blæst, varmt, koldt)
- Hvordan var turen herhen?
- Var det svært at finde lokalet?

Thit tænder kameraet og forlader rummet

To opvarmningsspørgsmål

- a. Jeg vil gerne starte med at bede dig om at beskrive farverne i det rum, vi sidder i. Du kan både komme ind på nuancerne, lyset, intensiteten eller andre aspekter, som du har lyst til.
- b. *Hvad er din yndlingsfarve og hvorfor er den det?*
 - i. **HVIS SVAR NEJ/INGEN:** Der må være en farve som du godt kan lide eller slet ikke kan lide?
 - ii. **HVIS KORT SVAR:** Kan du forklare hvorfor?

Interview

Nu stiller jeg nogle spørgsmål om forskellige begreber inden for farveteori. Du skal bare svare så godt du kan, og der er ikke noget svar, der er rigtigt eller forkert. Men jeg kan godt finde på at bede dig om at uddybe dit svar og måske stiller jeg lidt de samme spørgsmål. Det er fordi jeg gerne vil have det hele med.

Spørgsmål om farveteori

1. Hvad mener man, når man siger at en farve er kold eller varm?
2. Kan du forklare hvad primærfarver er, og kan du komme med nogle eksempler?
3. Kan du forklare, hvad nuancen af en farve betyder? Du må gerne komme med eksempler når du forklarer.
4. Hvad tror du, man mener, når man taler om intensiteten af en farve?
5. Kan du komme med nogle eksempler på farver der er intense?
6. Hvad betyder det, når man taler om kontrasten mellem farver, og kan du komme med nogle eksempler?
7. Hvad betyder det, når man taler om komplementærfarver, og kan du komme med nogle eksempler?
8. Hvad betyder det at en farve er mættet og kan du komme med eksempler på mættede farver?
9. Hvad mener man, når man taler om en farves valør?

Afslutning

Før vi runder af, vil jeg gerne stille nogle spørgsmål der handler om dig.

1. Hvad er din alder?
2. Hvad laver du til daglig?
 - a. Hvad studerer du?
 - b. **HVIS ARBEJDER:** Hvad har du studeret?
3. Er dansk dit førstesprog altså det, nogen kalder modersmål?
 - a. Taler du andre sprog flydende?
4. Hvor er du født og opvokset?
5. Beskæftiger du dig med farver i din fritid såsom at male, tegne eller andet eller er du blevet undervist i det?

Vi er næsten færdige med interviewet, men først vil jeg gerne spørge dig, hvad du tror at interviewet handlede om?

Har du nogen spørgsmål her til sidst?

Det var det hele.

Mange tak for hjælpen!

Noter

English translation

Interview guide

Introduction

(Thit is in the room)

The participant is greeted. Make sure that the participant is properly seated and that nothing is covering the view of the camera

1. Welcome

First, I am going to give some information about how the interview will take place and the subject we will be talking about.

2. Short info about the subject

I am going to ask you some questions about colours and you can answer how you want. The interview will last for approx. 15 minutes, but you can stop the interview and withdraw your participation at any time.

3. Short info about the context of the interview

The interview is a part of the data collection in connection with Thit's master thesis on her MA at Lund University.

4. Info om optagelse

The interview will be video recorded, but the video will not be published, and your participation will be anonymous. All of the data will be deleted after the paper has been handed in. Do you agree to this?

5. Samtykkeerklæring

Then I would like to ask you to read and sign the consent form.

6. Spørgsmål?

Do you have any questions before we move on?

Warm-up

Relaxing warm-up phase before the camera is turned on. Smalltalk about subjects such as:

- The weather
- The trip to the room
- Was it difficult to find the room?

The camera is turned on and Thit leaves the room

Two questions for warming-up

- a. I would like to start by asking you to describe the colours in the room we are sitting in. You can talk about the nuances, light, intensity or other aspects as you like.
- b. Which colour is your favourite colour and why?
 - iii. **IF ANSWER "NO"/"NONE"**: Do you have a colour you prefer from other colours?
 - iv. **IF SHORT ANSWER**: Can you explain why?

Interview

Now I would like to ask you some questions about colours theory. All you need to do is to give your best answer, and there are no right or wrong answers. I may ask you to elaborate on your answer and maybe some of the questions may seem a bit identical. This is because I want to be thorough.

Questions about colour theory

- a. What does it mean when you say a colour is cold or warm?
- b. Can you explain what the primary colours are, and can you give some examples?
- c. Please explain what the nuance of a colour is and please give some examples of colours while you explain.
- d. What do you think is meant by the intensity of a colour?
 - o Please give some examples of intense colours.
- e. What does it mean to talk about contrasts between colours, and can you give some examples?
- f. What does the term complementary colours mean, and can you give me some examples?
- g. What does it mean when you say that a colour is saturated, and can you give me some examples of colours that are saturated?
- h. What is meant by the value of a colour?

End part

Before we finish, I would like to ask some questions about you.

1. How old are you?
2. What is your occupation?
 - a. **IF STUDENT:** What are you studying?
 - b. **IF WORKING:**
 - i. What is your job title?
 - ii. What subject did you study?
3. Is Danish your native language?
 - a. Are there any other languages you speak fluently?
4. What is your birthplace and live for most of your life?
5. Do you spend your free time painting, drawing or anything related to colours?

We are almost done with the interview, but first I would like to ask you, what you think the interview was about?

Do you have any last questions?

That's all!

Thank you very much for your help

Notes