



UNIVERSITY OF HELSINKI

<https://helda.helsinki.fi>

Why our brains love arts and crafts: Implications of creative practices on psychophysical well-being

Huotilainen, Minna; Rankanen, Mimmu; Groth, Camilla; Seitamaa-Hakkarainen, Pirita; Mäkelä, Maarit

2018

Oslo Metropolitan University

<http://hdl.handle.net/10138/260967>

Huotilainen, M, Rankanen, M, Groth, C, Seitamaa-Hakkarainen, P & Mäkelä, M 2018, 'Why our brains love arts and crafts: Implications of creative practices on psychophysical well-being', FORMakademisk, vol. 11, no. 2, pp. 1-17. <https://doi.org/10.7577/formakademisk.1908>

Downloaded from Helda, University of Helsinki institutional repository. <https://helda.helsinki.fi>
This is an electronic reprint of the original article.
This reprint may differ from the original in pagination and typographic detail.
Please cite the original version.

<https://doi.org/10.7577/formakademisk.1908>

Minna Huutilainen, Mimmu Rankanen, Camilla Groth,
Pirita Seitamaa-Hakkarainen and Maarit Mäkelä

Why our brains love arts and crafts

Implications of creative practices on psychophysical well-being

Abstract

This article aims to integrate knowledge from the field of cognitive neuroscience and the arts by focusing on the implications that flow experience and the mirror neuron system integral to making processes have for our psychophysical well-being. Art and craft practitioners have personal experience of the benefits of making. We propose that the handling of material can help to regulate our mental states by providing a means to reach flow states. Furthermore, it seems that arts and crafts play an important role in controlling stress and enhancing relaxation. They enable us to fail safely and handle our associated emotions. It has also been proposed that the mirror neuron system helps in skill learning, and the plasticity of the brain ensures that skills may be learned at all stages of life. Finally, art and craft facilitate social activity for many individuals who are at risk of social isolation.

Keywords: art, craft, creative activity, well-being, brain, flow.

Introduction

Traditionally, crafts have been understood as human–material interaction mediated by the practice of a person’s skill and material-based knowledge (Adamson, 2010, 2). Over the past few years, interest in crafts has grown, as people recognise the enjoyment to be derived from craft activities. Some researchers have also started to stress the importance of both craft skills and the craft ethos, regarding these two facets as inherently characteristic of all making activities (Adamson, 2007; Sennett, 2008). Using the notion of a ‘holistic craft process’, researchers have strongly emphasised that craft is an entity including the idea of the product, the embodied craft skill of making the product and the reflective evaluation of the product and the process (Kojonkoski-Rännäli, 1995, 58–60; Pöllänen, 2009, 251). Thus, this holistic craft process is seen as an exploratory, inventive and experimental activity in its core nature.

Making crafts can both provide creative leisure and have therapeutic effects. Craft making has been found to contribute to the well-being of textile hobby crafters in a number of ways, and identified as a source of pleasure and creative self-expression (Burt, & Atkinson, 2011; Collier, 2011, Pöllänen, 2015). Some studies have emphasised the social side of craft making: friendship, sharing and belonging (Burt & Atkinson, 2011; Maidment & Macfarlane, 2009). In describing the positive well-being effects of crafts, researchers (Collier, 2011; Pöllänen, 2015) often use the well-known concept of flow, described by Mihaly Csikszentmihalyi (1996, 110–113) as an intense involvement in an activity within which the person experiences meaningfulness. Hobby crafters in textiles in particular emphasise the experience of the flow of making as a major factor in their well-being. In addition, they describe gaining well-being through bodily enactment. The time they spend quilting enhances feelings of satisfaction, flow and confidence (Burt & Atkinson, 2011, 58). Most textile hobbyists in Collier’s (2011, 110) survey underlined the aesthetics and beauty of textile crafts, as well as their capacity to serve as vital means of expression and identity. They also enjoyed the sensations of the materials, the repetition and the tempo involved in making. Pöllänen

(2015, 74) found that crafting helped the makers organise their thoughts and feelings; it promoted personal space, understanding of self and others and advanced physical and cognitive capabilities. Similarly, Burt and Atkinson (2011, 57) found that the pleasure of craft making arises from the purposeful and self-determined act of making and provides both tangible and intangible benefits.

Some researchers regard leisure craft making as the therapeutic exploration of materials, which provides a means of distraction from emotional stress by creating feelings of relaxation and a sense of empowerment (e.g. Collier, 2011; Maidment & Macfarlane, 2009; Pöllänen, 2015; Reynolds, 2000). Working with textiles in particular has been found to help in coping with or even neutralising grief, depression, personal distress (Collier, 2011, 110; Reynolds, 2000) and a range of physical illnesses (Reynolds, Lim & Prior, 2008), while simultaneously revitalising the practitioners, cheering them up and allowing to experience increased confidence. Professional artists to use craft making as a natural means of handling their emotions (Mäkelä & Latva-Somppi, 2011, 43–45) and to clarify the challenging issues they encounter in their lives (Mäkelä, 2003).

The combination of art or craft making and social interaction that is used both in educational and therapeutic settings affects the psychosocial well-being of individuals and communities in many ways. Arts, crafts and creative activities can have a healing or protective effect on mental, social and physical well-being (for a review see Clift, 2012; Leckey, 2011). Watching art being produced and discussing the products can enhance personally meaningful dialogue and contribute to social well-being (Berg, 2014, 217–218; Berg & Gulden, 2013, 5–7). Art making in itself has therapeutic effects, not only by providing a means of self-expression but also by reducing blood pressure while boosting the immune system and reducing stress (Abbot, Shanahan & Neufeld, 2013, 74–75; Leckey, 2011). In addition, art therapy reduces anxiety and distress, increases coping and quality of life and aids in the expression and handling of previously unresolved emotions (Utteley et al., 2015). It is also important to highlight the potential of the creative arts as a therapeutic tool in the transformational processes that we need to undergo at different points in our lives (RANKANEN, 2016b, 57–58).

Lately, neuroscientific research has provided evidence to confirm the potential of arts and crafts as a means for achieving relaxation and enhancing well-being (for a review see Preminger, 2012). Because the equipment and methods of cognitive neuroscience are constantly developing, there are increasing opportunities to conduct brain research studies outside laboratories, using modern mobile research devices, focusing attention on more natural tasks and approaching everyday issues (Figure 1). However, the strictly specified methods that need to be applied in experimental brain research settings are still the largest restricting factor in the whole research area, and there are still several phenomena that cannot be studied (Seitamaa-Hakkarainen et al., 2016). The main challenges lie in the inability to capture phenomena occurring during creative activity, as most brain imaging devices require the phenomenon or event to be replicated several times and the participant to be still.

In the ‘Handling Mind’ research project, to which all the authors of the present article contributed, attempts were made to measure the participating designers’ and artists’ physiological processes during actual drawing and clay-forming activities. Heart rate monitors and actigraphs were used to measure stress and flow states and the amount of physical strain (Leinikka et al., 2016). In addition, EEG measurements were conducted using the same experimental setup, focusing mainly on the planning phase of the activities, such as the designers’ planning for drawing or clay forming (Figure 2), in order to avoid excessive artefacts in the data due to movement during the actual activities. However, interviews with the participants suggested that this strict setting required them to make compromises in their

approaches to the making process and its products.



Figure 1: Finnish school children participating in a neuroscientific experiment (mobile EEG) in their natural environment at school. Photo by Minna Huotilainen.



Figure 2: Participant performing clay-forming tasks during EEG. Webcam image of the participant during the experiment. Photo by Camilla Groth.

Embodied cognition in making art and craft

Engagement in art and craft activities requires versatile cognitive and embodied processing, which are tightly intertwined. Most of our brain activity is unconscious and a large part of our cognition is linked to our motor system (Lakoff & Johnson, 1999, 9–15). This can also be referred to as procedural and implicit knowledge, concepts that are closely related to tacit knowledge, which is familiar to artists and craftspersons (Polanyi, 1966, 8–13). Experimental studies reveal that restrictions of physical activity also tend to restrict our mental abilities. For example, a study in which the participants' hands were immobilised showed that part of their cognitive capacity was lost as a consequence (Toussaint & Meugnot, 2013), suggesting that human cognition is enhanced by the use of the hands.

Organism–environment interaction is the fundamental starting point for cognition, and the mind is constructed through the experiences of the individual in interaction with the material and social environment (Hari & Kujala, 2009, 453–454; Noë, 2009, 7–8; Thompson, 2010, 13–14; Varela, Thompson & Rosch, 1991, 9–11). This understanding of 'embodied cognition' can provide us with a new view of the material interaction that takes place during the process of making arts and crafts and its implications and significance for psychophysical well-being.

According to Margaret Wilson (2002), cognition has the following properties:

- (1) Cognition is situated.
- (2) Cognition is time-pressured.
- (3) We offload cognitive work onto the environment.
- (4) The environment is part of the cognitive system.
- (5) Cognition is for action.
- (6) Offline cognition is body-based.

These views have gained a lot of attention, resulting in applications for use in learning design and also other cognitive skills. For example, the results from embodied cognition studies are being used in architectural design, which has benefited from the use of hands and materials in the early phase, or in engineering design, which can be taught with Lego bricks (Ringwood, Monaghan & Maloco, 2005). Belcastro and Yackel (2008) present examples of utilising embodied cognition and arts and crafts in mathematics education. Here, crafts allow the students to use their full cognitive capabilities in grasping difficult mathematical concepts. In addition, the use of embodied learning techniques helps the students both grasp and remember what they have learnt (Belcastro & Yackel, 2008). Furthermore, therapeutic applications involving arts and crafts seem to have potential for facilitating cognitive development and rehabilitation in the fields of special education and in circumstances in which cognitive skills are impaired in various disorders (Kim, Kim, Lee & Chun, 2008, 130, 131; Lusebrink, 2004, 129–130).

With regard specifically to the knowledge that is gained from neuroscience, it is evident that somatosensory, motor and visual areas – all activated during making arts or crafts – occupy a large proportion of the cortical surface. The stimulation of these areas is particularly crucial in childhood, because a lack of stimulation means that they will never develop normally (Allen, Celikel & Feldman 2003); indeed, they are necessary for the brain to develop to its highest level (Keifer & Trumpp, 2012, 19). In addition to being crucial for normal development in childhood, somatosensory stimulation and the use of the hands are important elements of rehabilitative practices for many elderly or disabled people, whose sensory system may be impaired in different ways.

Touching and forming different materials and surfaces during creative activities gives

a rich variety of somatosensory stimulation (Lusebrink, 2004, 129–130). It is thus important to use different materials to enable the sensing of opposites, such as heavy and light, soft and hard, warm and cold, because touching activates both cutaneous senses responding to pressure, vibration and temperature and the haptic sense that is used in perceiving shape, weight and surface texture (Gibson, 1983, 97; Lusebrink, 2004, 127).

There is already some empirical research evidence of the importance for mental well-being of touching art materials. A recent study found that the tactile sensations of finger painting facilitated a state of mindfulness that was connected with well-being, by providing experiences of being more aware and present in the current moment and having a broader scope of attention (Stanko-Kaczmarek & Kaczmarek, 2015, 283). In contrast to ‘mindlessness’, which is characterised by ruminations on the past or future and is a cognitive style associated with depression, higher levels of mindfulness are related to increased psychological health and decreased negative emotions.



Figure 3: Linda constructing her art piece at the Aalto University's Design Experimentation and Exploration course exhibition at the Design Forum Showroom, Helsinki, Finland, 2014. Photo by Krista Kosonen.

Simultaneously, touching and forming art and craft materials also activate motor areas of the brain (Lusebrink, 2010, 170). Movement is important for our psychophysical well-being, and both fine-grained and coarse tasks are needed to enable the development of hand–eye coordination, which is an important aspect of the somatosensory system and its development.

The ability to use the visual system in addition to the somatosensory system as an input to make the actions of the motor system more precise begins to develop in infancy and is one of the major milestones of human motor development (Bushnel & Bourdeau, 1993). The development of the visual system is thus tied to the motor actions. The development of the visual system benefits from art and craft making in the form of exposure to colour, small details versus three-dimensional large objects, wide visual fields and seeing the effects of one's own actions (Figure 3).

The brain is plastic

Plasticity is a lifelong property of the brain. Plasticity means that the brain alters its function and eventually its structure as a result of our experiences and actions: whatever we do for long enough will change our brain. The most dramatic examples of brain plasticity are cases involving the complete loss of sensory organs. For example, the occipital areas of congenitally blind individuals – the brain areas that process visual information in sighted persons – are shown to process auditory information (Kujala et al., 1995). Such cross-modal plasticity gives the blind person a larger amount of capacity for auditory processing, resulting sometimes in superior skills. These skills acquired by plasticity can be crucial for managing with sensory impairments because they enable the use of other sense modalities to support learning and personal well-being. For example, deafblind artists who participated in a ceramic workshop showed an unusually developed ability to learn a new tactile skill, namely the skill of throwing clay on a potter's wheel, through an entirely tactile learning process (Groth, Mäkelä & Seitamaa-Hakkarainen, 2013, 8–9). The multisensory qualities of art and craft materials can hence be central in facilitating social communication and the development of rewarding new skills for many people who have sensory impairments or restrictions.

Learning and therapeutic change, both of which contribute to our holistic well-being, are to a large degree based on the plasticity of the brain. The brain modifies its function and structure according to how we use it and also in relation to the kind of psychosocial environment in which we spend time. The neural networks that we use frequently will become stronger and those we do not use will weaken. This means that, over time, the neural networks in each individual will modify in a unique way, depending upon how they act and what kind of socio-emotional relationships they have. Naturally, these changes are not simple but are affected by many factors, including genetic and personal features. For example, proneness to flow, that is, the extent to which the person is gaining rewarding flow experiences from practising a certain art or craft skill, may act as a major mediator of plastic changes in the brain. The amount of practice needed to become an expert in certain skills may be mediated by a multifactorial gene–environment interaction model of how expertise is reached (Ullen, Hambrick & Mosing, 2016, 11).

One example of fast brain plasticity comes from the study of musical hobbies. The seminal studies carried out by Christa Hyde et al. (2009) showed that children's brains changed after 15 months of piano training. After training, more grey matter was found in the auditory and motor areas, as well as a thicker corpus callosum. Practising the piano had made these brain areas more active, increasing the connections between the neurons (Hyde et al., 2009). These findings are supported by those from a longitudinal follow-up, showing that the brain activity of children changes when they practise musical instruments (Putkinen et al., 2014a, b; 2015; Virtala et al., 2012) or are engaged in playing music at home and as a hobby (Putkinen, Tervaniemi & Huottilainen, 2013). Sara Bengtsson et al. (2005) have also demonstrated changes in the white matter of the brain of musicians, suggesting faster and more efficient transfer of information between brain areas and between the brain and the muscles.

It is important to note that these plastic changes in children's brains, which occur with musical training, are not changing some 'music areas' in the brain but rather changing the activity and structure of the general auditory and motor brain areas. Such an increase in grey matter and in electromagnetic neuronal responses to sounds and other events means in practice that there is greater processing power for the brain to compute any tasks that are related to sounds and motor activity. Thus, the impact of the training is not only seen in advanced skills in music but also translates into more potential capacity for any auditory or fine motor tasks. Accordingly, Saarikivi et al. (2016) showed that individual differences between children's capabilities to perform difficult mental tasks, such as set shifting, which require the use of attention and executive functions, were closely related to both their musical activities and their brain responses.

Making crafts and visual arts may deliver similar effects to musical training, but the hypothesis still needs to be confirmed by conducting more empirical research. In their review, Tyler and Likova (2012) have suggested that, because the learning of visual arts relies on the integration of multiple motor, perceptual and cognitive functions, it has a strong potential for cross-cognitive transfer. In a series of studies focusing on the training of diverse groups of people in spatial drawing skills, the subjects' general spatio-motor cognition abilities also improved (Tyler & Likova, 2012).

Craft work, like playing a musical instrument, involves a lot of fine motor movements that stimulate the motor and somatosensory areas of the brain. In the 'Handling Mind' research project, this hypothesis was tested in a short-term study focusing on the plastic changes in the brains of participants who were learning a new craft technique (either filet lace or tatting). Brain responses to visual images of the instructions containing known and unknown as well as to-be-learned techniques were compared before and after learning in a small group of participants. Changes in the responses reflected learning and plastic changes in the brain (Seitamaa-Hakkarainen & al., 2016).

The mirror neuron system

One of the most important tasks of the brain is to understand and learn from the actions of other people. A neurophysiological mechanism called the mirror neuron system is primarily responsible for understanding, imitating and learning from other people's actions, in other words, for multiple psychosocial skills that affect our well-being. It helps us to align socially and emotionally with our friends and family and to understand their intentions, as well as simulating and mimicking actions performed by others (Gallese, 2001; Hari & Kujala, 2009, 461–467; Iacoboni & Dapretto, 2006, 942). Mirroring systems are thus important in body-based procedural and tacit skill learning with the help of social interaction. Further, the process of learning arts or crafts is partially based on imitating others' activities, which is tantamount to mirroring, and partially on building upon one's own experimentation and testing.

Mirroring systems have been studied in relation to dance, performance and choreography (Calvo-Merino et al., 2005; Kozel, 2011). In a functional magnetic resonance imaging (fMRI) study on motor skill learning, expert dancers viewed dance activities that they had performed themselves and activities that were new to them (Calvo-Merino et al. 2005). The neuroscientific data showed that, when participants viewed actions familiar to them, their brains simulated these motor repertoires, indicating that the human brain understands actions by motor simulation (Calvo-Merino et al., 2005, 1243). Interestingly, not only viewing movement but also seeing pieces of static abstract visual art that artists had made by hand evoked motor simulation in the viewer's brain – quite the opposite of the case of computer-generated art (Umiltà et al., 2012). Furthermore, Freedberg and Gallese (2007)

suggested that this kind of embodied simulation can be an important part of both aesthetic and empathic responses to art and thus have special therapeutic possibilities.

In learning a manual skill, simulating or mimicking the actions of the teacher is essential, as body-based knowledge often has an implicit or tacit quality. A system of craft apprenticeships has enabled craft skills traditionally to be passed on from person to person. This has taken place through simulation and socialising, transferring cultural habits as well as manual skills and social norms attached to the profession (Hari & Kujala, 2009, 454, 458). The human brain is well equipped for such learning, and the use of the mirror neuron system permits knowledge about crafts to be passed down through the generations – indeed, it has been proposed as forming the basis of human culture. Furthermore, Ellen Dissanayake (2009, 148–150, 158) has suggested that the cultural evolutionary significance of humans' artistic behaviour is linked to the well-being of social communities and hence that making arts and crafts is crucial for creating social cohesion and for emotional bonding especially during uncertain and challenging circumstances.

Handling failures and emotions

Anyone engaged in a creative activity – whether involving artistic processes, the manipulation of materials in a craft or design context or a performative process such as music or acting – will recognise the emergence of emotions in this process. Current views in neuroscience consider emotions to be a central part of our cognitive abilities (Damasio, 1994, 1999), and emotions affect basic cognitive functions ranging from perception to memory and attentive functions. Emotions are needed in the sense-making processes during the organism–environment interaction (Johnson, 2007, 66–67). In a craft context, emotions guide our creative process in craft practice by helping us assess the risks and possibilities of our actions and the affordances of the materials (Groth, 2015, 18–19). Material manipulation also activates emotions connected to embodied experiences (Mäkelä & Latva-Somppi, 2011, 43–45; Niedderer & Townsend, 2014, 627; Seitamaa-Hakkarainen et al., 2013, 7).

When we face challenges that are imposed by the materials or the situations during the creative process, we are putting ourselves at risk of failing (Figure 4). Failing is considered to be an integral part of innovation and exploration, and we need safe contexts for failing and dealing with the emotions that are related to it. Arts and crafts may provide a good arena for practising failing. Carol Dweck (2006) has proposed that there are two different mindsets – the fixed mindset and the growth mindset – that are related to how we interpret and experience our failures. In a fixed mindset interpretation, failure is a sign of permanent inability to function and complete the task, whereas, in a growth mindset, failure simply means that the challenges accepted have been great enough and that a new approach is needed to continue in the task. The growth mindset has been shown to enhance deep learning and to sustain learning motivation and drive. Crafts are a prime example of a set of activities that may promote a growth mindset, as they offer a safe possibility for failure and they illustrate the fact that the making process is inherently slow, proceeding in a stepwise manner. The personal nature of making arts and crafts allows a wide variety of interpretations of the same theme to be created. At the same time, it fosters thinking outside boxes such as 'right' and 'wrong' answers or realisations. Accordingly, design and craft researchers have shown that we may develop ourselves in the process of overcoming disappointments through a re-negotiation of our initial motivations and the purposes of the activity (Groth, 2017, 58–59; Groth & Mäkelä, 2016, 18; Kosonen & Mäkelä, 2012, 236–237).



Figure 4: The results of a failed attempt to throw a clay bowl on a potter's wheel. Photo by Camilla Groth.

While arts and crafts can be practised alone, in educational and therapeutic situations the making process is interwoven with social interaction, in which emotions also play a crucial part. Dissanayake (2009, 158) claims that artistic behaviour assists the managing of difficult emotions in circumstances of uncertainty. In the context of art and design education, when young adults are still uncertain about their personal and professional identities, art and craft making has enabled students to ponder on these issues (Figure 5) and served as a method of finding their own way to proceed in their creative practice (Mäkelä & Löytönen 2017, 11–12).

With regard to art therapy, it has been noted that the social environment can foster the handling of emotions if it offers a safe, trusting and accepting context for sharing creative processes, personal expression and emotions (RANKANEN, 2016a, 106). However, artistic expression in the presence of others can also provoke feelings of vulnerability and overexposure, and experiences of failure in artistic endeavour can make people with fragile personalities feel fundamentally flawed (Haeyen, van Hooren & Hutschemaekers, 2015, 7; Morgan, Knight, Bagwash & Thompson, 2012, 95–96; Rankanen, 2016b, 42). In addition, it has been noted that the activation of emotions may become a problem if the process is left unresolved (Utteley et al., 2015). In contrast, if the ability to face up to, work through and reflect on difficulties or failures in art making and the handling of challenging emotions is supported, positive changes may result (RANKANEN, 2016b, 115).



Figure 5: Kevin with his conceptual piece of furniture *Dealing with Feelings* at Aalto University's Design Experimentation and Exploration course exhibition in Atski Gallery, Helsinki, Finland, 2011. Photo by Christiane Smeeing-Kneschaurek.

Craft as a means of shifting from a fight-or-flight state to a flow state

The brain and the body have different states depending upon the perceived experience of safety or threat. Increased mental stress affects the autonomous nervous system, leading to the activation of the sympathetic nervous system and an almost simultaneous withdrawal of the parasympathetic nervous system. This prepares us for action by increasing muscular tension, respiration and heart rate, and can create feelings of irritation or restlessness. Experiences of physical, emotional or social threat affect our ability to learn by restricting the capacities available for conscious reflection. Instead, the aroused energy is directed into a rapid and direct reaction to the situation, which is most evident in the fight-or-flight state. Interestingly, the flow is also described as a state in which attention is narrowed into a clearly framed activity (Csikszentmihalyi, 1996, 110–113). However, instead of feeling threatened, scared or angry, rewarding feelings of mastering challenges are prominent.

The state of flow – intense, focused and effortless concentration in intrinsically rewarding activity during which consciousness of time and self disappear – was originally identified and defined in the course of researching artists and their creative processes (Csikszentmihalyi, 1996). Lately, its physiological and hormonal consequences have also been the subject of research, which has found parallels with people's descriptions of being in an area between anxiety and apathy, where preoccupation with simultaneously challenging and rewarding activity engages their full attention (Chilton, 2013, 65; Ullen, de Manzano, Theorell & Harmat, 2010, 302–303, 309). This may well have interesting implications for using arts and crafts in the therapeutic treatment of problems related to deficits in the ability to control attention, such as attention deficit hyperactivity disorder (ADHD).

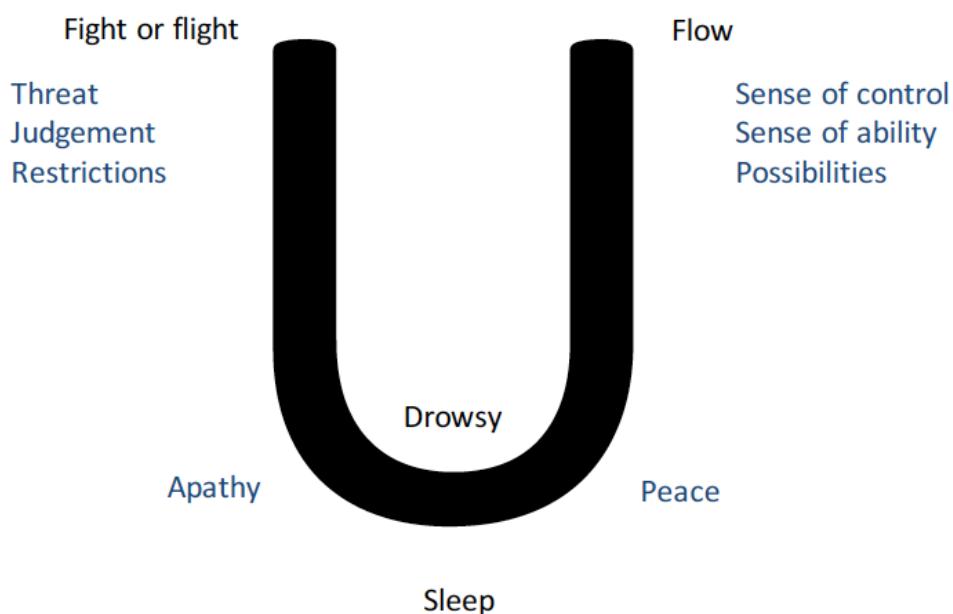


Figure 6: Physiological states presented on a U-curve. Graphic figure by Minna Huotilainen.

One way to describe the continuum of physiological states in two dimensions is to use the U-curve (Figure 6). Here, highly energetic states are in the upper part of the graphic figure, while low-energy states such as drowsiness and sleep are in the lower part of the graphic figure. The left–right dimension describes the valence of emotions, the left side representing negative emotions and right side positive ones. In such a model, the flow state is in the upper right corner, where high activity and arousal and positive emotions are found, while the fight-or-flight state is in the upper left corner, with similarly high activity and arousal but negative emotions.

It has been hypothesised that the state of flow takes place when the explicit information processing system shifts into the implicit automatic, nonverbal, experience- and skill-based processing system (Chilton, 2013, 65–66; Dietrich, 2004). This means that expertise gained by practice would ease the shift to the flow state. Novice practitioners, however, would need to apply conscious effort and engage in less demanding tasks to be able to reach flow and to avoid the anxiety and frustration that may arise from overwhelming challenges.

Art and craft making has been widely associated with flow states, but working with the hands can also elicit other, positive physiological states and be used to regulate our physiological states. For example, a very simple act of making art or craft that does not require much attention has been found to be beneficial for learning. Doodling or performing a simple task such as knitting while simultaneously learning by listening seems to yield better learning results than passive listening (Andrade, 2010). This may be the result of an automatic physiological state regulation: working with the hands keeps us from falling to the bottom part of the U-curve and allows us to maintain the steady, continuous arousal level required for learning.

Arts and crafts, especially in the form of very simple and repetitive actions, can also be deliberately used to push our physiological state lower down the U-curve. A very active working life, fast transitions between tasks and continuous time pressure can produce a

situation in which it is difficult to recover from work. Many overworked and stressed individuals suffer from symptoms such as an inability to fall asleep or maintain good sleep quality throughout the night, feelings of time pressure, impairments of attention, decreased working capacity, motivation and effectiveness, cynicism and decreased professional efficacy, even leading to neural-level changes in attention and emotion perception (Sokka et al., 2014; 2016). In such situations, the regulation of the physiological states is vital for recovery. Here, art and craft making can provide an embodied support to recovery by enhancing relaxation (Abbot et al., 2013; Collier, 2011; Leckey, 2011; Maidment & Macfarlane, 2009; Pöllänen, 2015; Reynolds, 2000). We hypothesise that, when starting a craft activity that the worker has frequently done before the symptoms of stress or burnout have appeared, the embodied cognitive status may be regulated by such activity: it may appear that ‘the body knows how to relax’ with the simple craft activity and may override the negative, arousing, threatening thought loops circulating in the conscious mind.

Robson and Kaplan (2003) suggest an interesting interpretation of the meaning of arts and crafts for the regulation of human physiological states by comparing our lives with those of hunter-gatherers. Hunter-gatherer societies were dominant in the history of mankind for approximately two million years. Arts and crafts were a crucial ingredient in the lives of hunter-gatherer groups and were passed on from one generation to the next. The link between our bodily activities, such as use of the hands, and our cognitive abilities, such as perception, memory, attention or creativity, can be understood in the light of this link in hunter-gatherer life. Continuous, repetitive hand movements related to crafts or food processing were a source of security and were much appreciated by the community, rewarding not only the maker him/herself but also her or his group (Robson & Kaplan, 2003). It is possible that such a reward for hand movements is still present in our brain–body system.

Conclusion

Nurturing well-being through arts and crafts

In this article, we have discussed how arts and crafts, and in particular the sphere of making, can enhance our well-being in a holistic way. To elaborate our arguments, we have brought together diverse discourses from different domains – craft science, design research, art therapy and cognitive neuroscience. In this concluding section, we briefly sum up the reasons why our brains love arts and crafts, in other words, how our embodied minds benefit when handling materials in the wide range available within these creative fields. We suggest implications for nurturing well-being throughout one’s life in various different contexts.

In infancy and early childhood, art and craft making serves several purposes. It is a commonly shared view that the normal development of the brain and its functions requires somatosensory stimulation (Allen et al., 2003), which can be obtained by working with the hands (Dissanayake, 1995, 41; Keifer & Trumpp, 2012; Lusebrink, 2004), learning fine and coarse motor skills and observing other people’s actions (Calvo-Merino et al., 2005; Hari & Kujala, 2009, 464; Iacobini & Daparetto, 2006). Experimentation with an abundance of materials without the purpose of creating anything useful is an integral part of play, which is essential for brain development in infancy and childhood (Dissanayake, 2009). In addition, it is crucial for the development of skills concerning emotion regulation, empathy and imagination (RANKANEN, 2016b, 66–70).

In schools and other learning contexts, we believe that arts and crafts should be utilised for visualising difficult learning tasks, for example in mathematics and biology. Learning by doing in craft projects and working with the hands have been shown to enhance the grasping of concepts, learning and memory (Belcastro & Yackel, 2008). Performing a simple craft may help during auditory-based learning in the regulation of emotional and

arousal states, yielding better learning than passive listening (Andrade, 2010). This may result in part from the close connections between the hand areas and the language areas in the brain.

In adolescence, arts and crafts can be used to empower young people and to help self-construction. Arts and crafts are also invaluable means to express and handle emotions for people of all ages (Collier, 2011; Rankanen, 2016b, 125–126; Reynolds, 2000). For individuals who suffer from stress, arts and crafts can help recovery (Abbot et al., 2013; Collier, 2011; Leckey, 2011; Maidment & Macfarlane, 2009; Pöllänen, 2015; Reynolds, 2000), among other things aiding sleep quality. For the elderly and for those individuals living in care homes, arts and crafts should be considered both as a rehabilitation (Kim et al., 2008; Lusebrink, 2010) and as a human right. Learning new craft skills is possible at all ages. Arts and crafts are ancient human activities that serve many purposes and are tightly woven into the essence of human embodied cognition and well-being.

Acknowledgements

This article is based on the keynote speech made by Minna Huotilainen during the Make it Now conference in Rauma, Finland, September 2016. This research contribution is part of the Handling Mind research project, funded by the Academy of Finland (project numbers 265922 and 266125).

Minna Huotilainen

Professor of Educational Sciences
University of Helsinki,
and Cognitive Brain Research Unit, University of Helsinki
minna.huotilainen@helsinki.fi

Mimmu Rankanen

Postdoctoral researcher, Doctor of Arts
Center for Educational Research and Academic Development in the Arts (CERADA)
University of the Arts Helsinki
mimmu.rankanen@uniarts.fi

Camilla Groth

Associate Professor II in Art and Craft, Department of Visual and Performing Arts Education,
University of Southeast Norway
and Postdoc researcher at Fashion / Textile Futures Research Group, Department of Design,
School of Arts, Design and Architecture, Aalto University
camilla.groth@usn.no

Pirita Seitamaa-Hakkarainen

Professor of Craft Studies
University of Helsinki
pirita.seitamaa-hakkarainen@helsinki.fi

Maarit Mäkelä

Associate Professor of Practice-led Research
Aalto University, School of Arts, Design and Architecture, Department of Design
maarit.makela@aalto.fi

References

- Abbott, K., Shanahan, M. & Neufeld, R. (2013). Artistic tasks outperform nonartistic tasks for stress reduction. *Art Therapy: Journal of the American Art Therapy Association*, 30(2), 71–78. doi:10.1080/07421656.2013.787214
- Adamson, G. (2007). *Thinking through craft*. Oxford: Berg.
- Adamson, G. (2010). Introduction. In G. Adamson (Ed.), *The craft reader* (pp. 1–5). New York: Berg.
- Allen, C. B., Celikel, T. & Feldman, D. E. (2003). Long-term depression induced by sensory deprivation during cortical map plasticity in vivo. *Nature Neuroscience*, 6(3), 291–299.
- Andrade, J. (2010). What does doodling do? *Applied Cognitive Psychology*, 24(1), 100–106.
- Belcastro, S. M. & Yackel, C. (2008). *Making mathematics with needlework*. AK Peters Ltd, Wellesley, MA. Retrieved on December 18th, 2016 from: <http://www.crcnetbase.com/doi/pdf/10.1201/b10652-1>
- Bengtsson, S. L., Nagy, Z., Skare, S., Forsman, L., Forssberg, H. & Ullén, F. (2005). Extensive piano practicing has regionally specific effects on white matter development. *Nature Neuroscience*, 8(9), 1148–1150.
- Berg, A. (2014). *Artistic research in public space: Participation in material-based art*. Doctoral thesis. School of Arts, Design and Architecture. Helsinki: Aalto ARTS Books.
- Berg, A. & Gulden, T. (2013). Interdisciplinary connections between health care and design – a case study in a psychogeriatric ward in Norway. DRS // CUMULUS 2013 2nd International Conference for Design Education Researchers Oslo, 14–17 May 2013.
- Burt, E. L. & Atkinson, J. (2011). The relationship between quilting and wellbeing. *Journal of Public Health*, 34(1), 54–59.
- Bushnell, E. W. & Boudreau, J. P. (1993). Motor development and the mind: The potential role of motor abilities as a determinant of aspects of perceptual development. *Child Development*, 64(4), 1005–1021.
- Calvo-Merino, B., Glaser, D. E., Grezes, J., Passingham, R. E. & Haggard, P. (2005). Action observation and acquired motor skills: An fMRI study with expert dancers. *Cerebral Cortex*, August 15, 1243–1249. Retrieved on March 9, 2017, from <http://cercor.oxfordjournals.org/content/15/8/1243.full.pdf+html>
- Chilton, G. (2013). Art therapy and flow: A review of the literature and applications. *Art Therapy: Journal of the American Art Therapy Association*, 30(2), 64–70. doi:10.1080/07421656.2013.787211
- Clift, S. (2012). Creative arts as a public health resource: Moving from practice-based research to evidence-based practice. *Perspectives in Public Health*, 132(3), 120–127. doi:10.1177/1757913912442269
- Collier, A. F. (2011). The well-being of women who create with textiles: Implications for art therapy. *Journal of the American Art Therapy Association*, 28(3), 104–112.
- Csikszentmihalyi, M. (1996). *Creativity. Flow and the psychology of discovery and invention*. New York: HarperCollins.
- Damasio, A. (1994). *Descartes' error: Emotion, reason, and the human mind*. New York: Putnam.
- Damasio, A. (1999). *The feeling of what happens: Body and emotion in the making of consciousness*. New York: Harcourt.
- Dietrich, A. (2004). Neurocognitive mechanisms underlying the experience of flow. *Consciousness and Cognition*, 13(4), 746–761. doi:10.1016/j.concog.2004.07.002
- Dissanayake, E. (1995). The pleasure and meaning of making. *American Craft*, April/May, 40–45.
- Dissanayake, E. (2009). The artification hypothesis and its relevance to cognitive science, evolutionary aesthetics, and neuro aesthetics. *Cognitive Semiotics*, 5, 148–173.
- Dweck, C. (2006). *Mindset: The new psychology of success*. New York: Random House.
- Freedberg, D. & Gallese, V. (2007). Motion, emotion and empathy in esthetic experience. *Trends in Cognitive Sciences*, 11(5), 197–203.
- Gallese, V. (2001). The 'Shared Manifold' hypothesis: From mirror neurons to empathy. *Journal of*

- Consciousness Studies*, 8(5–7), 33–50.
- Gibson, J. J. (1983). *The senses considered as perceptual systems*. Connecticut: Greenwood Press. (Original work published 1966)
- Groth, C. (2015). Emotions in risk-assessment and decision-making processes during craft practice. *Journal of Research Practice*, 11(2), article M5.
- Groth, C. (2017). *Making sense through hands: Design and craft practice analysed as embodied cognition*. Aalto University Doctoral Dissertations. Helsinki: Aalto ARTS Books.
- Groth, C. & Mäkelä, M. (2016). The knowing body in material exploration. *Studies in Material Thinking*, 14, article 02.
- Groth, C., Mäkelä, M. & Seitamaa-Hakkarainen, P. (2013). Making sense - what can we learn from experts of tactile knowledge? *FORMakademisk Journal*, 6(2), 1–12.
- Haeyen, S., van Hooren, S. & Hutschemaekers, G. (2015). Perceived effects of art therapy in the treatment of personality disorders, cluster B/C: A qualitative study. *The Arts in Psychotherapy*, 45, 1–10. doi:10.1016/j.aip.2015.04.005
- Hari, R. & Kujala, M. (2009). Brain basis of human social interaction: From concepts to brain imaging. *The American Physiological Society*, 89(2), 453–479.
- Hyde, K. L., Lerch, J., Norton, A., Forgeard, M., Winner, E., Evans, A. C. & Schlaug, G. (2009). Musical training shapes structural brain development. *The Journal of Neuroscience*, 29(10), 3019–3025.
- Iacoboni, M. & Dapretto, M. (2006). The mirror neuron system and the consequences of its dysfunction. *Nature Reviews Neuroscience*, 7(12), 942–951.
- Johnson, M. (2007). *The meaning of the body*. Chicago: Chicago University Press.
- Kiefer, M. & Trumpp, M. N. (2012). Embodiment theory and education: The foundations of cognition in perception and action. *Trends in Neuroscience and Education*, 1, 15–20.
- Kim, S. H., Kim, M. Y., Lee, J. H. & Chun, S. I. (2008). Art therapy outcomes in the rehabilitation treatment of a stroke patient: A case report. *Art Therapy*, 25(3), 129–133.
- Kojonkoski-Rännäli, S. (1995). *Ajatus käsissämme. Käsityön käsitteen merkityssisällön analyysi* [The thought in our hands. An analysis of the meaning of the concept handicraft]. PhD dissertation. University of Turku, Sarja C, Scripta lingua Fennica edita 109. Turku: University of Turku.
- Kosonen, K. & Mäkelä, M. (2012). Designing platform for exploring and reflecting on creative process. *Procedia – Social and Behavioural Sciences*, 45, 227–238.
- Kozel, S. (2011). The virtual and the physical: A phenomenological approach to performance research. In M. Biggs & H. Karlsson, H. (Eds.), *The Routledge companion to research in the arts* (pp. 204–222). London-New York: Routledge.
- Kujala, T., Huutilainen, M., Sinkkonen, J., Ahonen, A. I., Alho, K., Hämälä, M. S. ... & Salonen, O. (1995). Visual cortex activation in blind humans during sound discrimination. *Neuroscience Letters*, 183(1), 143–146.
- Lakoff, G. & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to Western thought*. New York: Basic Books.
- Leckey, J. (2011). The therapeutic effectiveness of creative activities on mental well-being: A systematic review of the literature. *Journal of Psychiatric and Mental Health Nursing*, 18, 501–509
- Leinikka, M., Huutilainen, M., Seitamaa-Hakkarainen, P., Groth, C., Rankanen, M. & Mäkelä, M. (2016). Physiological measurements of drawing and forming activities. In P. Lloyd & E. Bohemia (Eds.), *Proceedings of DRS2016: Design + Research + Society - Future-Focused Thinking*, 7(pp. 2941–2957). doi:10.21606/drs.2016.335
- Lusebrink, V. B. (2004). Art therapy and the brain: An attempt to understand the underlying processes of art expression in therapy. *Art Therapy: Journal of the American Art Therapy Association*, 21(3), 125–135. doi:10.1080/07421656.2004.10129496
- Lusebrink, V. B. (2010). Assessment and therapeutic application of the expressive therapies continuum:

- Implications for brain structures and functions. *Art Therapy: Journal of the American Art Therapy Association*, 27(4), 168–177. doi:10.1080/07421656.2010.10129380
- Maidment, J. & Macfarlane, S. (2009). Craft groups: Sites of friendship, empowerment, belonging and learning for older women. *Groupwork: An Interdisciplinary Journal for Working with Groups*, 19(1), 10–25.
- Morgan, L., Knight, C., Bagwash, J. & Thompson, F. (2012). Borderline personality disorder and the role of art therapy: A discussion of its utility from the perspective of those with a lived experience. *International Journal of Art Therapy: Formerly Inscape*, 17(3), 91–97. doi:10.1080/17454832.2012.734836
- Mäkelä, M. (2003). Constructing female genealogy. *Qualitative-Inquiry. Special Issue: The Arts and Narrative Research. Art as Inquiry*, 9(4), 535–553.
- Mäkelä, M. & Latva-Somppi, R. (2011). Crafting narratives: Using historical context as a reflective tool. *Craft Research*, 2(1), 37–60.
- Mäkelä, M. & Löytönen, T. (2017). Rethinking materialities in higher education. *Art, Design and Communication in Higher Education* (in press).
- Niedderer, K. & Townsend, K. (2014). Designing craft research: Joining emotion and knowledge. *The Design Journal*, 17(4), 624–684.
- Noë, A. (2009). *Out of our heads*. New York: Hill and Wang.
- Polanyi, M. (2009). *The tacit dimension*. Chicago: University of Chicago Press. (Original work published 1966)
- Preminger, S. (2012). Transformative art: Art as means for long-term neurocognitive change. *Frontiers in Human Neuroscience*, 6, 1–7.
- Putkinen, V., Tervaniemi, M. & Huotilainen, M. (2013). Informal musical activities are linked to auditory discrimination and attention in 2–3-year-old children: An event-related potential study. *European Journal of Neuroscience*, 37(4), 654–661.
- Putkinen, V., Tervaniemi, M., Saarikivi, K., Ojala, P. & Huotilainen, M. (2014a). Enhanced development of auditory change detection in musically trained school-aged children: A longitudinal event-related potential study. *Developmental Science*, 17(2), 282–297.
- Putkinen, V., Tervaniemi, M., Saarikivi, K., de Vent, N. & Huotilainen, M. (2014b). Investigating the effects of musical training on functional brain development with a novel melodic MMN paradigm. *Neurobiology of Learning and Memory*, 110, 8–15.
- Putkinen, V., Tervaniemi, M., Saarikivi, K. & Huotilainen, M. (2015). Promises of formal and informal musical activities in advancing neurocognitive development throughout childhood. *Annals of the New York Academy of Sciences*, 1337(1), 153–162.
- Pöllänen S. (2009). Contextualizing craft: Pedagogical models for craft education. *International Journal of Art & Design Education*, 28(3), 249–260.
- Pöllänen, S. (2015). Elements of crafts that enhance well-being: Textile craft makers' descriptions of their leisure activity. *Journal of Leisure Research*, 47(1), 58–78.
- Ranken, M. (2016a). Clients' experiences of the impacts of an experiential art therapy group. *The Arts in Psychotherapy*, 50, 101–110. doi:10.1016/j.aip.2016.06.002
- Ranken, M. (2016b). *The visible spectrum: Participants' experiences of the process and impacts of art therapy*. Aalto University Doctoral Dissertations 141/2016. Helsinki: Aalto ARTS Books.
- Reynolds, F. (2000). Managing depression through needlecraft creative activities: A qualitative study. *The Arts in Psychotherapy*, 27(2), 107–114.
- Reynolds, F., Lim K. & Prior, S. (2008). Images of resistance: A photonarrative enquiry into the meanings of personal artwork for people living with cancer. *Creative Research Journal*, 20(2), 211–220.
- Ringwood, J. V., Monaghan, K. & Maloco, J. (2005). Teaching engineering design through Lego® Mindstorms™. *European Journal of Engineering Education*, 30(1), 91–104.
- Robson, A. J. & Kaplan, H. S. (2003). The evolution of human life expectancy and intelligence in hunter-gatherer economies. *The American Economic Review*, 93(1), 150–169.

- Saarikivi, K., Putkinen, V., Tervaniemi, M. & Huutilainen, M. (2016). Cognitive flexibility modulates maturation and music-training-related changes in neural sound discrimination. *European Journal of Neuroscience*, 44(2), 1815–1825.
- Seitamaa-Hakkarainen, P., Huutilainen, M., Mäkelä, M., Groth, C. & Hakkarainen, K. (2016). How can neuroscience help to understand design and craft activity? The promise of cognitive neuroscience in design studies. *FORMakademisk*, 9(1), Article 3, 1–16.
- Seitamaa-Hakkarainen, P., Laamanen, T.-K., Viitala, J. & Mäkelä, M. (2013). Materiality and emotion in making. *Techné Series A*, 20(3), 5–19.
- Sennett, R. (2008). *The craftsman*. New Haven, CT: Yale University Press.
- Sokka, L., Huutilainen, M., Leinikka, M., Korpela, J., Henelius, A., Alain, C. ... & Pakarinen, S. (2014). Alterations in attention capture to auditory emotional stimuli in job burnout: An event-related potential study. *International Journal of Psychophysiology*, 94(3), 427–436.
- Sokka, L., Leinikka, M., Korpela, J., Henelius, A., Ahonen, L., Alain, C., ... & Huutilainen, M. (2016). Job burnout is associated with dysfunctions in brain mechanisms of voluntary and involuntary attention. *Biological Psychology*, 117, 56–66.
- Stanko-Kaczmarek, M. & Kaczmarek, L. D. (2016). Effects of tactile sensations during finger painting on mindfulness, emotions and scope of attention. *Creativity Research Journal*, 28(3), 283–288.
- Thompson, E. (2010). *Mind in life: Biology, phenomenology and the sciences of mind*. London: Harvard University Press.
- Toussaint, L. & Meugnot, A. (2013). Short-term limb immobilization affects cognitive motor processes. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 39(2), 623–632.
- Tyler, C. & Likova, L. (2012). The role of the visual arts for enhancing the learning process. *Frontiers in Human Neuroscience*, 6, 8. doi:10.3389/fnhum.2012.00008
- Ullén, F., Hambrick, D. & Mosing, M. (2016). Rethinking expertise: A multifactorial gene-environment interaction model of expert performance. *Psychological Bulletin*, 142(4), 427–446.
- Ullén, F., de Manzano, Ö., Theorell, T. & Harmat, L. (2010). The physiology of effortless attention: Correlates of state flow and flow proneness. In B. Bruya (Ed.), *Effortless attention* (pp. 205–218). Cambridge, MA: The MIT Press.
- Umiltà, A., Berchio, C., Sestito, M., Freedberg, M. & Gallese, V. (2012). Abstract art and cortical motor activation: An EEG study. *Frontiers in Human Neuroscience*, 6, 1–9. doi:10.3389/fnhum.2012.00311
- Uttley, L., Scope, A., Stevenson, M., Rawdin, A., Taylor Buck, E., Sutton, A., Stevens, J., Kaltenthaler, E., Dent-Brown, K. & Wood, C. (2015). Systematic review and economic modelling of the clinical effectiveness and cost effectiveness of art therapy among people with non-psychotic mental health disorders. *Health Technology Assessment*, 19(18).doi:10.3310/hta19180
- Varela, F. J., Thompson, E. & Rosch, E. (1991). *The embodied mind: Cognitive science and human experience*. Cambridge, MA: The MIT Press.
- Virtala, P., Huutilainen, M., Putkinen, V., Makkonen, T. & Tervaniemi, M. (2012). Musical training facilitates the neural discrimination of major versus minor chords in 13-year-old children. *Psychophysiology*, 49(8), 1125–1132.
- Wilson, M. (2002). Six views of embodied cognition. *Psychonomic Bulletin & Review*, 9(4), 625–636.