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# Making sense

## What can we learn from experts of tactile knowledge?

***Abstract***

*This article describes an embodied way of making sense through making with the hands. We examine the potential of tactile experience in the making process and analyse what tactile experiences mean. The study takes place in the context of an era marked by audio-visual dominance. The article presents a case study that observed and interviewed deafblind makers while they worked with clay. The findings reveal that modelling in clay resembles the visualisation process of sketching. As such, it may contribute to thinking through the hands. Language is not a self-evident communication tool for transferring tactile skills. Based on our case study, we propose the use of tactile communication in the process of transferring tactile knowledge through making with another person's hands.*

*Keywords:* tactility, embodied knowing, making, clay, deafblind

**Introduction**

"Touch is a kind of communication between person and world, a corporeal rather than a cognitive positioning" (Rodaway, 1994, p. 148) .

In Japan, the expression '*Te de kangaeru'* means 'thinking through one's hands'. This expression is very common, and there is no doubt about its meaning. It is, as Paul Rodaway stated, a bodily rather than a mental positioning. In this article, we investigate the experience of 'thinking through one's hands'. Although this is a poetic expression that may not be taken literally, artisans and craft people use similar expressions when describing their tacit and embodied experiences in their making process (Dormer, 1994, p. 4; Sennett, 2008, p. 9).

The case presented in this article focuses on tactility and involves people working in the area of ceramics. In this study, the tactual experience is isolated, as visual perception is not in use. In this way, we study whether removing sight enhances the sense of touch. Before conducting the case study, one of the researchers, who is also a professional ceramist, used a potter's wheel with her eyes closed to practise her skills in a new way. During this exploration, she realised that her tactile awareness was clearly enhanced. She noticed that she was able to throw clay just as well with her eyes closed, since throwing clay is largely a tactile skill. Based on that experience, we propose that makers and artists who have lost their vision are experts in the field of tactile knowledge (see Nicholas, 2010, p. 16).

The starting point for the present research is learning from people who have lost a modality and investigating what they have gained instead. These gains could take the form of an augmented, enhanced or trained ability in another modality—in this case, the tactile. The sense of touch is an essential element in the making process. By exploring and augmenting the tactile sense, we can learn something new in the area of designing and making. We could use blindfolding as a way to augment tactile experiences in people who have not lost their eyesight. This leads to the following questions: Can a person with all modalities in use enhance the modalities less in use? If this is the case, how could we benefit from this? In his book *The Thinking Hand,* architect Juhani Pallasmaa wrote that, in any creative field, the process of un-learning is just as important as learning, forgetting is as important as remembering, and uncertainty is as important as certainty (2009, p. 143). The

present case is based on the idea that, by temporarily forgetting how to perceive with our eyes, we can learn how to perceive through our body and to explore with our hands.

Both the making experience of working with clay and the enjoyment of finished ceramic pieces are strongly tactual. Working with the deafblind people has shown us that many of them are fond of making ceramics because it is one form of making that they can do without needing to see or hear well. In the following sections, we first introduce some theoretical discussions related to tactility and embodied knowing. Second, we describe how the case study was conducted, and we analyse the outcomes. Finally, we discuss the implications of the study and how these findings might be pursued further.

**Towards embodied knowing**

While visual and auditory cognition have been investigated extensively, there is relatively little research about tactile cognition (Nicholas, 2010, p. 5). There appears to be a hierarchy of the senses, which has changed over time. The present era is characterised by audio-visual dominance, where cognitive skills based on reading and writing are valued more than bodily skills relying on the bodily senses of smell, taste and touch. This is the case even though we use all our senses simultaneously to perceive and to create meaning from the world. In his book *The Eyes of the Skin*, Pallasmaa stated that, in Western culture, sight has historically been regarded as the noblest of the senses, and thinking has been thought of in terms of seeing (2005, p. 15). Hence, the link between seeing and understanding has gained a fundamental position in Western thinking. Pallasmaa added that,

> during the Renaissance, the five senses were understood to form a hierarchal system from the highest sense of vision down to touch. The Renaissance system of the senses was related to the image of the cosmic body; vision was correlated to fire and light, hearing to air, smell to vapour, taste to water, and touch to earth. (2005, p. 15)

> It is plausible that in pre-ancient times, when survival depended on sensing danger with the whole body, sight was not the only primary sense. It would have been equally necessary to hear someone or something advancing from behind and to smell a fire. French historian Robert Mandrou supported this idea of a different hierarchy of the senses in the medieval era. He proposed that the hierarchy was not the same:

> The eye, which rules today, found itself in third place, behind hearing and touch, and far after them. The eye that organizes, classifies and orders was not the favoured organ of a time that preferred hearing. (Mandrou, 1977, p. 76)

According to Professor Walter J. Ong (2002, p. 117) the shift from oral to written speech was essentially a shift from sound to visual space. He suggested that, as hearing-dominance has yielded to sight-dominance, situational thinking has been replaced by abstract thinking. In our opinion this transformation from situational to abstract thinking is clearly visible as one watches children grow up. By the time they start school and learn to process information on an abstract and conceptual level, the embodied exploration evident in smaller children has started to fade away. This development is permanent; Ong proposed that a literate person cannot fully recover a sense of what the world is to purely oral people (p. 12). Similarly, it is impossible for a person with eyesight to imagine what the world is like to someone who was born blind.

## Situated and enactive cognition

There are grounds for thinking differently about this hierarchy of the senses and for thinking of the brain as the only location of cognition. For example, situated cognition supports a more whole, embodied attitude. It suggests that knowing is inseparable from doing and argues that all knowledge is situated in activity (Brown, Collins, & Duguid, 1989; Robbins & Aydede, 2009, p. 3). Cognition depends not just on the brain but also on the body (the embodiment thesis). Cognitive activity routinely exploits structure in the natural and social environment (the embedding thesis), and the boundaries extend beyond the boundaries of the individual organism (the extension thesis) (Robbins & Aydede, 2009, p. 3). The enactive approach is closely linked to this way of thinking and was originally proposed by the neuro-phenomenologist Francisco Varela. It is a theoretical approach to understanding the mind; it emphasises the way that organisms and the human mind organise themselves by interacting with their environment (Varela, Thompson, & Rosch, 1991, p. 173).

Enactive knowledge is not simply multisensory mediated knowledge, but knowledge stored in the form of motor responses and acquired by the act of doing. Examples of enactive knowledge are tasks such as typing, driving a car, dancing, playing a musical instrument and modelling objects from clay.("Enactive Interfaces," n.d.). Philosopher and neuroscientist Alva Noë has been developing this idea in his research on enactive perception. He claimed that,

> to understand consciousness in humans and animals, we must look not inward into the recesses of our insides; rather, we need to look to the ways in which each of us, as a whole animal, carries on the process of living in and with and in response to the world around us. The subject of experience is not a bit of your body. You are not your brain. The brain, rather, is part of what you are. (Noë, 2009, p. 7)

To conclude, perception is a combination of all modalities forming an embodied understanding of the world. But what happens when one or multiple modalities are blocked? In the next section, we will connect the primary focus of our article, tactility and touch, to the ideas of sensory substitution and neuroplasticity.

## Sensory substitution

Sensory substitution was developed and mainly used to help people with one or multiple modal impairments achieve a better quality of life by augmenting other modalities to make up for the lost one. It was first conceived by neuroscientist Paul Bach-y-Rita, who proved the brain's capacity to transform itself by enhancing other areas of the brain when one or several modalities were injured.

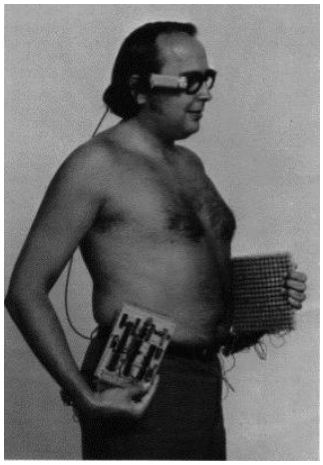

Figure 1. Early sensory substitution experiments by Paul Bach-y-Rita.
http://www.lumen.nu/rekveld/wp/?p=383

Figure 1 shows an early sensory substitution experiment by Bach-y-Rita. A camera records what is seen through the glasses, transforming the image into electric impulses. The image is then flashed onto the body via a tactile display. Through this vision substitution by tactile image projection, the blind subject is able to see through his skin. His tactile sensitivity and tactile skills grow through training of the tactile sense due to the lost visual modality. Learning typewriting using a keyboard without letters to exercise the tactile memory of the letter key positions is, in a way, a reverse use of sensory substitution. We could even call it a form of partial sensory deprivation, performed to augment the tactile memory by reducing the visual modality. This is the basis for attempting the reduction of the visual modality to achieve tactile augmentation. The above theoretical frame provides grounds for believing that we can, to some extent, 'think through our hands'. Consequently, making can be seen as a way of thinking through the hands by manipulating a material (Nimkulrat, 2012; Nicholas, 2010, p. 16).

According to Gray and Burnett (2009), craft is a dynamic process of learning through material and sensory experience leading towards a broader understanding (see Sennett, 2008, p. 9; Nimkulrat, 2012). In craft and design, visual and material artefacts and tools have a central role in mediating the thinking and making processes (Goel, 1995, pp. 128, 190; Keller & Keller, 1999). Craft can also be seen as a form of embodied knowing that involves materials, tools and social communication. Patel wrote about embodied thinking as an anchor linking the mind and body, with emphasis on understanding the relationship of the body to the process of making and thinking, i.e., how artisans relate their bodies, tools, materials and space in their work setting (2008, pp. 18, 131). The case study introduced here forms the first in a planned series. The purpose of this study is to learn from experts of tactility: How do these experts make sense through making? How do they think through their hands?

## Case: Augmented tactility

The study was conducted at the Tampere Activity Centre for the Deafblind in the spring of 2012. A workshop with two adult deafblind makers in ceramics was arranged. The makers were interviewed during their working processes, partly with the help of an interpreter. The setting was recorded on video, documenting both the working process and the interpretation. The interviews and videos were then transcribed and analysed. Participants of the workshop were invited through the Finnish Deafblind Association and participation was voluntary. The real names of the participants have been changed. The first participant in this study is

55-year-old Olavi. He is deafblind and communicates by tactile sign language, i.e., by hands-on signing and using a sign language interpreter. The second participant is 36-year-old Laura, who is deaf (but uses a hearing aid), has 10% sight and communicates through speech. Both participants work professionally in the area of art: Laura is a painter and Olavi uses mixed media in his artwork. The accounts of the participants presented in this article are translations from Finnish to English.

***Working with clay***

The session began with a brief description of the layout of the workshop. One of the authors, who was conducting the workshop, asked both participants to give a brief account of themselves and their relationship to clay as a material. The participants had some experience sculpting and using clay, including throwing, but were not experts and were not familiar with the type of clay used in the workshop. They were handed a piece of smooth porcelain clay and were given free rein as to what to make out of it. They both started working without hesitation.

During the two-hour workshop, the working process was stopped from time to time to interview the participants in the middle of their work. This was done to obtain a fresh account of what was going on in their minds while making, as opposed to an account given after the workshop based on memory. Laura worked on one sculptural piece depicting a hand (Figure 2). Olavi made a female sculpture, and with time left over, wanted to do some throwing on the potter's wheel. The researcher assisted him on the wheel by throwing a bowl with his hands. After that, Olavi took more clay and threw one bowl himself (Figure 3). After the workshop, the whole team, i.e., the researcher, Laura, Olavi and the translator, assembled in a coffee room for one hour to talk about their experiences during the workshop.

Figure 2. Laura's sculpture of a hand showing the sign for the letter R.
Photo by Camilla Groth.

Figure 3. Olavi's bowl thrown on the potter's wheel. Photo by Camilla Groth.

In the workshop, the participants were asked to work with porcelain clay, which is very smooth and can be tricky to handle. Since the material was new to the participants, it caused some surprise and a little suspicion at the beginning. Olavi asked, 'Is this a bit bad, this clay, worse than the other one [that I was used to]?'

By the time the session ended, they had both gotten used to the way the clay behaved. Laura was very fond of it. She said, 'I really like this clay; it is really smooth and feels good to work with. It doesn't start cracking as much as other clays.' After the session, even Olavi said that the porcelain had grown on him and that he was happy to have tried a new type of clay. When asked to describe briefly what the session meant to him, he answered that he was happy to have experienced a new sensation, the new type of clay, and that his throwing had gone well. He said he had increased his skills and felt more confident in his making.

The authors have held classes with seeing and hearing adults in the past; the most striking difference of this class from their previous classes was the fearlessness with which the participants started working. Both makers were very brave in the way they handled the clay. They did not have a tendency to be overly careful. Both worked briskly. While she was working, Laura said,

> My relation to using my touch sense has changed, and I'm no longer afraid of using my hands; for example, if there is something lying on the ground, I would just go and touch it even if it turned out to be a dead rat … I used to go running but had to stop when the limbs of the trees started to hit me in the face [as my eyesight deteriorated]. I still run everywhere, running after my three sons, and sometimes I run into things or fall over. But if I fall over, then I fall over; that's the way it has to be.

When Olavi was asked if it was possible to think through one's hands and if he had any experience doing so, he replied,

> As I can't see anything, I kind of have to also think through this tactility. I got completely blind around the age of 40 and turned tactile at that point, so yes I would say that thinking partly happens that way. When I could still see, I never thought with my hands; but now I always have to use my hands, for example in measuring sizes and so on. It is easy for me to use my hands, especially when working with clay.

Laura also supported the idea that it is possible to think through one's hands:

> Yes, I think it is possible to think through one's hands. My opinion of this comes from having taught deafblind people art in the art classes here [at the activity centre]. There, I have noticed how people really engage with and familiarise themselves with different materials through their hands.

They were also asked whether they had ever tried thinking through clay, such as by making a model as a 'tryout' before making the real piece. Laura said she had never done so and would always just start making a piece and finish it as it came out: 'Clay is such a flexible material, I don't need to make a model; I just remake it straight away.'

This reflection indicates that modelling is a continuous remaking process. The clay is flexible and the artefact often emerges by remaking, through modelling with one's hands directly in the material. As sketching is considered the main thinking tool for designers (Goel, 1995, p. 198; Seitamaa-Hakkarainen & Hakkarainen, 2000), we suggest that thinking can also be attributed to the act of modelling in clay (Dormer, 1994 p. 24).

During their work, the participants were asked, 'What are you thinking right now?' This was done with the assumption that the participants would not have processed their thoughts through any analysis, but would give a fresh picture of what was going on in their working process. Olavi answered,

> 'I have to do the head now, and I need to be really careful as the clay is so soft.'

Meanwhile, Laura replied,

> I'm not thinking of anything, maybe just about yesterday's meeting. When I'm making, it is the best time to think about all the things I should be doing, and still I am only making this.

### *Working patterns and confronting new materials*

According to Patel (2008, pp. 18, 131), the artisans carefully relate their bodies, tools, materials, and space to each other in their work setting. Similarly, the deafblind have to organise their workplace immaculately before working to know where the tools are. During the workshop, both Laura and Olavi arranged their immediate surroundings and the table with their tools to have everything within reach. They found the tools they needed before starting to work and then kept the tools in one place on the table. When Laura dropped one of her tools on the floor, she said, 'Now I'm in trouble.'

The participants' actual finger movement patterns were quick but trembling and tended to feel rather than press onto the material. Laura said she had difficulties seeing the piece she was working on; touching it to feel what it was like would already change it, as the clay was so soft. Another observation is that blind makers do not need to turn the work over to see it from all angles. They can work on the back of the sculpture as well as on the front, with the piece remaining in the same position. This serves as a new positioning towards the relationship of the body to the material.

We can understand our bodily limitations through making with a material. For example, there is a limitation to size, or how large or small one can make an object. When our body is in communication with a material, the material also responds to our body. The imprint we make tells us about ourselves and our limitations. The piece that we produce can be seen as an extension of ourselves, as it always includes some self-expression. When we touch a material, we simultaneously feel ourselves and become aware of 'being'. In this

sense, making can be considered a way of being in contact with oneself. Our body is in contact with a material that bends to our will, but the material also has its own will; thus, there is a struggle between our will and the material. We make concessions to the material and we make compromises with ourselves, due to the will of the material. It is as if there is communication with and through the material, and the outcome is an expression of this struggle or collaboration. Therefore, the outcome of this process is not a pure expression, but rather evidence of that process. In other words, it is an artefact that embodies the self and the material. This struggle was evident in both Olavi's and Laura's processes as they familiarised themselves with, and eventually won the struggle with, the new material.

At some point in the middle of working, when the work had reached a 'critical point' of starting to crack or wanting to bend, both participants expressed some stress over their lack of technical skills. Overall, the participants expressed stress over their lack of technique and worry that they would not succeed at what they had imagined they would make. In the end, the participants were happy with their results and the whole experience. A kind of catharsis appeared to be reached when the worry turned into contentment. The end result was accepted through the process, as their image of the piece changed while they were working.

### *Shared tactile experience*

After finishing his sculpture, Olavi tried throwing porcelain on the wheel, aided at first and then on his own (Figure 4). He had tried throwing a few times before and had even taken a throwing course. Although he felt some frustration during the workshop over not being able to make a narrow neck on his vase, he was still very pleased that the throwing resulted in a nice bowl instead. Previous tryouts had sometimes resulted in the clay being flung onto the floor.

Figure 4. Olavi throwing with the researcher.
Still photo captured from video clip by Camilla Groth.

As the researcher was throwing with Olavi, she could not speak with him or guide him in throwing by speaking through his interpreter, since he would have needed his hands for conversation. Instead, she was tacitly guiding him with her hands by placing them over his and throwing the clay with him. Based on this experience, we propose that this

teaching method was efficient. The researcher was able to pass the exact timing of muscle pressure against the clay, and all her collected tacit knowledge was available for Olavi. She realised that she was performing a kind of transferral of her embodiment with the material to him. At the same time, he could also feel the material moving and shaping under his own hands.

Concepts such as tacit knowledge (Polanyi, 1966, pp. 9-11), knowing-in-action (Schön, 1983/2008, p. 59) and reflection-in-action (Schön, 1983/2008, pp. 49-69) are attempts to characterise the knowledge and practices of skilled performers in art, craft and design. According to Michael Polanyi, the founder of the concept of tacit knowledge, 'an art which cannot be specified in detail cannot be transmitted by prescription, since no prescription for it exists.' (1958, p. 53). Polanyi proposed that such a skill may be passed on only by example from master to apprentice. The craft skills are taught through modelling, coaching and scaffolding; hence, they are the core of traditional apprenticeship, which is supported through the processes of observation and guided practice (Wood, Bruner, & Ross, 1976; Collins, 2006).

In addition, according to Pallasmaa (2009, p. 15), learning a skill is not primarily founded on verbal teaching, but rather on the transference of the skill from the teacher's muscles directly to the apprentice's muscles through the act of sensory perception and bodily mimesis. Explicit knowledge, the part of tacit knowledge that can be articulated, always rests on a much larger, hidden foundation of implicit knowledge. We propose that the skill of throwing clay also rest on such a foundation. Therefore, we agree with Polanyi's (1966, p. 4) basic idea that we can know more than we can tell.

Instead of having a pupil watching from the side, it might be more efficient to take his or her hands and perform with him or her. If a tacit skill is taught tacitly, the tacit knowledge can be transferred more easily than by merely watching and hearing instructions. Imaginary tactile learning by hearing or by using a tactile memory of a similar experience through watching is not enough. We also propose that the tactile experience of blindfolding can be used in education to further enhance tactile awareness in a learning situation where the pupil is sighted.

### *The problem of language*

One of the problems of this case study was the use of language. Language has been proven a problem both in communication with the deafblind and in the processing of experiences. In addition, we found that abstract concepts are difficult to communicate via tactile signing. The main questions of this study are abstract and somewhat poetic ones: 'Do you think it is possible to think through your hands?' and 'How do you think through your hands?' This way of speaking requires a culture and a language that supports abstractions and conceptualisations. This observation is linked to the pre-literal condition discussed earlier in this text. Even though many deafblind people are or have been literate, there may be less literal culture in their everyday lives after losing both modalities. Situational experience moves to the forefront. As language is not an exact mode of representation, there are also a number of different ways to understand the spoken language. A word has different connotations to different listeners. When working with the deafblind, communication passes through a number of filters. This is evident especially in the use of a translator, as the information changes at every step of the translation process (Benjamin, 1923/2005, p. 152).
This problem with language led us to realise that language is not the appropriate mode for this type of research. As a tactual modality is also available, it might be more suitable to use this. This means that, especially in the context of tactility, we should show and

communicate through making. This suggests that we are also capable of understanding by making and thinking through our hands.

## Discussion

In contrast to an ocular-centric worldview, the material arts and crafts are largely tactile-centred. We could benefit from an augmented tactile awareness in our working process with a material. We can try tapping into our embodied knowledge simply by closing our eyes. Modelling in clay resembles sketching, and as such, may contribute to thinking through one's hands. Language is not a self-evident communication tool when it comes to transferring tactual skills. Based on our case study, we propose that tactile skills can be taught to another person by 'hands-on' communication, which is similar to tactile communication, rather than through verbal and visual communication only.

Art, craft and design activities are fundamentally creative in nature; they require the implementation of conceptual ideas in the design of materially embodied artefacts (Keller & Keller, 1999). Traditionally, the body and mind have been studied separately. While design and craft processes are usually considered to represent a high level of cognitive and motor skills, there is little research that reveals the neurological basis of these skills (Alexiou, Zamenopoulos, Johnson, & Gilbert, 2009). In recent years, the embodied dimension and its reflection in designers' and artisans' work have gained increasing attention (Patel, 2008; Mäkelä & Latva-Somppi, 2011). Furthermore, research on mirror systems in particular has begun to provide knowledge concerning the neural foundations of embodiment and social interaction, which are crucial aspects in designing and learning craft and design skills (for a review, see Hari & Kujala, 2009). These recent developments in cognitive neuroscience, i.e., neuroimaging, have provided more knowledge about the mechanisms underlying tactile cognition than ever before (Nicholas, 2010, p. 5).

More interviews with experts of tactile knowledge who have worked professionally with one material over a long period needs to be conducted. Expert practitioners have handled material countless times; thus, without conscious effort, they can imagine and predict the perceptual consequences of their actions. In the next step of the study, one of the authors will spend a week working with clay while blindfolded. She will record her experience, the progress of her work and her thoughts during the process.

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