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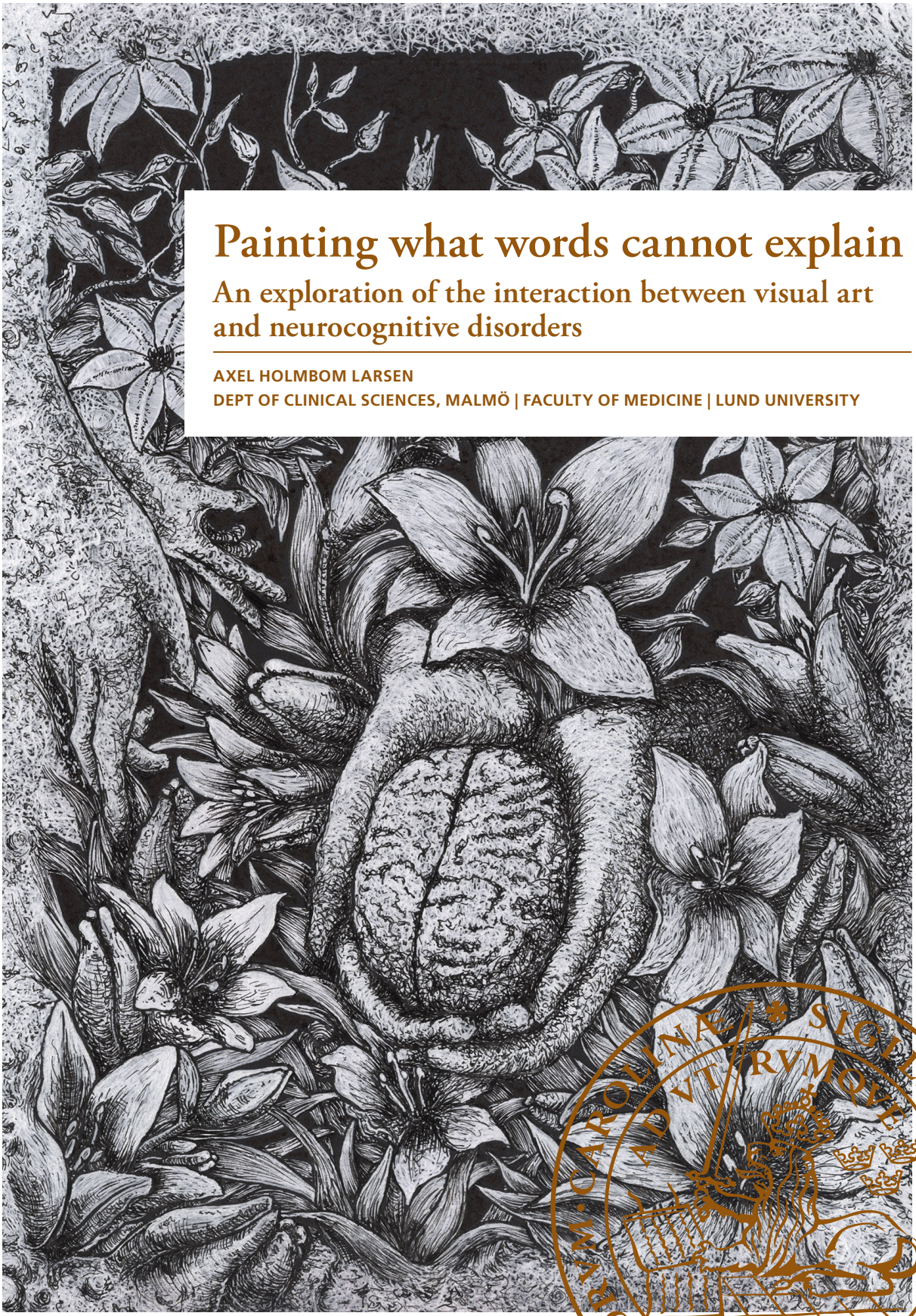

Painting what words cannot explain

An exploration of the interaction between visual art and neurocognitive disorders

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Painting what words cannot explain

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An exploration of the interaction between visual art and neurocognitive disorders

Axel Holmbom Larsen

LUNDS UNIVERSITET

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Method: This research has a qualitative approach, through interviews, active observations and analysis of the visual artists artwork before and after diagnosis of AD.

Results: For the educated visual artist the creative expression and production continue, provided that some practical preparations were made, far beyond when the conventional cognitive testing assumed total loss of function. A decade before diagnosis of AD art critics could identify changes in the creative expression of the artist.

For the group of creative novices some participants experienced increased cognitive abilities in their everyday life after partaking in a selection of creative challenges, with novelty, limit of scope and inspiration from current art exhibitions and their techniques.

Conclusion: From a neurocognitive perspective, visual art and creativity could bypass the singular roadblocks that otherwise cause an apparent global loss of function.

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Axel Holmbom Larsen

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“In art, the greatest energy can be expended to produce the least appearance of effort.”

- Robert Pepperell, 2018

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Abstract

Background: The function of the brain is dependent on cooperation of nerve cells in multiple regions, which is performed through network interactions. A possible expression for this cooperation could be creative output such as visual art. Cognitive disorders influence the foundations for the network interactions which should then also influence creativity.

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For the group of creative novices some participants experienced increased cognitive abilities in their everyday life after partaking in a selection of creative challenges, with novelty, limit of scope and inspiration from current art exhibitions and their techniques.

Conclusion: From a neurocognitive perspective, visual art and creativity could bypass the singular roadblocks that otherwise cause an apparent global loss of function.

Populärvetenskaplig sammanfattning

Vad händer med hjärnan när den drabbas av en neurodegenerativ sjukdom såsom Alzheimers sjukdom, Parkinsons sjukdom (eller atypisk parkinsonism) eller Frontotemporal demens? Vi vet att nervceller går under och med dem följer förlusten av deras kopplingar i ett stort nätverk av nervceller som ständigt kommunicerar med varandra. När celler går under förändras också aktiviteten i de kvarvarande nervcellerna, som går miste om signaler som brukade finnas. Med tiden går så många nervceller förlorade att funktioner som kräver att nätverket samspelar upphör; såsom att minnen försvinner, uppfattningen av omvärlden påverkas och orden hittar inte alltid hela vägen fram. Verkligheten kan då bli alltmer främmande, skrämmande och svårnavigerad, det uppstår tankevurpor och känslor som nedstämdhet, frustration, osäkerhet och förvirring kan ligga närmare ytan än tidigare. Det som en gång var självklart behöver inte längre vara det och det är inte säkert att det går att beskriva så att någon annan kan förstå.

Kognitiva domäner

För att utreda och följa patienter som misstänks ha drabbats av neurodegenerativ sjukdom förhåller vi oss till funktioner i kognitiva domäner. Detta kan beskrivas som en grov indelning av hjärnans större och mer övergripande funktioner. Ett sätt att fördela dessa på följer diagnosmanualen, DSM-5 (American Psychiatric Association, 2013), och lyder då:

- **Inlärnings- och minnesfunktion:** Det som gör att tidigare händelser fortsätter att vara värdefulla över tid. Innefattar hela inlärnings- och minnesprocessen, från korttidsminnets här och nu till långtidsminnets bevarande av tidigaste minnen i livet och därefter. Det är denna funktion som gör att vissa saker kan utföras utan att återkommande behöva yttre stöd eller stimuli—vi minns hur vi gjorde förra gången.
- **Exekutiva förmågor:** De processer som används för att kunna påbörja och utföra något. Innefattar hela skeendet, från initial planering till slutgiltigt genomförande, med alla beslut däremellan. Kan beskrivas i långa kedjor av beslut och utförande.

- **Språk:** Det som möjliggör interaktioner med andra genom språket. Förmågan att vidareförmedla inre upplevelser och resonemang till andra personer—eller att ta emot detsamma från en annan och förstå.
- **Perceptuell-motorisk förmåga:** Den med vilken vi försöker förstå verkligheten omkring oss så att vi kan interagera med den ändamålsenligt. Rymmer sådant som djupseende, rumsuppfattning och avståndsbedömning, för att nämna några.
- **Uppmärksamhet:** Förmågan att hålla fokus vid en specifik uppgift eller stimuli—att inte ledas bort från det aktuella av andra intryck. Innefattar även kapaciteten att ändamålsenligt skifta fokus till något annat för att sedan kunna återgå till det redan påbörjade, utan att tappa tråden och behöva börja om.
- **Social kognition:** Förmågan att fungera i och förstå sociala sammanhang. Att interagera med andra på ett för ändamålet adekvat sätt. Att känna igen och förstå andras känslor och sin egen inverkan på dessa för att navigera i ett socialt samspel.

Vid utredning bedömer vi dessa kognitiva domäner och försöker förhålla oss till hur patienten fungerat tidigare i sitt liv och hur de fungerar just nu. Om förändringen är stor är det ofta väldigt tydligt att något försämrats men i många fall är det subtila förändringar som inte alltid är så lätta att notera ens i ett längre patientsamtal. Det är då vi kan ha nytta av strukturerade tester för att bättre kvantifiera en nedsättning. Känsligheten i olika typer av tester och bedömningar har blivit allt viktigare med tiden när vi strävar mot att kunna diagnosticera dessa sjukdomar så tidigt som möjligt i hopp om att använda oss av sjukdomsmodifierande biologiska behandlingar (med mål att få sjukdomen att stanna upp eller fördröjas så länge som möjligt).

Kognitiva tester

I den kliniska vardagen bedömer vi kognitiva domäner dels utifrån patientsamtal och anhöriginformation men också utifrån en myriad av tester, historiskt oftast exemplifierat av Mini Mental State Examination, MMSE (Folstein et al., 1975). Med tiden har tester adderats och reviderats och används oftare i vissa sammanhang, exempelvis vid testning på specialiserade enheter eller vid utökad testning i studiesammanhang eller om patienten har ett annat modersmål än svenska. Mängden tester som utförs i en specifik situation kan därför variera från patient till patient men också från gång till gång. Testerna är oftast designade för att vara smidiga och relativt snabba att genomföra för en tränad testledare—med fördel ska de hinnas med inom tidsramen för en typisk vårdkontakt eller att flera tester kan utföras på ett, för ändamålet bokat, testningsbesök. Enstaka tester såsom MMSE kan

ge en snabb fingervisning om patientens funktionsnivå och kan därigenom vara vägledande om det är relevant med utökad testning eller kompletterande undersökningar därefter. I sammanhanget används vissa tester gärna för att övervaka förändring över tid eller eventuell behandlingsvinst med insatser som en redan diagnostiserad patient kan få eller har fått. Likaså här är deras snabbhet och enkelhet att genomföra en styrka.

Språkets betydelse

De kognitiva tester som används lider av en rad nackdelar, där patientens eventuella språksvårigheter är ett tydligt exempel med stort genomslag. Eftersom flertalet av testerna är beroende av verbala instruktioner för att förklara hur de ska utföras och därefter behöver verbal respons från patienten som svar på frågor innebär det att en patient vars språk eller språkförståelse drabbas tidigt i en sjukdom felaktigt kan bedömas som sämre i samtliga funktioner som testet berör—inte enbart i de språkliga. Testerna har i sig heller ingen förmåga att hjälpa bedömaren att förstå varför patienten inte klarar en specifik uppgift utan enbart att det inte går att utföra den korrekt i någon bemärkelse. En skicklig testledare med mycket erfarenhet kan i observation av patienten, medan denne utför tester, skönja vissa ledtrådar som kan vara av betydelse för att tolka var bekymmer uppstår, vilket kan vara av klinisk nytta.

Utbildningsnivå och kognitiv reserv

Vid bedömning av kognitiv funktion behöver man ta hänsyn till utbildningsnivån patienten har för att värdera testresultaten. En välutbildad person med flera år av högre studier, motsvarande högskola eller universitet, förväntas prestera bättre på samtliga kognitiva testningar än någon som fullföljt grundskoleutbildning men inget därutöver, som i sin tur förväntas prestera bättre än en person med bristande läs- och skrivkunskaper utan någon formell skolgång alls. Vilken typ av arbete man haft kan likaså påverka ens förmåga att navigera testerna, där exempelvis en akademiker kan förväntas prestera bättre än någon som haft ett primärt fysiskt krävande arbete. Detta fenomen ingår i det som kallas för kognitiv reserv och betyder kortfattat att den som använder hjärnan på många olika sätt och över lång tid bygger upp en reservkapacitet och motståndskraft i hjärnan som kan nyttjas vid eventuell nedsättning, sjukdom eller skada för att kompensera för förluster. Detta kan liknas vid att någon som regelbundet tränar på gym har ökad muskelmassa och bentäthet och därav har bättre motståndskraft mot mindre skador och dessutom en avsevärt mycket bättre rehabiliteringsförmåga vid allvarligare skador såsom benbrott. Den kognitiva reserven medför en fördröjning av symtomdebut men ger i sig inget absolut skydd mot sjukdom, även en välutbildad akademiker kan drabbas av Alzheimers sjukdom. Men att missa patientens utbildningsnivå vid bedömningen av resultatet från en kognitiv testning riskerar att felbedöma patienter med högre utbildningsnivå som att de vore friska, även längre in i en begynnande kognitiv sjukdom, än jämbördiga med lägre utbildningsnivå. Det är av denna anledning som

man ibland kompletterar med mer extensiva kognitiva tester för att fånga upp en begynnande dysfunktion hos specifikt den undergrupp av patienter som förväntas ha hög kognitiv reserv.

Specifick kognitiv reserv

Vid diskussioner om kognitiv reserv beskrivs effekter som ses i stora patientpopulationer. Hög akademisk utbildning skapar en större kognitiv reserv och en generell "extra" kapacitet som gör att hjärnan kan kompensera bättre för förlust på grund av sjukdom eller skada. I detta finns likaså ett resonemang att en person som arbetat hela sitt liv med siffror tordes vara bättre på att hantera siffror även om densamme drabbas av en kognitiv sjukdom. Ändå finns förhållandevis lite undersökt kring vilken effekt kreativt skapande på hög nivå har för den kognitiva reserven generellt och specifikt. Är all utbildning på högre nivå motsvarande varandra? Är det faktiskt så att hög nivå av färdighet (och därmed indirekt erfarenhet och nedlagd tidsåtgång) på specifika uppgifter skyddar hjärnan? Eller är det så att detta skyddar hjärnan specifikt - att ökat visuellt kreativt skapande medför att just de visuellt kreativa processerna är skyddade av överkapacitet medan övriga funktioner inte är det? Skulle då en hög akademisk utbildning ge utslagskraft på kognitiva tester för att dessa tester vilar på en grund av akademiska färdigheter? Bedömer vi komplexa processer på rätt sätt med vår nuvarande testning?

Att bedöma komplexa processer

Ovan diskuterar vi fördefinierade kognitiva domäner som vi kan bedöma med befintliga validerade tester, men hur blir det då med andra hjärnfunktioner, i synnerhet sådana som är sammansatta och komplexa, om man drabbas av kognitiv sjukdom? Vad kan vi förvänta oss hända med en konstnärs kreativa skapande? En målares målningar? En skulptörs skulpturer? En musikers spelning av instrument? Kompositörens skrivande av musikaliska stycken?

Det kan te sig självklart att testa samtliga kognitiva funktioner hos samtliga patienter för att få en rättvis bild av varje patients funktionsnivå och för att kunna bedöma om det föreligger en nedsättning eller ej i det specifika fallet. Detta introducerar dock en rad praktiska bekymmer. En sådan testning vore allt för omfattande att utföra i praktiken, med troligen obefogad tidsåtgång per testning. Likaså skulle det sannolikt vara svårt att utbilda tillräcklig med testledare för att kunna genomföra dessa testningar i tillräcklig omfattning och med bra nog tillförlitlighet för att tillgodose behovet som skulle finnas. Dessutom hade vi behövt strukturera lämpliga tester för samtliga komplexa funktioner och dessa testningar skulle sedan behöva genomgå validering genom vetenskapliga studier, vilket i sig skulle vara ett enormt arbete. I dagsläget får vi således acceptera att vissa funktionsförluster kan gå obemärkt förbi

våra standardiserade tester. Och om vi då inte frågar efter dessa förluster kommer vi sannolikt aldrig se dem annat än av slumpen.

Bortom orden—Bortom språket—In i bilden

Om vi inte har tillgång till validerade testningar för att utforska komplexa funktioner, finns det möjligen andra sätt att ändå använda oss av dem i vår bedömning? Kan vi använda oss av komplexa funktioner för att komma runt problemet med testning hos patienter där sjukdomen stulit deras ord—den funktion genom vilket vi brukat kunna kommunicera våra djupaste tankar och känslor? Jag föreslår att det, åtminstone i utvalda fall, går att betrakta visuellt kreativt skapande som en informationsbärare som ligger bortom språkets ord. Och då kan vi försöka närma oss en mer rättvis bild av patienternas funktion utan att använda oss av orden som försvunnit, oavsett när det sker i sjukdomsprocessen. Att studera en utbildad och skolad konstnär som drabbats av Alzheimers sjukdom, möjliggör att belysa ämnet från fler håll och ger en första inblick i vad som kan hända när orden faller men annat står kvar.

Att tolka det kreativa proffset

Med kunskap om att neurodegenerativa sjukdomar som Alzheimers sjukdom uppstår långt innan första symtomen blir tydliga ens för den drabbade kan vi i efterhand förhålla oss till konstnärens produktion över tid och följa om och hur den förändras allt eftersom sjukdomen fortskrider. Hur detta förmedlas i konstnärens skapelser kan vara svårt att värdera i efterhand, eftersom vi redan sitter med kunskapen om när sjukdomen uppstår. Därför kan vi i stället använda oss av samtida konstkritikers recensioner av utställningar och verken. Deras tolkning av budskap och känsloförmedling får agera uttydare av det konstverken projicerade i sin samtid. Detta skapar en renare tolkning än den som färgats av medicinskt kunnande och som en efterkonstruerad analys kan ge.

När den svenska konstnären Peter Tillberg i början av sin Alzheimers sjukdom (innan diagnosen är ställd) själv i anteckningar beskriver ett trevande sökande efter mening och tydlighet i det oklara beskriver en konstkritiker att hans bilder är diffusa och lösa samt att det är svårt att förstå vad de vill säga. Det verkar som att konstkritikern upplever de förnimmelser Peter hade, bara att kritikern, måhända likt Peter själv, inte förstår varför denne känner så och därmed direkt förskjuter det som att något dåligt hänt med konstverket. Egentligen är budskapet som förmedlas möjligen det konstnären ville eller behövde uttrycka just då, eftersom orden själva inte kunde fånga det.

PAPER I visar att när en konstnär som Peter Tillberg drabbas av neurodegenerativ sjukdom kan han producera konstverk långt in i sin sjukdomsprocess, mycket längre

än tolkningen av traditionella minnestester skulle antyda vore möjligt. Här ses också en diskrepans mellan funktionsnivån i det generella, tillvaron i helhet, och det specifika, det kreativa skapandet. Det tycks finnas avgörande omgivningsfaktorer som kan påverka konstnärens möjlighet att fortsätta skapa—tillgång till material som är enklare att handha och förstå (byte från egenblandad till färdigblandad färg, byte från pensel till pastellkritor, att få duken uppspänd istället för att spänna den själv, att byta från duk till papper och så vidare), att ha tillgång till en yta avsedd enbart för kreativt skapande (minska annan stimuli) och att skapandet sker i en miljö som är trygg och bekant (hans ateljé). Det tycks också finnas avgörande steg i den kreativa processen där yttre påverkan kan vara behövliga—exempelvis när konstnärens hustru tar bort ett fyllt papper och ersätter med ett nytt, då konstnären själv tycks ha tappat förmågan att bestämma sig för när något blivit färdigt och därmed aldrig kan avsluta en bild.

Att betrakta de kreativa noviserna

Som motpol till den erkända konstnären har jag i **PAPER II** följt och observerat en grupp personer med diagnostiserad kognitiv sjukdom som genomfört ett projekt på Malmö Konsthall, 'Konst som uttrycksmedel', ett samarbete mellan Malmö Konsthall, Club Cefalon och Minneskliniken i Malmö. Här visas att även personer med kognitiv sjukdom, utan konstnärlig utbildning, kan genomföra förvånansvärt komplexa kreativa utmaningar om dessa kopplas till en kontext där förväntningar och tidigare erfarenheter inte färgar situationen. Genom att bli guidad, av en skicklig konstpedagog, förankras deltagarna i uppgifter som använder kreativa metoder likt erkända konstnärer gjort och genom att använda sig av en metodik som främjar funktion i stället för att belysa dysfunktion lyckas deltagarna skapa saker de i början av sessionerna aldrig trott sig kunna.

Att möjliggöra

Sammanfattningsvis visar avhandlingen att även personer som drabbats av neurodegenerativ sjukdom kan utföra komplexa uppgifter och utmaningar, oavsett vad deras kognitiva testresultat beskriver. Stora delar av förlusten av funktion tycks vara driven av enstaka hinder snarare än totala förluster av kapacitet. Nyckeln tycks vara att hitta lösningar eller alternativ för att kringgå dessa hinder för att därigenom möjliggöra fortsatt aktivitet.

List of papers

PAPER I

Holmbom Larsen A, Londos E. The Paintings Reveal the Story: Case Study of a Well-Known Swedish Artist Suffering from Alzheimer's Disease. Journal of Alzheimer's Disease Reports. 2024;8(1):173-187. https://doi.org/10.3233/ADR-230134

PAPER II

Holmbom Larsen A, Londos E. Expanding Function with the Creation of Visual Art: A Pilot Study of a Group with Early-Onset Neurocognitive Disorders Attending Specialized Art Education Activities. *Unpublished manuscript.*

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A wholehearted thank you to Kerstin Schild-Tillberg for her willingness to share her and Peter's story, answer questions and provide valuable insight into their challenges during a difficult time. She provided valuable support in gathering information from the medical clinics Peter visited in France and aided in procuring his medical records from France.

While I was unable to have a conversation with Peter Tillberg about his creative process and how he viewed his situation, I would still like to thank him for leading an interesting life and, unwittingly, for leaving many breadcrumbs that I could follow to piece together a description about his artistry, his evolving process and his creative output. I am honoured to be able to learn so much about the creative process through analysing and writing a case study about him.

I also wish to thank Anna Holmbom, my mother, without whom this thesis would not have been possible. Thank you for not only finding the Meet Me at Museum of Modern Art (MoMA) NY project, but also being willing to adapt it for local conditions and making sure even more people had access to the wonderful facilities of Malmö Konsthall at the time. Thank you also for using your knowledge and connections to reach out to Kerstin Schild-Tillberg. For allowing me to scamper about your workplace as a child, engrossed in a fantastic world not all are privileged to take part in or even experience. For engaging in stimulating conversations about creativity and the brain. For always seeing what is possible within the impossible. For always trying to find the next train to take in order to continue the journey forward instead of remaining still and stagnating. For making sure that creativity is nurtured, providing ample opportunities to express oneself in many different ways. For being a continuous inspiration as a human being but also inspiring me to delve deep into the cross-section between medicine and the arts and, most crucial for this thesis, using all your connections to facilitate such an endeavour. Without your aid, I never would have gotten in contact with the arts in such a profound way, and certainly not with Kerstin and Peter.

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Abbreviations

AD	Alzheimer's disease
DMN	Default Mode Network
fMRI	Functional magnetic resonance imaging
FTD	Frontotemporal dementia
MMSE	Mini-Mental State Examination
MoMA	Museum of Modern Art
PD	Parkinson's disease

Introduction

Have you ever found yourself thinking 'Why am I feeling this way right now?' Perhaps you were talking to someone and the conversation made you feel a way you did not expect? Maybe you went to a theatre show, listened to a particular piece of music or looked at a piece of art when you had that thought? Was it as if the feeling had been placed inside you by an external source rather than being created from within?

This thesis begins by theorizing about the basis for creativity and the proposed evolution and experience of art. It then takes a brief look at the neurobiological and neurocognitive functions responsible for art and its interpretation. Next, it looks at the neurocognitive function visual art possibly represents in a healthy brain and what it holds. It is in this context that art is explored as a carrier of information, similar but not equal to language.

This thesis then explores the interaction between an accomplished visual artist, his art and the neurodegenerative illness from which he suffered later in life: Alzheimer's disease (AD). It explores the function visual art takes root in and delves into whether it can communicate cognitive decline before the actual artist can. It stands to reason that complex cognitive functions are influenced at an early stage of AD because of neural network interactions; however, little remains known about in which way and how this would be expressed by an artist through art and in their interactions with others.

This thesis also explores how a group of people with neurodegenerative disorders who have no formal training in art approach art education-related challenges in sessions based upon guided tours of an exhibition hall, where observations are made about how they take on challenges and, even more interestingly, how they are affected by these activities.

Background

Importance of change

Allen and Heaton (2018) suggest that creativity represents the ability to enact change upon that which previously was and turn it into something that was not there before, often by connecting things, thoughts and ideas in a manner not yet attempted up to that point. As such, all creativity is constructed of a chain of previous creative acts, change acting upon change, as it were, by intertwining, splitting and coalescing. When we regard creativity this way, we see creativity as a much wider concept and let go of its usual association with the arts. After all, to be able to bring about change is not only a skill of the artist, but also one crucial for survival.

Andreasen and Ramchandran (2012) stated that creativity is not confined solely to the arts, but rather, is a commonality shared between frequently juxtapositioned groups—such as the artist and the scientist. These groups often, but not always, show many discrepancies in attributes, such as logical reasoning and social, motor and executive skills, to name a few. However, when studying diverse groups of the most creative individuals, they tend to have one thing in common: highly developed and responsive association cortices accompanied by a high degree of activity in the default mode network (DMN) in the brain (Andreasen & Ramchandran, 2012). This commonality could explain why many highly creative individuals, regardless of their field, describe their respective breakthroughs as intuitive or as 'know[ing] something without knowing how' framed by Hardman (2021).

Survival of beauty

When discussing the creation and viewing of artwork, the notion of beauty, or the aesthetic, inevitably comes up. In this context, beauty is typically defined as an aesthetic appreciation that triggers a sensation of pleasure when experiencing something (Comfort & Freitas, 2023) based on neuropsychological processes within the observer (Zaidel, 2015a). Previously, the perception of beauty has been tied to evaluations of the health and fertility of a prospective partner of the opposite sex; therefore, the possibility to experience and observe beauty was a directly enforced evolutionary trait. However, that explanation has recently been challenged (Lidborg

& Boothroyd, 2026) as studies suggest that there is far too much societal and cultural influence on beauty standards and perceptions for it to have an all-encompassing importance for human procreation. Then again, this objection is not completely new, as Darwin himself had doubts that the perception of beauty within humans rested simply upon reproduction (Darwin, 1871). Besides, if beauty were only tied to sexual reproduction, then what would be the point of recognizing beauty in a landscape or artwork? Why would the neural pathways be hijacked for something apparently unrelated and continue to be allowed to do so if it held no clear benefit?

Brown et al. (2011) propose that aesthetic appreciation had to evolve because of a survival benefit at first, and that it would then be integrated into other niches (such as when viewing art) because it then held functions usable for other aspects of human evolution, namely those tightly connected with the group, society and culture, as discussed later. Dehaene & Cohen (2007) proposed the theory of neuronal cycling as the mapping of innovations upon present cortical regions. It is reasoned that because all humans have the ability of aesthetic appreciation (Cela-Conde & Ayala, 2018), the original function of these cortical regions must have held some importance—even if it was not strictly for sexual reproduction—and as this adapted function became more usable, the ability remained.

The origin of artwork

To understand what creativity and the arts (e.g. visual art, music, dance, literature) is, and perhaps even more importantly, why it is, we have to consider the evolution of the human species. Within the context of human evolution, we have to consider the evolution of the group, culture and society. Why would a function such as artistry not only evolve in the first place, but also thrive in such a manner that it appears to be omnipresent across all known cultures?

Very little remains known about the actual origin of communication, creativity and the arts from a biological evolutionary standpoint, or when and how these changed from more the basic relaying of concepts (e.g. danger, safety, food, water) into phenomena used for sharing complex ideas and concepts. We are halted in this exploration mainly by the lack of remains needed to examine brain function and verbal capabilities—there is the distinct issue that neither soft tissue (e.g. brain tissue) nor thought, spoken word, song or dance leaves a detailed fossilized record that can be unearthed (Cela-Conde & Ayala, 2018; Westphal-Fitch & Fitch, 2018). What remains we do have, particularly skulls, can infer the presence of some areas of the brain, suggesting that some of our current abilities were present in early Homo sapiens as well—making the creation of art possible for them (Zaidel, 2018). We have also found remnants of ornamentations such as beads, but whether these represent the chronological start of these practices or are simply the first lasting

record of this phenomena that we have happened to find or has survived throughout the ages remains unclear (Westphal-Fitch & Fitch, 2018). Some researchers (e.g. Benítez-Burraco & Nikolsky, 2026; Stout et al., 2008) suggest that it is unlikely that different aspects of what humans use for communication (e.g. dance, music, language, art) evolved in separate sequence or completely separately from each other; rather, these likely coevolved and then diverged to fill similar but different roles along with the expansion of human groups and our need to interact with each other for survival. If this is the case, it implies that fragments of one practice suggest the presence of them all. As demand grew and group and societal coherence became increasingly important, it stands to reason that the need for the signalling of group inclusiveness and the sharing of vital information and feelings became useful and, in many ways, necessary (Zaidel, 2018, 2020).

While language grants many advantages, especially in the fidelity of shared information, it is also limited in such a way that it can only be used to communicate with others who share it. Visual communication (such as through ornamentation and body paint) could therefore have served to enable interactions with outsiders to avoid conflict and provide a basis for exchanging valuable goods, and possibly even mates between different groups (Westphal-Fitch & Fitch, 2018). Another way to convey meaning is through music and dance (Benítez-Burraco & Nikolsky, 2026), which are often described as other non-verbal forms of communication.

Westphal-Fitch and Fitch (2018) argue that the cognitive ability to be able to express oneself through art (e.g. to decorate oneself, another or something) was most likely a side effect of other budding cognitive abilities; this had a biological foundation, rather than being a specific adaptation that emerged on its own, which is supported by the theory of neural recycling of Dehaene and Cohen (2007). In effect, this considers artistic ability a positive side effect that hijacks already present pathways and continues to exist because of its usefulness as a conveyor of meaning and a complement to other communicative processes arising at that time (Zaidel, 2020). A strong neurobiological foundation for the capability of artistic expression and creativity could also explain why the occurrence is so persistent even between very different cultural traditions and populations (Westphal-Fitch & Fitch, 2018). As researchers approach this subject through modern proxies (such as isolated hunter-gatherer tribes) and studies of societal structures and elements (in current Westernized society), it becomes apparent that creative capacity is a pivotal characteristic possessed by humans (Andreasen & Ramchandran, 2012), even though the extent to which each individual can use it varies.

When approaching the evolution of art creation, we also have to acknowledge that the artist cannot evolve in isolation. There does not appear to be a significant advantage to being alone and creating art only for oneself, because that time could be spent on other survival-related activities. Instead, the artist evolves together with the observer, the audience, the target of the message—and crucially, the artist must also have the capability to adopt the position of these viewers and approximate what

the observer will experience when viewing their art while producing it (Westphal-Fitch & Fitch, 2018), as it would otherwise risk being undecipherable. Because these different proposed aspects of the evolution of the artist and the observer are interactive and continue to evolve with time, the traits of art also change over time (Westphal-Fitch & Fitch, 2018). It is this loop that can feedback into the evolution of the species via gene-culture coevolution as these expressions influence how humans interact, thereby strengthening symbolism and abstract and referential cognitive functions further (Zaidel, 2018).

One tantalizing theory postulates that this abstract and referential functionality within creativity and the arts could be a gene-cultural adaptation to reduce the cost of exploring new concepts, thereby increasing the chance for important discoveries to be made (Steen & Chakraborty, 2022). Such an adaptation would lower the energy cost for innovation over time while simultaneously reducing the risk of stagnation that could otherwise be exploited by outside threats. Steen and Chakraborty (2022) exemplify this idea through the notion of the protected and well-nourished children engaging in explorative activities that often rival the creativity of scientists, as their parents supply the means for their survival. As such a group or a society could supply what is needed for survival for a small number of innovative individuals who could continue with such activities even as adults, because the benefit for the group would far outweigh the costs.

In summary, art and creativity are inherently the effects of biological evolution, that emerge from a conglomerate of cognitive abilities necessary for other behaviours. Their function can be both communicative and explorative, and involve both social and cultural components. Therefore, an artwork can be observed and interpreted on its own, leaning on ubiquitous interpretations of aesthetic qualities, but most likely not truly understood without placing it within the context of the society and culture in which it was created (Van Leeuwen et al., 2022; Zaidel, 2018).

Complexity of creation

The processes of both creating and consuming art have been explored through many different perspectives, such as genetic influence studies (Sotiropoulos & Anagnostouli, 2021), electroencephalogram studies (Pang et al., 2013), brain imaging studies (e.g. functional magnetic resonance imaging (fMRI) and positron emission tomography (PET); see Cela-Conde and Ayala (2018); Van Leeuwen et al. (2022)) and neuropsychological observations (Zaidel, 2018). At this stage, current conclusions suggest that artistic ability and appreciation are widely distributed overarching functions of the brain, where no singular type of damage to the brain (regardless of aetiology) appears to be able to limit them completely—

contrary to other brain functions, such as language, which can effectively be silenced by a singular lesion (Zaidel, 2010, 2015b).

Disparate brain regions and their respective proposed functions and interactions in regard to the involvement in the creation and interpretation of art are far too numerous and extensive to relay in this thesis (e.g. Cela-Conde & Ayala, 2018; Spee et al., 2018; Van Leeuwen et al., 2022 for examples of how to approach and structure this subject). What is important to understand is that there is no collection of neurons within the brain responsible for all aspects of the artistic experience. However, accumulating evidence suggests that brain activity previously dismissed as background noise—activity primarily located in the DMN—could be important for the aesthetic experience (Pepperell, 2018).

As the name suggests, the DMN is a network of neurons spread over distinct parts of the brain (both the cortical and subcortical regions) that has connections to many other brain areas (Seoane et al., 2024). Much of the activity in this region is present even when other parts of the brain are at rest—e.g. when attention is not needed or tasks performance is not specifically goal-oriented (Cela-Conde & Ayala, 2018; Raichle, 2015). In fact, DMN activity is never silenced completely, but rather, redistributed according to the situation at hand (Raichle, 2015). The functionality of such activity has been the foundation of numerous studies and interpretations and led to many conclusions and suggestions. For example Sambuco (2024) inferred the construction and emotional coding of memories, Raichle (2015) mentioned the role of relaying external and internal information to other parts of the brain for further processing, as well as componental function in memory formation, Cela-Conde and Ayala (2018) suggests a broader function of the DMN as an interpreter of information to elicit responses and even predictions about our surroundings via associative functionality and Menon (2023) noted many more inferred functions, among which, self-reference and mind-wandering are of particular note and often mentioned by others. All of these functions link the DMN to artistic capabilities in some way, as it connects experiences with perception, the self and emotions, which could be interpreted as the very basis for experiencing beauty (Vessel et al., 2019), without which, there would be no foundation for art.

Deciphering art

Tinio and Gartus (2018) argue that the view of art interpretation and reflection (or as they refer to it, ‘art processing’) as a singular and unique experience within every observer is paradoxical because humans have similar neurobiological systems and structures, which should generate predictable perceptual and cognitive behaviours given a specific input. It should be noted that their scepticism does not involve questioning whether parts of the aesthetic experience are individual, but rather why

interpretations of some parts of reality should differ so much when humans, in a neurobiological sense, are similar in terms of structure, organization and function. This view of art processing ties into the notion not only that art is communicative and purposeful in both its creation and existence, but also that once the artwork is completed, the process is finished and its functionality remains unchanged unless acted upon, and, if that is the case, then what is experienced should remain over time (Tinio & Gartus, 2018). This phenomenon of a discrepancy between biology and individuality is referred to as the 'curatorial paradox'—described briefly as the desire between each viewer and piece of art to claim a unique relationship—while our neurobiological properties should be similar enough to allow for no such real uniqueness in experience (Tinio & Gartus, 2018).

A counterargument to the 'curatorial paradox' is a theory regarding the 'beholder's share'—the concept that as an observer views a piece of art, the work is finished as it undergoes processing within their brain (Seth, 2019). In this process, the viewer recapitulates the making of the artwork, and in doing so, infuses it with their own experiences and in a way tests it against their own experiences using the artwork as their own internal canvas. Durkin et al. (2025) suggest that subjective experiences can be understood by using art as a catalyst in this manner. In this viewpoint, the artwork is never truly finished, but rather, completed each time an observer views it—thereby making space for endless and diverse individuality in every interpretation—regardless of the biological construct of the brain.

Regardless of which perspective we assume, we still encounter issues when talking about the viewing of artwork and the communicative aspect of art. For a multitude of reasons, whether there is correspondence between what the artist communicates through the artwork and what the viewer experiences is difficult to establish. However, it is also difficult to establish whether observers of an artwork share any similarities in terms of experience when viewing it (Tinio & Gartus, 2018). The fact that we observe reality and interpret it in such a way that benefits us, rather than with perfect clarity or without bias, should also be considered (Seth, 2019).

While there have been pervasive discussions of art containing emotion, little remains known about what viewers experience when they view artwork; therefore, whether artists can convey actual emotion as a real experience to the viewer of their artwork remains unclear (Tinio & Gartus, 2018). One possible confounder is the fact that feelings experienced when viewing artwork are coloured by other current factors such as events and occurrences on the day of or surrounding the viewing (Tinio & Gartus, 2018).

Therefore, although humans appear to be capable of ascertaining that information and emotions can be shared through art, we still have to contend with the fact that we also need to contend with what appears to be art literacy. Durkin et al. (2025) show that the more representational art is, the more coherent and similar the interpretations of that artwork are. By contrast, the more abstract a piece is, the more

divergence is introduced in the interpretation. The driving force behind this change appears to be that people with higher levels of art knowledge and experience (i.e. 'aesthetic fluency') can engage with more complex and abstract pieces than can those with less knowledge (Belke et al., 2015). In addition, those with more knowledge and accompanied by the trait of openness to new experiences also engage with art in a different way (Silvia, 2006, 2013). Silvia (2006) also shows that this difference impacts how strongly one responds emotionally to artwork, even if the range and type of emotional response are not totally dissimilar between groups. Compared with novices, the experts appear to show more interest in artwork and be able to cope with uncertainty and confusion more effectively. When delving deeper into this phenomenon by comparing brain activity during the processing of art between novices and experts, the biggest difference appears to be a greater efficiency of specific neural activation (i.e. a more focused use of energy in a smaller area of the brain) (Pang et al., 2013) and more widely used associative brain structures (such as the DMN) (Durkin et al., 2025). Perhaps unsurprisingly, and in accordance with both the 'curatorial paradox' and 'beholder's share' little difference is seen in the activation of visual processing pathways (Durkin et al., 2025), suggesting that this difference does not lie in what or how we perceive, but rather, how much energy we have to spend on trying to make sense of the artwork.

In their study on the feelings evoked while viewing art in an exhibition hall, Tinio and Gartus (2018) found interpersonal variation in what feelings were experienced when viewing selected artworks, likely due to different aesthetic fluencies, even though the range of emotions expressed still indicated commonalities between different viewers. This suggests that at least some neurological structures form the basis for interaction to interpret art and thus something that all humans share, as opposed to the idea that the experience of art is exclusively a cultural and societal phenomena or a completely singular and unpredictable phenomenon without any foundation.

A higher aesthetic fluency enables a higher degree of fidelity when experiencing art. Regardless of what that experience is, an uninitiated visitor to an exhibition hall will experience something, but an art critic will most likely be able to discern it more clearly with increased precision and less effort. Increased aesthetic fluency can be attained through not only formal education, but also the information obtained when viewing an artwork (e.g. personal knowledge or a relationship with the artist, details provided about the artist, information about the context of the artwork), the setting surrounding the viewing (e.g. displaying pieces together when there is a common theme) and personality traits (e.g. openness) (Silvia, 2006; Tinio & Gartus, 2018).

Loss of connection

With passing time, research into the DMN, amongst other phenomena, has expanded our understanding of interactions within the brain, in effect, how the network of cells collaborate and interplay in different ways to create functionality. Because of the many regions with which the DMN intertwines, there was interest early on to examine how the DMN interacts with diseases that affect large regions of the brain, with one example being AD (Corriveau-Lecavalier et al., 2026; Malotaux et al., 2023; Mevel et al., 2011; Seoane et al., 2024; Yildirim & Soncu Buyukiscan, 2019).

The literature indicates that AD has unexpected effects on the DMN. As illness progresses, the activity in the DMN is modulated, leading to both increased and decreased activation, which in turn, leads to inefficiencies within the network (Corriveau-Lecavalier et al., 2026). Normal aging is also known to affect the DMN with both reduced and increased activity at rest and weaker and stronger deactivation (both depending on the subregion) when other cognitive processes are needed—these are posited to be compensatory mechanisms within the DMN even though exactly how and what it is compensating for remain unclear (Mevel et al., 2011). However, the changes in interaction caused by AD appear to be able to predict which patients have relatively stable cognitive decline and which patients progress into further disease stages, and possibly to differentiate between different illness subtypes (anamnestic vs non-anamnestic) (Malotaux et al., 2023; Yildirim & Soncu Buyukiscan, 2019).

Interestingly, Yildirim and Soncu Buyukiscan (2019) suggest that, if studied using fMRI, alterations in the function of the DMN caused by AD can be seen long before other clinical presentations of AD and even used to identify patients at risk for developing AD further down the line (along with other biomarkers). This leads to the question of what other possible effects this change in the DMN can have.

Given this background, there is a case to be made for the DMN having important roles in the functions of both creating and interpreting art, as well as in creativity. What happens to these capacities as a result of developing AD? How does this influence the schooled artist with high aesthetic fluency? What about the artistic novice? Can artistic output be used as a proxy to examine these questions further?

Overall aim

The overall aim of this thesis is to explore the interaction of a neurodegenerative disorder with complex brain functions other than those commonly tested with current cognitive test batteries, in this specific case, the creation of visual art. If there is an interaction, then how does it manifest? In what way is the creation of visual art shaped by neurodegeneration? Of particular interest is the possibility that visual art can carry information otherwise mislaid when spoken and written language is lost.

To explore this subject, the present thesis contains two studies:

- One detailing the life, creative visual art output, art critic reviews and medical history of Peter Tillberg, a famous Swedish visual artist who was diagnosed with early-onset AD and subsequently passed away in 2016, just days before his 70th birthday.
- One following a group of individuals with early-onset neurodegenerative disorders attending specialized guided tours at Malmö Konsthall, followed by workshops in which visual art was created based on art viewed in the exhibition hall and how the artist approached creating those artworks. The pedagogical approach was based upon the Meet Me at Museum of Modern Art (MoMA) NY project, but further developed for local conditions.

Method

The studies presented in this thesis were designed with qualitative methodologies because they are more suited to the analysis of the subject matter being studied (e.g. subjective experiences, observations made during workshops, personally expressed thoughts). This is discussed further under **Methodological Considerations**.

Study design

In this thesis, **PAPER I** in this thesis utilizes a qualitative approach to allow for the exploration of the chosen facets of the studied subject, in this case, the Swedish visual artist Peter Tillberg. As I was interested in using differing viewpoints to construct parallel timelines of the same person, his body of work, his disease progression and his interaction with society, this approach enabled the use of subjective experiences and interpretations of the content to be brought together and analysed to form a more complex and widely applicable whole.

By contrast, **PAPER II** explores how a locally adapted version of the Meet Me at MoMA NY concept, with guided exhibitions tours and workshop activities, is applied and how the participants take on the challenge. Our main interest involves the subjective experiences and observations made regarding how the participants adapt to new situations, guided tours and creative challenges in the workshop. I chose to be present at the sessions to make the observations in person. I also chose to have everyone present at the sessions, even the researchers, to be included in all the activities to lessen the experience of being observed.

Study context

As my degree project in medicine, I examined the creative output of a patient with early-onset AD, of whom I came in contact with through Club Cefalon, an adult day-care centre catering to this group. The patient had painted as a hobby for many years prior to diagnosis, but had no formal art education or artistic training. The artistic output continued well into the illness and symptom progression and caused some changes in the expression of the artwork, such as use of colour and placement

of motifs. The effects that the neurocognitive disorder had on the creative output of the patient incentivized me to delve deeper into the subject. I realized the prospect and interest of being able to conduct an expanded analysis of someone with a high degree of artistic education and training. Because of the constraints involved in sourcing artists who meet these criteria, once the chance appeared to conduct such an analysis of Peter Tillberg, it was quickly acted upon, which then laid the basis for **PAPER I**. Being able to examine a singular subject, especially when that subject is a famous visual artist who has been in the public eye for decades and whose collected work spans an archive large enough to warrant the dedication of an entire career to explore, offered me the possibility to delve as deep as I wanted.

Inspired by the Meet Me at MoMA NY project, discussions were held between Malmö Konsthall and the Memory Clinic in Malmö about the possibility to pursue an adapted version of the project at Malmö Konsthall. This would later become the basis for **PAPER II** because Malmö Konsthall had both the ambition to reach more diverse groups with art education activities and the resources available at the time to do so. Because I had previously worked with the Club Cefalon adult day centre, I made a proposal regarding who the activities could target and they agreed. This had a number of advantages, which will be discussed later.

The rationale to partake in and document the sessions was the ability to examine how the participants took on the challenges proposed and whether the adapted version of the programme was feasible. The theoretical reasoning was that a shift in focus from disability and loss of function towards possibility and capability could offer many benefits to this group, especially those with early-onset disorders.

Study participants

PAPER I revolves around the Swedish visual artist Peter Tillberg. Through my connections in the art world, I was made aware of Peter Tillberg and the fact that he, at the time, was experiencing late-stage AD. Therefore, I established contact with his wife, Kerstin Schild-Tillberg, who expressed interest in the proposed research. Regarding the ethics of studying someone with late-stage AD, please refer to the **Ethical Considerations** that follow this section of the thesis.

Having previously had contact with Club Cefalon, their operation appeared perfectly aimed to source participants for **PAPER II** as they could provide both participants and personnel for the sessions at Malmö Konsthall. This proved to be advantageous in many ways because everyone attending Club Cefalon constitutes a predefined group as they all have an early-onset neurocognitive disorder and attend a specific follow-up programme (meaning that they had undergone the same diagnostic evaluation). This meant that I did not have to advertise for participants, could be reasonably sure that their diagnoses were correct and feel confident that

their medical work-up was done to the same standard. The selection of attendees from Club Cefalon to be included in the study was made by the personnel at Club Cefalon based on interest from the individual. In other words, there were no additional requirements to be included other than a willingness to participate.

Data collection

The data collection process for **PAPER I** was divided into two chunks mainly because of data availability. The first of these chunks was the most recent chronological information about the artist, which was gathered at the artist's home in France. His wife was interviewed at this location, and extensive photographic documentation of the atelier in its current state was collected along with photographs of all recently produced artwork. The second chunk, which regarded previous work, news articles, analysis of medical records and so on, was more chronologically widespread. This data collection process could all be done in Sweden using available methods (e.g. newspaper archives, digital resources for searching for scientific articles, published art books and exhibition guides, recorded interview materials, photographs of artwork, medical record requests, email or telephone correspondence).

In the interviews with Kerstin, the structure of the conversations was based on that used in consultations with patients and their caregivers at memory clinics in Sweden. Once these talking points were finished, the interviews expanded into broader conversations about their situation and history, as well as Peter's history as an artist (e.g. how he approached exhibitions and artworks, how he used to work in the atelier).

The data collection process for **PAPER II** consisted of adapting a pedagogical approach to local conditions, structuring the sessions and workshop activities for a group and attending and documenting sessions through photography and taking notes about observations made during the sessions. The notes were mostly written down after the sessions and contained short quotes from the participants, which were related to the sessions themselves (as they were discussing things that happened) or their lives in general, as well as reflections about how they interacted with the proposed creative task, what was easy or difficult for them to achieve comparatively and any observed behavioural changes over time or noteworthy differences in function between the individual participants. The photographs were sorted according to session date and stored for later use, for example, in informational materials about the programme or for lectures.

Data analyses

The data collected for **PAPER I** were examined and compiled into distinct timelines for later use within the study itself:

- **Disease progression:** These data included personal observations from Peter's wife, Kerstin, and their interactions in everyday life and later on as a caregiver, medical records gathered from Peter's general practitioner and the Memory Clinic in Tarascon and insights into the experiences, symptoms and issues that both Peter and Kerstin brought up at specific times. Because the memory clinic conducted baseline memory testing, expanded testing and follow-up testing, it was also possible to follow the progression of cognitive decline and which areas of testing were failing over time. There were also brief mentions of trying different medications in an attempt to alleviate symptoms.
- **Artistic career:** Here, I viewed Peter creatively as an artist, analysing both his creative output and approach and how they changed over time. I looked at not only the artwork itself (i.e. his paintings, drawings and sculptures), but also how he expressed himself about the artwork in interviews and texts about his exhibitions and pieces (e.g. in published exhibition materials). I was also lucky enough to view some rough cuts of an interview with Peter filmed for Swedish public television.
- **Art critics:** Here, I analysed societal views of Peter's creative output, which involved reading art critic reviews about his exhibitions and specific pieces in relation to previous encounters, as well as the expectations placed upon him by his body of work and the perception of his creations in relation to the time the reviews were written. The art critics represent well-educated and knowledgeable observers with a higher degree of precision regarding interpretations of the subtle details and messages conveyed within the artworks.

The analysis for **PAPER II** was conducted by compiling the process of the project from conception to completion of all 80 sessions. A structured description is given in the paper along with a section on the observations made of the participants during the sessions as well as their evolving creativity and expanded functionality. The study itself should be viewed as a proof of concept for the methodology with a possibility to be expanded and broadened, as described in the **Future Research** section.

Methodological considerations

A qualitative approach was chosen to explore the subject matter in both studies—the articles about Peter Tillberg and the group activities at Malmö Konsthall, '*Konst som uttrycksmedel'*. The criteria used to assess the quality of the quantitative designs (internal validity, generalizability, reliability and objectivity) cannot be readily applied in quantitative research; rather, Korstjens & Moser (2018) pointed to the importance of trustworthiness, which in turn, is defined by the following criteria:

- **Credibility:** Are the findings plausible considering the available data?
- **Transferability:** Can the results be transferred to another context or setting?
- **Dependability:** Are the findings stable over time?
- **Conformability:** Can the findings be confirmed by other researchers?
- **Reflexivity:** Is the research influenced by the researcher?

Reflections on these criteria in regard to the studies are as follows.

Credibility

When gathering and analysing the data for **PAPER I**, there was much reflection about how to interact with Peter's body of work. Because Kerstin had firm knowledge, most of the pieces in the atelier could be placed in a chronological creative timeline (and thereby in relation to other symptoms), even though Peter had not dated all the pieces himself. As a medical professional with no higher formal education in art critique, review or analysis, I faced many potential issues in trying to achieve an objective interpretation of intent, invocation of emotion or similar communicative aspects. Even if one were to make use of current professional art critics to conduct a retrospective analysis, there is potential for the interpretation to be coloured by the time that has passed since its production. Not only could the knowledge that Peter potentially had AD when the artwork was produced colour the interpretation, but also his body of work had expanded, which could inadvertently change the interpretation of older pieces in light of what the newer ones had achieved. By utilizing what critics had written at the time of the exhibitions and the creation of new art pieces, we can obtain a more accurate depiction of how the piece was interpreted at the time. I believe this decision lends further credibility to the findings, anchoring the analysis in a concurrent situation.

The approach of the different timelines of the same artist from different perspectives is in effect a way to increase the credibility of the findings. The more fidelity one can achieve in these timelines, the more clearly one can see potential overlaps or discrepancies between them—such as the fact that Peter could still create paintings

even though he was approaching single digit scores on the Mini-Mental State Examination (MMSE). Arguably, one could improve credibility further by expanding the scope of the timelines, such as including all published art critic reviews and comparing them over time at specific dates corresponding with data from other timelines (such as a distinct cognitive decline). However, this would drastically increase the time frame of the study.

The credibility of **PAPER II** is largely improved by the prolonged engagement in and persistent observation of the 80 completed sessions spanning over many years; these sessions also included a core of stable participants over that time period. The fact that both the guided tours and workshops spanned multiple exhibitions with wildly different subject matters and artistic methods made it possible to triangulate data over time, further increasing the credibility of the paper.

Transferability

While Peter is a unique artist, I believe the methodology applied in **PAPER I** could be used to make a similar exploration of other recognized visual artists with or without a neurocognitive disorder. One possible difference could be the ability to interview the artist themselves, if you were to reach them at an earlier stage of illness. However, other considerations need to be made in such a case (see **Future Research**). Nonetheless, the process of constructing timelines based upon the artist's creative output and body of work, exhibitions and art critic reviews, and then comparing these with health records and interviews from close relatives, is applicable to other visual artists.

As far as applying the results from **PAPER I** to another artist or the general public, the findings indicate that we can, and should, aim to enable function to a far greater extent. Whether the suggestions provided in **PAPER I** are directly applicable to others probably depends on the dysfunction of the other visual artist. For example, visual artists may be more or less inclined to mix their own paint, stretch their own frames for canvas or make their own brushes, where workarounds for potential issues in these processes may be more or less useful. However, the approach to identify and clear singular specific roadblocks in order for the rest of the functions to continue to flourish is a very effective and directly applicable mindset to have in many situations.

Meanwhile, the pedagogical approach used in **PAPER II** is applicable to other settings. Any exhibition hall that does not have a permanent display but does have access to art guides and educators, as well as workshop space, can directly apply the pedagogical method to a similar group of participants, and researchers can make similar observations or expand upon the scope of the analysis (see **Future Research**). Cognitive disorders are common and adult day-care centres for such patients are present in many larger communities, so there should not be a lack of

participants or possibilities to apply the pedagogical methodology in another setting. The finding that participants are able to overcome most creative challenges if the approach is adapted is readily applicable in most specialized adult day-care centres.

Dependability

Because any changes in the artwork in **PAPER I** were assumed to be subtle, we also assumed that subtle differences would leave subtle trails. Although an extensive amount of information was available, we had to make a sampling choice regarding which art critic reviews to include in the study. This inevitably meant that we would choose reviews to support our hypothesis, and we concluded that this choice was purposeful in a first study because of the limitations in relation to scope. A deeper and more thorough investigation of art critics as a whole could include as many reviews as possible (but some most likely lost, as discussed in the published article) over an even larger period of time (perhaps even all available reviews over the artist's entire career, as mentioned in the **Credibility** section). Such an expansion of scope could both strengthen and weaken the proposed findings regarding the art critic timeline in **PAPER I**, thereby affecting dependability. I would like to add that a deeper exploration into all art critics would also warrant a deeper analysis of the critics themselves and their individual relationships with Peter himself or his body of work, which could colour their interpretation and perception of the artwork and possible changes therein. There remains an interesting analysis to conduct in regard to how such familiarity could deepen or lessen the possibility of the transfer of information through the artwork. Other aspects of Peter's history (e.g. the timelines not connected to the art critics) have more stable findings and should remain stable even if evaluated by others.

In **PAPER II**, the findings are based on observations made during guided tours and workshop activities. These consist of documented behavioural changes (e.g. increased speech flow, increased ability to make choices, adaptation to current situations) or quotes from the participants explaining that they have done something in their spare time inspired by the activities, how they view the activities, and so on. These observations were later discussed between the researcher and art educator. The observations chosen for the paper illustrate what happened in the sessions. No deeper analysis was made of the observations. Rather, the paper stands as a proof of concept for the adaptations made for this subset of participants in similar settings. To ensure dependability, the observations could go through a more extensive analysis process (e.g. coding, processing).

Conformability

I had no previous relationship to Peter or Kerstin before conducting the research or the analysis for **PAPER I**. I had no previous experience of examining a well-known visual artist in relation to the possible effects of a neurocognitive disorder. The choice to use contemporary art critic reviews for the analysis of the artwork was an attempt to distance myself further from the analysis because I am inevitably biased as a result of my knowledge of what happened to the artist.

One question that arose early on is the possibility that Peter did not have AD, but rather, some other neurocognitive disorder. For example, his cerebrospinal fluid (which can heavily indicate the likelihood of AD) was not analysed and no autopsy was performed after his passing to confirm the diagnosis, which introduces uncertainty into the expected behaviour of the disease (such as start of the disease within the brain in relation to possible first experienced symptoms). However, the description of loss of function remains, and the main interest of this study was not to determine why neurons were lost, but rather, what functions remained and how they interacted with his creative visual artwork—which is disease-agnostic.

In the study for **PAPER II**, conformability was achieved in the observations by discussing them with the art educator and personnel from Club Cefalon who were present at the sessions. It is noteworthy that although many observations were made by separate individuals, when compiled, they pointed towards the same process—for example, one participant showed an increase in spontaneous speech, another became more flexible and faster when choosing, and so on. The fact that the observations differed is most likely due to the fact that the art educator and personnel were often placed between different participants and therefore had closer contact with specific individuals during different times in the sessions. To increase the objectivity of the observations further, one could argue that session recordings would have been useful; however, this adds another level of observation on top of being photographed, and many people are uncomfortable even with having their picture being taken, especially in this type of setting. Additionally, analysis of recordings adds considerably to the time frame of the study.

Reflexivity

Even though I often mention that Peter, the subject in **PAPER I**, is a well-known and recognized Swedish visual artist, I must admit that I had limited knowledge of him and his body of work before delving deeper into the study. Even though I have been involved in the world of art and exhibitions through personal experience (see **Reflections** for more details), it is difficult to grasp Swedish visual artists fully without a formal art education. Due to my lack of knowledge, I had few preconceptions about Peter and his situation. Therefore, I had to undergo a comprehensive exploration of his artwork and its evolution from the ground up.

Seeing as how his style has changed over time, I believe this exploration was very important to avoid attributing too much of this change to an underlying and undiagnosed condition. What I knew of AD and disease progression meant that I had an idea of his current level of function after some correspondence with Kerstin. Seeing as how he had been diagnosed in another country with a methodology similar to that used in Sweden, there were still differences in approaches, which meant that I had to be especially thorough when reviewing the medical records. Overall, I believe that my inability to follow Peter himself for a long time or interview him about his creativity as a result of disease progression reduced my bias towards the information presented about him. If I had been able to form a personal connection to him earlier, it may have influenced the research in some way.

In regard to **PAPER II**, I did not partake in the participant selection for the activities. I had no knowledge of or involvement in the medical treatment of the study participants. I had no knowledge of their cognitive test scores at the time of participation or any other information pertaining to their health status or difficulties in everyday life. I was aware that they were all included in the follow-up programme at the memory clinic pertaining to early-onset neurocognitive disorders (predominantly AD). While the participants received information that I was working as a physician at the memory clinic in Malmö, we only met during activities related to the project at Malmö Konsthall. Their participation within the project also had no influence on the follow-up sessions related to their disease monitoring or participation in any other study related to following the progression of their neurocognitive disorder. In addition, there was no clear medical benefit for them to participate in the study (e.g. no extra follow-ups, no difference in treatment, no extra examinations/imaging) and thus no reason for them to exaggerate any potential positive effects of the activities. I believe that this distancing from the participants' medical information means that I had fewer preconceptions about how they should function (pertaining to specific memory test scores or medical history) or what I should be looking for during the guided tours and workshop activities. This, I would argue, strengthens the reflexivity of the study. While I realize that the participants shared many things about their lives and situations over time, they did so at their own pace and without the context of a doctor visit. The observations made during the sessions were related to the activities themselves, not responses to specific questions asked by me or the art educator.

Ethical considerations

Studies involving single subjects, such as in **PAPER I**, involve many ethical dilemmas, all of which are heightened further when the subject is a famous and easily recognizable person. Any study about a single subject has special considerations regarding the possible negative outcomes of resultant publicity. The

more uncommon the theme of the study, the less possible it is for the subject to remain anonymous and protected from unwanted attention and stigma—effects that can be difficult to quantify beforehand. Unfortunately, neurocognitive disorders such as AD are still associated with more negative stigma compared with other illnesses affecting the body in general and the brain in particular. As such, many famous and recognizable people with a neurocognitive disease withdraw from the public eye, simply fading away. On a positive note, a shift in transparency has recently been seen in Sweden, exemplified by cases such as Björn Skiffs revealing a diagnosis of frontotemporal dementia and Mikael Weihe revealing a diagnosis of AD. Another example would be American actor Bruce Willis, who first revealed a diagnosis of aphasia/dysphasia, followed by a diagnosis of frontotemporal dementia. This is perhaps a marker of the effects of increased efforts from advocates for awareness of neurocognitive disorders and recent gains in earlier and more specific diagnostic tools and possible new treatments. There is, of course, a difference between making a public statement on your own, while still cohesive, and having a diagnosis revealed by a study or a third party later on.

Regarding Peter's case study, it was very clear that it would not have been possible to publish anything regarding his creative output without revealing his identity, considering that his artwork is vital to the study, and that it would have been instantly recognizable through the comparison between his earlier and more recent output in the study. Many of Peter's earliest paintings are still considered some of the most beloved and publicly acknowledged artworks of that era of Swedish visual art.

Written informed consent from Peter was not deemed ethically applicable considering his advanced disease progression, and could have been argued to be unreasonable even if he was in an earlier disease stage. Publishing the findings of the study while he was still alive but with written consent from his wife was also deemed ethically questionable considering that she was not the one who would experience the most negative effects from his condition being publicly disclosed in a scientific publication. After discussions with legal advisers, no clear consensus was reached regarding how to proceed with publication while Peter was still alive.

As fate would have it, Peter passed away before the article was finalized. Publication after his passing was deemed less likely to cause negative effects, and with permission from Kerstin, the article was published, even though it revealed his identity. Kerstin would later express that if something positive could come from all the hardship the illness caused them, it would be more valuable than the public not knowing.

Regarding **PAPER II**, there was an initial discussion about expanding the available data about the participants to include such things as cognitive test results, imaging findings, the results of cerebrospinal fluid analysis, medical treatments and more. Because of the possible inclusion of singular data, the study was included in an

ethics application that was later approved by the Swedish Ethical Review Authority (2014/451). However, during the process of adjusting the pedagogical approach and gathering data for the study, no such information was extracted or used. No identifiable data were shared by the researchers; however, some participants chose to be interviewed for news articles, which meant that they were identifiable and clearly associated with the project. The identifiable data gathered by the researchers consist of photographs of the participants during the guided tours and workshop activities. Regarding the photographs, informed consent for each participant was obtained from Malmö Konsthall. Each participant could choose whether they wanted to be shown in images from the session either completely (easily identifiable), partly (most likely not identifiable) or not at all. All informed consent forms were kept at Malmö Konsthall. Any participant could choose to adjust or withdraw their consent at any time (an option no participant used). Because no easily identifiable data about the study have been used in the article, there are fewer ethical considerations in regard to the participants. Considering that the study focuses on possible advantages from the methodology rather than loss of function or negative aspects of their illness—there is a lower possibility of publication having a negative impact on the participants.

Use of generative artificial intelligence

For this licentiate thesis, no generative artificial intelligence tools were used. Proofreading of the thesis was made by an editor at a qualified and professional English editing service.

Summary of the results

This section presents a summary of the most important findings from each study in a condensed format. For the full results, please refer to the individual papers at the end of the thesis.

PAPER I summary

This paper investigates whether and if so, the artwork and creative process of Peter Tillberg, a well-known Swedish visual artist, was influenced by AD. I achieve this by comparing his artistic process and artwork to information gathered from his spouse, exhibition material (e.g. books, interviews), medical records and cognitive tests, as well as exhibition reviews by art critics published in the Swedish press.

The reviews of art critics concerning the current artworks produced by the artist at that time and displayed at exhibitions function as a representation of the analysis of the creative process in that moment. When comparing that information to information about disease progression, I show that the artist may have been influenced by AD earlier in his creative process and artworks. However, initially, that influence appears to have been subtle, increasing slowly with disease progression, and consisted mostly of transferred feelings of emptiness, approaching the unknown or having lost direction. Therefore, while the paintings still show a sense of beauty, there is a lack of depth in what they evoke and they become more singular in their expression.

In **PAPER I**, I show that visual art can carry information from the creator to the observer, as suggested by the theory of visual art as a carrier of information discussed in the Background section of the thesis. I also show that this passing of information can be influenced by neurocognitive disorders. How sensitive you, as an observer of the art piece, are to receiving this information does not, however, necessarily influence how good you are at interpreting what caused the artist to transmit it.

I also show that the visual creative process can continue much further into cognitive decline (even as low as single digit scores on the MMSE) than previously assumed if specific roadblocks are cleared for the artist to enable continued function. In the late stages of disease progression, function can cease for singular reasons as well as

because of global dysfunction. Common cognitive tests are therefore not representative of more complex cognitive functions such as the creation of artwork.

PAPER II summary

In **PAPER II**, I follow a group, all suffering from early-onset neurocognitive disorders, given specialized guided tours of the exhibitions at Malmö Konsthall, followed by workshop activities based on the creative process the artist displayed in the exhibition hall used for their artwork. The pedagogical approach of the tours was based on the Meet Me at MoMA NY project but adapted to local conditions, as well as an additional creative workshop activity connected to those adaptations.

I show that with relatively few adaptations to local conditions, the group quickly took on complex and varied creative challenges, regardless of their initial perceived difficulty. Because of the direct connections between the art pieces viewed, the artist's method of producing them and doing something similar in the workshop, the participants experienced a sense of purpose in taking on these challenges. Observations made during the sessions involving both what the participants did during the workshops and what they talked about show that there were modulations to some experienced symptoms in their everyday life.

Most importantly, I show that with adaptations, we can enable creative expressive activities that are in opposition with the participants' cognitive decline in everyday life. We can do this by removing connections to practical hindrances, previous experiences and the weight of the end results from the creative process. How we, as facilitators, approach activities is vitally important regarding whether we enable function or remain in dysfunction. We are capable of circumventing cognitive difficulties to enable the creative process, which gives those who have become accustomed to failure another chance to succeed.

General discussion

The results of this thesis challenge presumptions about how some complex cognitive functions are influenced by neurodegenerative diseases compared with functions assessments using common memory tests. Test scores are not directly connected to the possibility to complete some creative tasks for the educated artist or creative novice if common blockers are cleared or avoided. Loss of function in complex tasks appears to be connected to singular roadblocks more than a global loss of function.

Strengths & weaknesses of PAPER I

We have extensive information and knowledge about Peter because he is a famous person and details from his life, art and creative output have been preserved in exhibition materials, articles, books, interviews, and so on. Another important factor is that because his spouse, Kerstin, is also a prominent and educated visual artist, we know that she has maintained a preservative approach in regard to Peter's output, even after his diagnosis. This meant that she kept most of his artwork for longevity and stopped him from destroying previously finished pieces by reworking them in an almost feverish attempt to 'finish' them again. The fact that a connection was established between Peter, Kerstin and Malmö Konsthall meant that I had the possibility to convene with them. There is a distinct possibility that access to these trained and recognized individuals is not available to just any researcher with an interest but without a link to the art world. With the connection available to me, I was able to achieve a foundation of trust, which gave me access to exhaustive interviews with the possibility to record, even though many personal details about his private life, creativity and background were discussed. Personally, I believe that my own background in creative expression (see **Reflections** for more details) created an understanding for the technical aspects of the processes needed for the creation of artwork. This helped me understand the importance of details that Kerstin mentioned surrounding different pivotal moments in his creative abilities as the disease progressed. It was also this added layer of understanding that led me to use current art critic reviews for a chronologically relevant interpretation of the artwork and exhibitions. I also understood that they would provide a relevant elucidation of the particular pieces made by this particular artist while not being coloured by the knowledge of a disease that would be diagnosed later on.

The strength and transferability of the results of **PAPER I** are difficult to apply in more common settings, seeing as how the observations are of one individual artist. However, I wanted to study an educated and well-known visual artist, not just any artist or someone with a more limited body of work or knowledge of the art; hence, the selection of possible participants was limited.

When I first learned about Peter, his illness had already progressed to the point that he had lost much of his spoken language ability. As such, there was no way for him to express himself about his current or previous situation. What information I could learn about his point of view as his neurocognitive decline progressed had to be gathered from his wife (speaking about it in retrospect), previous interviews with Peter (for exhibitions) or notes he had written himself (provided by his wife). There are many pitfalls with information gathered this way, especially considering that accounts spoken in retrospect are inevitably coloured by the experiences that have occurred thereafter. As a result, I was limited in terms of what questions could be asked and how they could be answered. Some of the materials available had chronological gaps because of a lack of digital archives (e.g. digitized newspaper articles), and some factors influencing access can be hard to discern in retrospect. Studying famous individuals with prominent production and a creative profile also leads to methodological issues if you want to expand studies further (e.g. randomization, blinding artwork analysis).

Furthermore, there continues to be a certain prevailing stigma about neurocognitive disease and symptoms, which could influence what you would choose to disclose in an interview, even for a scientific study (see **Ethical Considerations**). Some of this concern was possibly alleviated by the fact that I am a physician who was working at the memory clinic in Malmö at the time of the interview and had experience with such issues.

Strengths & weaknesses of PAPER II

It was a clear benefit that this study could use a predefined and distinct group of participants from Club Cefalon. This allowed me to avoid the recruitment process and the need to examine how possible participants had been diagnosed, what examinations had been made and so forth. Because everyone attending Club Cefalon had been examined and diagnosed at the memory clinic in Malmö following their current protocol at the time, they were also all included into a specialised follow-up programme for people with early-onset neurocognitive disorders. Another benefit was that the personnel from the day centre would not only follow the participants to and from the sessions, but also participate in the sessions. This alleviated many of the possible practical issues that could arise around the sessions, such as transportation to and from Malmö Konsthall and who to contact should any problems arise. They acted as a familiar face in the sessions, which was likely very important, at least initially.

Prospective participants were selected at Club Cefalon by the staff more or less directly by asking attendees whether they thought they would enjoy the project. As such, there were no predefined characteristics to be adhered to, and no previous knowledge or interest in art was required. Whether this selection process was a hindrance or strength to the study remains a topic for discussion.

The fact that the pedagogical approach used in the sessions was based on an established concept and structure (Meet Me At MoMA) meant that I could, together with the art educator, adapt an existing structure to the local conditions instead of having to develop something from the ground up. The same holds true for the fact that I could utilize the facilities and personnel at Malmö Konsthall for the sessions. Moreover, the fact that the exhibition hall lacks a permanent collection meant that the sessions spanned many different exhibitions and artists, which expanded what the participants experienced and offered them many varied challenges. The majority of the participants (including the art educator, personnel and researchers) followed along with the sessions over the entirety of the study, which promoted stability and predictability over time and eliminated some possible confounders.

While a predefined group of participants was used, I did not consult any of their individual medical records or cognitive test results. As such, no inclusion or exclusion criteria for participating in the sessions were established. In effect, this made it possible to participate regardless of cognitive function. The downside to not knowing this information is that I could not discern whether there were any obvious differences regarding how the participants adhered to the content of the sessions, whether there were obvious differences in what challenges were more difficult or whether specific types of artworks had more impact when viewed. Because this information was lacking, no guidance was provided from the study regarding how to relate to the level of cognitive function if the concept were to be expanded in the future.

Conclusion and educational implications

The findings of this thesis suggest that signs of neurocognitive disease can be seen in visual art far earlier than one would expect from conventional memory testing. However, specialized knowledge of art or perhaps even the specific visual artist may be required to recognize the fact that a change has occurred. This has implications in how visual art can be seen as a means of communication, different from written and spoken language but still a carrier of information nonetheless, which is also suggested by research into the evolution of the arts. Through visual art, it is possible to express things that are more difficult to convey through spoken or written language.

Another inference is that higher function failure, such as that in complex cognitive tasks, is more likely influenced by a singular fracture in a particular part of a sequence than by a failure of the complete, overarching function in its entirety. This was clearly exemplified by Peter's failure to mix his own paint, which completely hindered him from painting until he was provided an alternative. However, without an analysis of the complete sequence and keen observation during the process, the end result would appear similar to an outside observer—i.e. you cannot discern whether a task fails for a singular or multiple smaller reasons unless it can be observed. At the same time, with ingenuity, many of these singular obstacles can be overcome (e.g. by changing from canvas to paper or from oil paint to oil pastels), enabling function much further into disease progression than would be expected. Conversely, a more disseminated loss of function likely cannot be avoided in such an easy manner, if at all. It therefore stands to reason that this approach is what enables creative function much further into disease progression than what scores on memory tests would otherwise suggest.

During many of the sessions at Malmö Konsthall, I had my own preconceptions about ability shattered by how the participants attempted quite difficult activities and succeeded most of the time with very limited assistance. As described in the paper, some challenges were equally arduous regardless of background and training—proving that while previous skill might be helpful in some situations, it does not always solve the task at hand. In that vein, current loss of function does not necessarily dictate which novel skills are possible to achieve. By enabling non-

verbal creation without a comparison to what previously was or could be done, we can provide positive cognitive effects—which in turn, can improve well-being.

If everyone surrounding patients with cognitive decline were aware of these issues, and keener and more perceptive to observe them while doing things, we could improve the chance of giving patients more autonomy further into their illness. As such, this would promote wellness and appreciation among both patients and caregivers, possibly reducing conglomerated suffering and even delaying some of the societal effects these disorders have. In effect, this would shift focus from decline, a loss of function, limitations and seclusion more towards capability, individuation, continued expression and inclusion.

In conclusion, this thesis shows, through both papers, that even when experiencing neurocognitive disorders, the experienced artist and creative novice share many things in common. They both have needs to relay information, be able to communicate with others and feel that they are seen and heard. They also need to be able to do things, experience sensations and, maybe most importantly, be able to succeed even when the things they used to take for granted are difficult to do and hard to achieve. They should be enabled to feel that they can function above expectations.

Future research

While insights have been gained from studying Peter Tillberg in **PAPER I**, he is but one individual. With singularity comes considerations of how broadly one can extrapolate and apply findings to a specific part of not only a creative subset of the population, but also the wider population as a whole. It is difficult to infer whether Peter's reactions to his illness were truly unique or if there are or would be similarities with other visual artists with present or future neurocognitive disorders. It would be interesting to examine whether there are societal and cultural aspects that matter by examining visual artists from different time periods—can we extrapolate the individual from the culture they were a part of and active within? To explore any of these considerations, it would be of vital importance to expand the sample size of artists, preferably along with even more clinical medical data to examine. This is discussed further below.

It would be immensely valuable to follow established visual artists over an extended period of time, perhaps decades if possible, and monitor their artistic output and its subtle evolution as influenced by age, environment, culture, society and in some cases, neurodegenerative disorder. Further insights into the health of individual artists could also be of interest, such as other illnesses (e.g. cardio- or cerebrovascular disease, psychiatric illness), for determining whether there are major differences in creative output and expression between differing spectrums of diseases and disorders, and perhaps even compare these to expected changes caused by 'normal' ageing—a field of research that could prove insightful in itself.

One downside to such an approach, and a very important consideration to make with any gathering of data over time, is the need to evaluate whether inclusion in such a study influences the creative artist, and if so, how? Do repeated medical examinations, testing and interviews about the creative process actually lead to changes in some important manner? What kind of influence do they have? Does the artist adjust their approach to what and how visual art is created because they are being observed? If visual art is a form of communication, then should it not stand to reason that such communication could travel both ways and be moulded in the process of being studied? Is the message that the art conveys changed in any way by being observed in the process or act of making it? Perhaps by carefully adjusting creative choices (e.g. motifs, colours, compositions, materials) to be perceived in a certain way—or, similar to what Peter did, by changing creative expression completely just to break out of the box in which others had placed him (i.e. from a

photorealist into something approaching a surrealist or expressionist). The extent of contact with the studied artist would likely be of such magnitude that it would be difficult, if possible at all, to minimize such an influence over time. Methodological considerations would also need to be made because using art critics as a proxy for interpretation may not be as useful or at least as strong, as the possible influence the researcher has on the studied artist could influence not only the message within the art itself, but also the manner in which the critic observes the artwork. At the time of writing, I am not certain how one should approach such a study to minimize the possible effects of these proposed issues.

While diagnosing neurocognitive disorders is not always done using cerebrospinal fluid testing, it is, at the time of this writing, still common practice in specialised clinics. It also provides a greater degree of certainty regarding what illness the patient has, or can at least provide additional information. To add even more clinical data, one could argue that an autopsy of the brain with histopathology would be even more valuable not only to confirm clinical diagnostics, but also to examine the patient's neurodegenerative pathway. Although this is done at the end-point of the illness, it could help describe how different regions of the brain are affected, thereby adding interesting aspects to the analysis of how and when the creative process was influenced. This information could be compared with brain images taken during disease progression to map the stages of degeneration to a certain time, which could then be compared with different periods of creativity. It may then be possible to tie certain specific losses of artistic function to influences of some areas of the brain.

As new diagnostic tools such as biomarkers and blood markers are developed and refined, diagnostic certainty will most likely increase over time, especially regarding the possibility of an early diagnosis, which could prove useful for identifying additional artists to follow. Our knowledge into how life in general affects the brain and its differing functions and neural network is expected to continue expanding over time. As this knowledge develops, it would be interesting to add more specific test and brain activity imaging findings to the overall data for the examination of not only visual artists and the creation of visual art in general, but also specifically artists with a neurodegenerative disease.

While I have read numerous articles discussing different aspects of creativity in relation to brain function and creative evolution, it remains an interesting prospect to delve deeper into the differences between differing artistic outputs. Even within the field of visual art, there are paintings, drawings, pottery and sculptures, just to name a few. Each choice of materials has its own unique constraints, and each expression places different demands on its participants and observers. There are obvious divergences between a chisel and a paintbrush, for example, even if they are both tools used by a human hand. As insights and knowledge become more granular and particular, the fidelity of our knowledge may become great enough to discern whether and how these types of expression differ on not only a neurological, but also a cognitive basis.

A deeper dive into possible differences concerning methods of creation could provide additional insights into discussions about whether creativity plays similar or different roles in building a cognitive reserve compared with academic pursuits. Another possible research venue would be to examine the resilience of different methods in the face of neurocognitive disorders. For example, for Peter, pastel crayons became the last 'tool' used, as it were, but would that differ for someone else? Is there a difference between artists who have mostly pursued one type of creative expression and those like Peter, who have explored the use of many different types of media over the years?

Although **PAPER II** provides valuable insights into what ability and function can be, there are limitations in terms of the scope and execution of the study. First, this study revolves around a selected group of participants from one adult day-care centre. An expansion of the programme to include more groups, and therefore more participants, would likely add further insights into the methodology, enabling further enhancements. Such an increase in participation could reveal, for example, whether some challenges or aspects of the sessions are more suitable for a subset of individuals or a subset of specific neurocognitive disorders. Perhaps some challenges would be less suited for specific losses of function if the aim of the sessions were to help prevent a sense of failure and loss. Another possibility is to add an age-controlled control group of participants without neurocognitive disorders to examine whether there are any differences in how they approach the sessions and the content therein. This could provide a clearer understanding of whether some challenges are universally difficult; perhaps there are unforeseen differences between these groups.

Expanding the numbers of groups and participants would require more information about the prospective participants and most likely involve some manner of recruitment along with assessments of medical records and diagnostic data (e.g. neural imaging, cognitive test scores, cerebrospinal fluid testing). A deeper dive into such factors would allow an examination of whether specific difficulties in execution are linked to disease-related changes. Another possibly useful factor to consider would be to determine whether participants have previous artistic experience and capabilities, and if so, to what extent? This would enable an examination of whether activities are agnostic to previous capabilities or whether some level of previous skill facilitates the achievement of results, and thus the effects of the sessions. Perhaps previous abilities and experiences are the driving factor for willingness to attend the sessions at all, thereby representing an unknown bias.

To gain a better understanding of the effects of the sessions, it would be valuable to determine some kind of baseline before the intervention and then conduct follow-up at specified time points. Because we are interested in not only function in the sessions, but also everyday life, we also have to gather such information. Realistically, interviews with participants, if possible, depending on disease

progression, as well as with caregivers and day centre personnel, could be used. However, a specified structure for these interviews would have to be determined beforehand. The bias of interviews with proxies for the participants must be handled carefully for the results to be stable.

To increase the strength of the observations, it should be possible to change how the observations are made. In the present study, the researcher attended and documented the sessions by camera photography and subsequent note-taking. Filming the entire sessions adds the possibility to do more targeted observation of individual participants, possibly increasing the amount of observations to be made while also lowering the threshold for when something can be observed. However, it could be argued that filming the sessions changes the setting considerably and adds another level of ethical considerations regarding how the material is used. Photography is considered less revealing than video, as many are much more reluctant to be video-recorded than photographed.

One way to increase the amount of possible observations would be to include more researchers in each session. This could change the group dynamics depending on the number of added people compared with the number of total participants. It could also reduce the possibility of bias in observations (such as favouring specific participants or behaviours) and improve the conformability and dependability of the findings.

Reflections

Living with art

I grew up far from hospitals and outpatient clinics and spent much of my youth at my mother's place of work, Malmö Konsthall, the public art museum in Malmö. There I had, in retrospect, the immense pleasure of being engrossed in a world quite different from what one typically would experience as a child in the early 90s in Sweden. To be surrounded by creative people, artists from all walks of life, with wildly different perspectives on both life and visual art makes you view things more often as possible than as not. Also, in some cases, the end result can in many ways be less interesting than the journey or process that brings you to that point. For example, amongst many others at the time, I helped produce one of the 40,000 clay figurines in Antony Gormley's exhibition 'The European Field' ('Antony Gormley – Sculptures and Installation', 1993); one tiny cog in a humongous machine making an idea come to life. I, as well as likely many others, was of course blissfully unaware of what a privilege this was back then. However, in retrospect, especially when writing this thesis, I have come to view this not as a mechanical process of doing, but rather as being part of a cultural, societal and personal experience of art. As a child at Malmö Konsthall, I met artists, curators and producers from other parts of the world and expressed my thoughts, more or less gracefully but in a childlike and unfiltered manner, about the situations in which I was placed by circumstance. As common among children, I had no real concerns about fame or authority or the finer details of courtesy when I met these people—and yet I remember that more often than not I was met with a smile.

I now realise that it is most likely not a coincidence that as far back as I can remember, I have had a pencil, crayon, paintbrush or some similar tool in my hand. Days at preschool were spent filling numerous papers with scribbles and images of creatures and people, to such an extent that the preschool attempted to limit my use of materials, something my grandfather quickly remedied by personally making sure that more materials were available. I have later come to realize the importance that my ability to create freely at preschool had for my grandfather—a man from whom such opportunities were taken by circumstance, as he grew up in a time of much less abundance and more careful considerations of expenses. For him, my creativity was a blessing, and he saw the opportunity to be an enabler instead of a hindrance, to help ensure that history did not repeat itself. Yet, when I consider his life, the stories

I have been told about him and what I remember myself, I see that the limitations he encountered did not stifle him. Rather, his creativity took other paths and made way for many interesting experiences and possibilities. He did not get the education he dreamt of in his youth, but that did not stop him from living life to the fullest.

During my formative years, I continued to produce visual art. As a matter of fact, I have come to realize that most of my inner thoughts are experienced as sequences of images or short pieces of moving pictures. When talking to friends and acquaintances, I have been made aware that this is not something all people do; rather, there appear to be different preferences regarding how your inner monologue and thoughts play out: some more visual, some more auditive and some based more on inner speech or 'written' words. I have yet to delve deeper into whether and how this influences thought processes in substantial ways. Even though the time I spend with a pen or paintbrush in my hand has diminished in recent years, the process of using them always feels like coming home, and most of my thoughts are still visualized.

Art as communication

Due to my background in visual art, the thought that art can convey meaning, messages and feelings is far from unknown to me. I have personally experienced it many times, sometimes subconsciously, while viewing the many exhibitions I have had the pleasure to attend (and in some cases, even help construct). With time, and in particular, with the process of studying Peter Tillberg, conducting a study about him and now writing this thesis, I have become more cognizant about how visual art conveys meaning to the observer. I remember the immense dread that caught me unaware when viewing Goya's black paintings ('Pinturas Negras') for the first time at Museo del Prado in Madrid and the disquiet and growing uncertainty that flooded my mind when walking through Peter Greenaway's exhibition 'Flying over Water' at Malmö Konsthall ('Peter Greenaway – Flying over Water', 2000); the interior of the art museum, now painted black with brightly lit display cabinets containing feathers and eggs, and even one with a decomposing swan—with time yielding its structural composition to the hunger of thousands of maggots. Even in my memory, the feelings I experienced back then are still vivid. I also remember that I did not quite understand exactly what I was feeling, apart from uncomfortable and uneasy, or why I was feeling that way. It was most likely because I had never considered the potential of visual art in this way—something that this thesis explores, the communicational aspect—where something is projected through the artwork by the artist and pieces of art communicate themselves, when being observed, from the moment of completion until their potential destruction.

To effect an effect

Working as a clinical psychiatrist, I have become increasingly attuned to when feelings are being placed on me by others rather than having an inner loci. Early in my career, such emotional contagion could be quite upsetting, and I remember many times when I called upon more experienced colleagues because I was sometimes doubting not only my capabilities as a physician, but also my value as a human being. Considering that this was a situation for which I had trained for over many years and also been in time and time before, it is still humbling to reminisce how off guard I could be in some patient appointments and consultations. How you attune to the feelings of others can indeed reveal a lot about yourself, and how you react to this fact can mould both the current situation and your very being with a longer perspective. These days, I am far less susceptible to being overtaken by these projections, even if they are still both challenging and tiring to have. There are even situations when they can be useful in clinical practice, incorporating feeling into the conversation as it were and speaking about the elephant in the room instead of trying to skirt around it.

While conducting research for this thesis, I have come across many of the current theories about neural components, neurotransmitter theories and psychosocial constructs about both the creative aspects of art and its interpretive and participatory elements. I understand that these processes are widely distributed within the brain and involve myriad pathways and transmitter interactions, much like their interactions within our society and culture are wildly diverse and disseminated. Yet, this also leads me to think about what you convey and project when you experience something as utterly different and uncertain as a neurocognitive disorder—when the very foundation of yourself is shaking. How firm is our sense of self in actuality?

In a raw footage interview with Peter he talked about shapes, using something found to make something new. A collection of pieces of driftwood became a sculpture with human-like shape and motion, quick to be identified but also simultaneously uncanny and vague. I cannot help but speculate what happened in his mind at that time, since the footage was captured around the time of disease initiation, according to current knowledge about AD. It ties back to the bigger question of the thesis, how does artistic creativity interact with neurodegenerative disorders? What change is Peter acting upon in his creativity and drive to create? What shape was he trying to define?

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AXEL HOLMBOM LARSEN is a clinical psychiatrist with special focus on the older population. He has special interest in the creation of visual art and how creativity interacts with the constraints of the artist.

This thesis focuses on how the creation of visual art interacts with neurocognitive disorders. This thesis first explores the basis of visual art as a complex cognitive function and then delves into how that function is influenced. This is exemplified using the example of a well-known Swedish visual artist with Alzheimer's disease and a group with neurocognitive disorders attending specialized guided tours and creative workshops at Malmö Konsthall.

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