

THE MEANING OF NON FUNCTIONAL TOUCH

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ABSTRACT

Non-functional tactual interactions with objects (such as fiddling, swinging or just caressing) are frequent and familiar and can therefore be considered as being meaningful to users. Yet they do not seem to be part of the considerations of designers when designing products. This paper addresses the experience of these non-functional physical interactions: why do people interact with objects just for the sake of the interaction? What kind of movements are made? What tactual properties of objects elicit these kind of interactions? And why should product designers care about these aspects of human-product interaction? During the elective course Tactility at the Delft University of Technology, students from the Master Design for Interaction explore these non-functional interactions with objects. They observe their own non-functional behavior, analyze these experiences and design objects with the mere function to satisfy these non-functional needs. The results of the design exercise show that students *are* able to discover their own characteristic non-functional tactual behavior. Moreover, they discover that a specific stereotype movement seems to fulfill a specific need: for example to calm somebody, to enhance concentration, to stimulate day-dreaming, to pass time while waiting, to give support in socially awkward situations, and so on. Overall, these needs can be characterized as the need to *feel good*. The results of this design exercise show that designers should be aware of these non-functional aspects of physical interaction, because they address basic affective human needs.

Keywords: *tactual experience, affective design, designing for physical pleasure*

1. INTRODUCTION TO NON-FUNCTIONAL TOUCH

Consider the physical interaction between a person and a pen. Very likely you will think of somebody writing with the pen on a piece of paper. But people interact in many more ways with the pen than while just writing with it. People swing or roll the pen between their fingers, continuously click the mechanism to pull the tip of the pen in or out, tap with the pen on the table, chew on the back of the pen, scratch their head, develop amazing tricks with the pen, and so on. The possibilities of interaction seem endless. These interactions can be characterized as non-functional touch: they are not related to the functional use of the pen,

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that is, to the writing. These - often repetitive - interactions occur absent-mindedly: the body seems to reach out for these kind of interactions while the user is unaware of it. But they are very present. Also, more than once, they irritate the environment, and elicit remarks such as: "Can you please stop that clicking!". These non-functional interactions with objects are frequent and familiar and we can therefore ask ourselves "are they meaningful to users?". And if so, what is their meaning, and could this meaning be part of the considerations of designers when designing products?

This paper addresses the meaning of the non-functional physical interactions, such as fumbling, fiddling, playing and other kinds of absent-minded behavior people display when interacting without a functional motivation with an object. This perspective on non-functional touch as a possible approach to tactual aesthetics is inspired by a specific perspective on aesthetics in other sensory domains, for example in visual aesthetics: looking at an object per se, not for functional purposes but merely to enjoy its beauty.

The questions addressed in this paper are: Why do people interact with objects just for the sake of the physical interaction itself? What are they after? What kinds of movements are made? What tactual properties of objects elicit these kind of interactions? And why should product designers care about these aspects of human-product interaction? The underlying assumption of this study is that non-functional interaction with objects *is* a meaningful world of its own, within which specific affective aspects of objects emerge as a basis for aesthetic experience of these objects. If we can understand this meaning, we can use these insights to increase the tactual aesthetic aspects of objects.

The phenomenon of non-functional touch is explored *through* design. The study is executed in a design education context at the Delft University of Technology and the Design Academy in Eindhoven during the elective course "Tactility". Goal of this course is to make design students aware of the (aesthetic) experience of tactual properties of objects. The course offers hands-on exercises combined with design projects, both aimed to increase the personal world of experience of the students as designers. During the elective course Tactility at the Delft University of Technology, students observe their own non-functional behavior, explore these experiences and design objects with the mere function to satisfy these non-functional needs. This paper will report the insights in the meaning of non-functional touch that emerged from these exploratory design exercises.

2. THE STRUCTURE OF TACTUAL EXPERIENCE

Touching objects is a behavior we develop from the day we are born, to get in touch with the world and get familiar with it. Touching is our bodily way of understanding. Touch is also our way to feel present in the world, to be aware of our self. In addition, touch is our communication channel of affection: it is through touch that we feel loved and express love. But despite the importance of touch for our cognitive and emotional well being, the insights and knowledge generated through tactual experiences remain tacit (Polanyi). We bodily know, but we are not able to explain in words what we know. This tacit aspect makes the tactual experience difficult to explore. Before exploring the meaning of non-functional tactual experience, we need to understand the phenomenon of tactual experience itself. We need to

understand its structure in all its aspects, to be able to explore it as a whole. We need a conceptual framework to be able to unravel it and get access to it.

The following insights in the structure of tactual experience were obtained through a qualitative research involving 45 participant describing their tactual experiences with specific objects (Sonneveld, 2007). From these descriptions, different themes emerged characterizing the physical and emotional aspects of touch.

2.1. Conceptual framework

Starting point for the conceptual framework is the insight that touching is an *event* founded in movement. Moreover, touching is an *inter-active* event: to touch is to be touched. It is *while moving* that we explore the tactual properties of the world that surrounds us, and that we are simultaneously touched by that world.

Once we are aware of the fact that touch is grounded in movement, the next steps to understand tactual experience is 1) to explore *why* we move, 2) to explore what we experience physically, and 3) to explore our affective response to this physical experience.

2.2. Motivations to touch

Although this paper already focuses on a specific behavior (non-functional touch), we will describe all the different motivations to touch objects, to position non-functional touch in its broader context. Each aspect of this overview may offer starting points for insights in possible meanings of non-functional touch, and will therefore be discussed as such.

First, a motivation to interact with an object can be functional. The object is used as a tool, in a very broad sense. The objects are *functionally manipulated* in order to achieve some kind of result in the environment. The intention of the interaction is directed towards the outside world, for practical reasons. Evident examples are the use of scissors to cut paper, the use of a knife to slice bread, the use of a camera to take a picture, or the use of a car to get somewhere. Objects can be used for practical reasons the object was not intended for, for example when using scissors to open a jar of paint. Thus the motivation for practical tool use should not be confounded with the function of the object. Therefore, interactions that are not related to the function of a product, but that are motivated for another functional use are not part of this study.

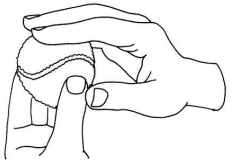
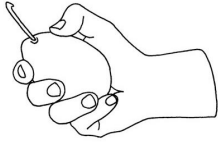


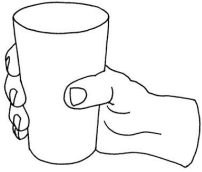
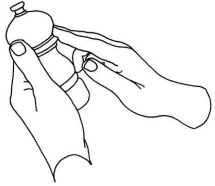
As stated in the introduction, motivations to touch are not *limited* to functional use. People also interact with objects to *play* with them, in the broadest sense of the word, including sports or just messing around. Some objects are actually meant to play with; the motivation is then inherent to the function of the object. Examples are tennis rackets and yo-yos. But people also play with objects that were not initially meant to play with. This playing has a specific character: it is physically moving and interacting with the object just for the sake of the resulting sensation. It is sometimes referred to as 'thoughtless' playing with the object. The non-functional touch addressed in this paper can be considered as part of this playing behavior. For our study, this leads to the suggestion that a possible meaning of non-functional touch could be to entertain, to pass time, and so on.

Another specific motivation to interact with objects is 'to take care'. First, objects are used for personal care, that is, to brush one's teeth, or to comb one's hair. But this taking care can be seen in a broader perspective. For instance, supporting someone is also a way of taking care of someone. In that sense chairs and beds take care of people. In both ways, this taking care of people can be the object's primary function, like a towel that dries, a chair that supports or a coat that warms. But this being taken care of by an object can be sought for independently from its function. For example, an object can warm or cool somebody and can be held for that reason. This is why one may hold a warm mug against one's cheek. People also interact with an object to take care of the object: to wash it, repair it, store it, and so on. In other words, 'taking care' is a mutual aspect of the human-product-interaction. For our study, this insight leads to the suggestion that non-functional touch could have the meaning of taking care of oneself: releasing stress, calming down, energizing, staying alert, and so on.

Finally, regardless of its function, an object can be touched for the sake of exploring it, for example because it is unknown and people want to discover how it feels. This motivation is not necessarily restricted to unknown objects. Also familiar objects can be touched just for the sake of touching it, exploring it, and being comforted by the experience of recognition. For our study, the comfort of being in contact and recognizing familiar objects could be a possible meaning from non-functional touch.

2.3. What we experience physically: objects' tactual properties and users' bodily sensations

When touching an object, we physically experience the interactive character of touch: we perceive touching the tactual properties of an object and simultaneously we experience the bodily sensations elicited by being touched by that object. For example, when holding a wooden cube and manipulating it, we perceive its shape, its hardness, the sharpness of its edges, and so on. Simultaneously, in our body, we sense the pressure of its corners on the different parts of the skin of our hand.

<p>Lateral Motion (texture)</p> 	<p>Pressure (Hardness)</p> 	<p>Static Contact (temperature)</p> 
<p>Unsupported Holding (Weight)</p> 	<p>Enclosure (Global Shape) (Volume)</p> 	<p>Contour Following (Global Shape)(Exact Shape)</p> 
<p>Moving Parts</p>		

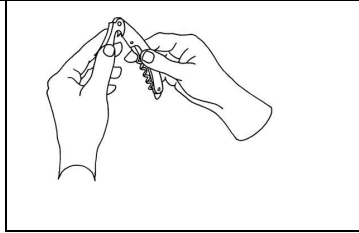


Figure 1: Exploration strategies: Specific exploring movements people make to explore specific tactual properties of objects (Klatzky et al., 1985)

Again, movement plays a key role in this physical experience. Each tactual property has its own specific movement to explore it (figure 1). Exploratory touching behavior will therefore involve these specific movements. Yet, when we touch for other reasons than mere exploration, for example when playing or when using the object for functional purposes, we will still perceive the specific tactual properties related to the specific movements involved. For example, we will perceive the texture of a table when sitting at the table and stroking it with the hand, but we will experience its weight only when we lift it, and its hardness when we hit it. This relation between movement and perceived tactual property suggests that specific non-functional movements with objects lead to the perception of specific tactual properties. The question is: which tactual properties will elicit these non-functional movements?

In being touched, the bodily sensations we experience are also related to the type of movements we make. These sensations are: pressure (when an object is pressing against our skin), vibration (when caressing a texture), light touch (when an object is merely touching us without pressure), warmth, heat, cold, pain, tickle, and so on. From this perspective, a specific meaning of non-functional touch could be the longing for specific bodily sensations. And an appropriate question for our study is: what are the bodily sensations one is after?

2.4. What we experience affectively: objects expressions & users gut reactions

We have seen that people have specific motivations to touch and to be touched. This motivation will lead to specific movements, which in turn will lead to the perception of an object's tactual properties and the associated bodily sensations. The insight that touch is grounded in motivation is fundamental to understand people's affective response to the physical interaction. Because people are motivated to move and touch, they experience an object, *through its touch*, as if it is motivated as well. People experience the object as having a personality, intentions, emotions, and so on. This can be characterized as the body language of the object. It seems that objects have a body language of their own, expressing their intentions, personality, emotions, and so on. For example: a hammer, because of its weight distribution, may feel as if it wants to cooperate, or on the contrary, if the balance is bad, as if it wants to nag you. A chair may feel as if it wants to welcome you and comfort you, or as if it wants to get rid of you as soon as possible. The concept of body language as a conceptual framework to understand tactual experience can be illustrated with the metaphor of the handshake. When shaking hands we experience someone's personality (for example warm, dominating, or rude), someone's intentions (wanting to stay, wanting to leave), emotions (loving or rejecting us), and so on. We use that same language to understand objects. Body language therefore proved to be a fruitful mean to get access to the tactual experience of

objects. Thus, when researching the non-functional tactual experience, the question becomes: what is the affective meaning of the body language we are experiencing?

3. EXPLORING NON-FUNCTIONAL TOUCH

For this study, the phenomenon of non-functional touch is explored *through* design, using the elective course Design for Tactility as an exploration platform (Sonneveld & Schifferstein, 2009). The course Design for Tactility is set out in the context of product design education to introduce students to designing for the tactual senses. The starting point for this course is that to be able to design for the senses one should develop one's tactual aesthetic sensitivity. Stimulating sensitivity for touch is therefore a key issue in the course. In addition, when designing for the senses, designers need to develop design knowledge to be able to use their sensitivity in the design process, referred to a 'a designerly way of knowing' by Cross (1982) . The design knowledge addressed in the course Tactility is twofold. First, the course develops the knowledge designers need *about* tactual experience in a specific domain (domain specific knowledge). Second, it develops the skills to design *for* tactual experience. For the development of domain specific knowledge as well as of skills in designing, personal and biographical experience seem to play a key role. Therefore, the course focuses on learning through experience: students explore their own world of experience and design for themselves.

3.1. The setup of the design exercise for non-functional touch

One of the course exercises focuses on a specific aspect of aesthetic touch: touching just for the pleasure of touching. The first motivations behind this exercise was that focusing on the aesthetic aspects of touch *only*, without being distracted by the function, would allow students to explore in depth aesthetics of tactual experience. But ongoing, we discovered that this particular way of interacting with an object has a meaning of its own. The exploration of this meaning became the additional goal of this exercise. To start with, students have to observe their own non-functional interactions with objects during a week, and conclude on a description of a preferred personal characteristic movement that emerges from these observations. Next, they have to observe in which contexts they display this kind of behavior, and reflect on what this behavior means to them. Once the students found out what their characteristic non-functional movement is and what this movement means to them, they are asked to study what tactual properties an object needs to have, to offer an optimal interaction experience for that specific movement. The students are asked to design a small handheld object that elicits these stereotype movements, offering a pleasant tactual experience. The designs are realized and brought into the classroom to present to each other. First, everyone experiences how it is to play with these objects. Next, each student comments on the development of his/her object. Finally, the students reflect on possible applications of such interactions in functional objects, as additional features. These concepts are presented as sketches. Eventually, the goal of the exercise is to show that it is inspiring to make these aesthetic aspects of non-functional interaction part of the design process, because they may lead to attractive and rich interactions.

3.2. Inventarisation of non-functional movements

What movements were reported? The results of the design exercise show that students *are* able to discover their own characteristic non-functional touching behavior. Although some students report that they discovered more than one type of movement, they mostly conclude that one of these movements is dominant. It is even a strong experience: the stereotypical movements students observe are often referred to as *'my nervous tic'*. Also, they discover that once they have found the 'perfect' object to touch, they cannot stop playing with it. In most cases, the exercise shows that this stereotypical and repeated playing with objects is a positive experience for the one who is playing, but irritating for the surrounding people: *"can you please stop that clicking!"*.

Students come to class with the objects they found that suit best their needs to touch and declare: *'I'm a real swinger', 'I'm a real stroker', 'I'm a real squeezer', or 'I love to try to break down everything into as little pieces as possible'*. Other examples of stereotypes are clickers, scratchers, builders, destroyers, folders, tappers, and so on (table 1). Each year new stereotypes are discovered. Figure 1 showed us an overview of exploratory movements. It is doubtful if we can make such an overview of non-functional movements, the possibilities seem endless.

It seems that discovering one's stereotype movement is an exciting event: *"this is great, I've been doing this all my life but was never aware of it!"*. There seems to be comfort in discovering this personal behavior. This enthusiasm and comfort are the first clues to assume that this behavior *is* meaningful.

Table 1: Examples of some stereotypical movements and possible benefits

Examples of movement	Examples of interactions	Possible benefits and effects
Clicking	Clicking the mechanism of a pen, opening and closing one's mobile phone.	Makes me concentrate
Swinging	Swinging a key chain around one's finger.	Makes me daydreaming
Doing little tricks	Flipping a coin or turning a pen around one's finger	Pass time, Entertainment
Destroying in as little pieces as possible	Tearing a coaster made of thick paper	Supports me in difficult conversations.
Caressing	Stroking the surface of one's mobile phone, stroking a particular piece of one's clothes.	Makes me feel safe Calms me Makes me daydreaming
Exploring holes	Putting one's finger in the hole of a beer bottle.	Gives me physical pleasure, Thrilling
Building, putting together	Playing with a paper clip, adding other little objects to it	Pass time, Helps me in difficult conversations
Balancing	Making a pile of objects on the table, till they tumble over	Pass time, Entertainment
Squeezing	Squeezing in a rubber ball	Calms me
Turning	Turning a ring around one's finger.	Makes me daydreaming, Helps me to concentrate

Tapping	Tapping with the fingers on a table, on one's leg. Tapping with the feet on the ground.	Stress relieve
Chewing	Chewing on the back side of a pen or pencil.	Helps me to concentrate
Folding	Folding little pieces of paper from candy or chocolate bars as often as possible. Folding a table napkin, again and again	Helps in difficult conversations Pass time
Straightening the lay-out of objects on a surface, arranging them in relation to each other.	At a diner table, arranging the eating utensils, and positioning the wine glass according to the pattern of the table cloth. Putting objects in a specific order at a desk, before starting a new task.	Getting a clear mind before starting something. Helps in difficult conversations Pass time.

3.3. Inverntarisation of possible effects of playful movement

What effects did these tactual experiences have? The explorations show that the students are well capable of defining the specific meaning of these different movements. These can be grouped in different categories, such as: passing time (entertaining), trying to concentrate, concealing one's uneasiness, ordering thoughts, getting prepared for an activity, releasing stress, stimulating daydreaming, or seeking pleasant bodily sensations (table 1). Again, the possibilities do not seem limited, on the contrary, within the categories students seem to be able to refine and discover new meanings. Following this overview of possible meanings, we can conclude that the objects address the specific needs that were discussed in section 2: people want to play, to feel taken care of, to be supported in difficult moments, and so on. Overall, we can conclude that the body language of the objects expresses the affective message: *"we want you to feel good"*. The way this 'feeling good' is elicited differs for specific situations and contexts, but the message is the same.

The explorations often show another aspect of product experience as well: the interaction with these objects is not only pleasant, but even addictive. During the discussion in class on the meaning of non-functional touch, all conclude that this behavior is normal, meaningful and longed for, and that it should not be referred to as a tic but as an aesthetic aspect of physical interaction in its own right. These effects can be related to the motivations to touch as discussed in section 2: playing, taking care of and seeking for bodily pleasures (sensations). The exercise gave more depth to these first assumptions

3.4. Designing the perfect object to touch

Students explore the tactual properties of the objects they interact with, and try to understand what tactual properties 'the perfect object' should have, such as: weight, temperature, texture, shape, and so on. As expected, the objects that elicit a specific desired movement can be characterized by a specific tactual property, related to the properties showed in figure 1: for example size (for example organic and solid versus long and flexible),

the way it is balanced (well balanced or out of balance), its texture (smooth or with specific patterns), and so on. This exploration of properties is done hands on: by comparing existing objects, but mostly by making different models to play with. It is *while* making these objects that students learn about the perfect properties. This exploration of properties through designing allows students to develop their own world of experiences and to take their own discoveries as starting points, rather than taking guidelines for granted.



Figure 2: Some results of designs of objects for non-functional interaction: exploring holes, clicking two magnets, folding and caressing feathers.

Once they created an object, students discover that the way of playing with the object may evolve in time: at first, one plays with it the way it was intended to, but after a while one starts to discover new aspects, new ways of playing. For example, for the effect of passing time, one student made two rings with a magnet in each, to be able to alternately click them together and separate them again. After a while he found out that it is challenging to join the two magnets together as close as possible, but to prevent them from actually clicking. The discovery of this tension field was an exciting experience, enriching the meaning of the interaction (of passing time). Another student, to stimulate daydreaming, created an object out of feathers to caress with the hand, after a while she found out that caressing her cheeks, neck, and so on are other interesting areas to explore. Figure 2 shows different design results

4. DESIGN FOR THE NON-FUNCTIONAL EXPERIENCE

4.1. The affective body language of objects

We can conclude that awareness of the meaning of non-functional touch contributes to the development of objects that elicit a rich affective experience. Taking non-functional touch as a serious aspect of design will allow the designer to design objects that express the intention

'I want you to feel good'. It is up to the designer to explore and envision what a user needs in a specific situation to feel good: passing time, being able to concentrate, to daydream, etc. For example, mobile phones enhancing stress relieve, car-keys enhancing concentration, and so on.

4.2. Relation between type of movement and effect

Observations of the designed objects and the reported experiences show that the interactions fulfilling each specific needs have some general characteristics in common. For example for a calming, stress relieving effect, and for enhancing daydreaming, students create objects that elicit *continuous, fluent* movements (figure 3). Examples of such movements are: turning a lint around ones fingers and letting it unroll again, caressing smoothly, swinging a key cord, etc.

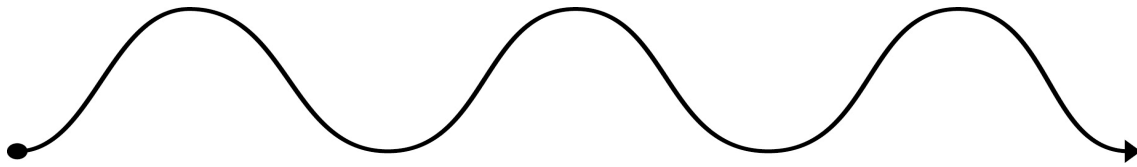


Figure 3: Schema of a fluid and smooth movement to stimulate experiences such as daydreaming, relaxing, feeling loved, and so on.

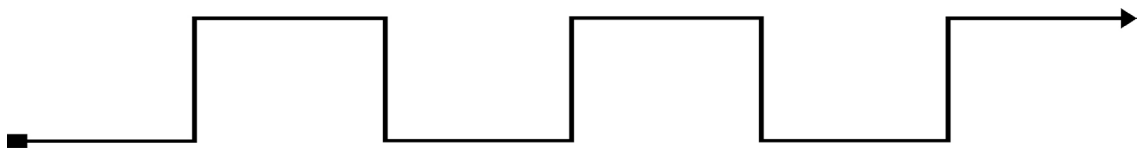


Figure 4: Schema of a staccato movement to stimulate staying alert, problem solving, relieve tension and stress, and so on.

On the other hand, to enhance concentration, students choose for staccato, short and repetitive movements (figure 4). Examples of such movements are: clicking with a pen, tapping on a table top, folding and unfolding an object, and so on. And to pass time while waiting, objects may offer the possibility to develop different tricks. This specific non-functional touch asks for complex, difficult to learn movements, such as flipping a coin between one's fingers, turning a pen on one's hand, and so on.

5. RECOMMENDATIONS & FUTURE RESEARCH

This study offers some first insights in the phenomenon of non functional touch and can be seen as a plea to incorporate awareness for this very specific behavior in product design. Through non-functional touch people experience an important affective meaning in human – product interaction: the object cares about the user *feeling good*.

Although this plea for awareness and attention for this affective behavior of objects is mostly meant to be inspirational, the phenomenon can be explored more in depth, to allow students to develop their sensitivity towards this domain. To develop additional insights, we need to work towards a more systematic overview of motivations to reach out for non-functional touch, of the movements people are looking for, and of the tactual properties that elicit these movements. Moreover, these movements and tactual properties can be analyzed in

a systematic way to discover underlying characteristic patterns, such as roughly sketched in figure 3 and figure 4. These patterns will support design students to explore and design for this domain. Finally, the developed insights and generated patterns should be applied in products that do have a specific function, such as a mobile phone, a car seat, or a wine glass, to truly assess the added value of designing for non-functional touch.

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