



TOUCHING
THE IMPORTANCE OF
SOMATOSENSORY STIMULATION



I want you to do me a favour.

Yeah, sure.

I want you to hit me as hard as you can.

What? In the face?

Surprise me.

Images and dialogue from Fight Club 1999

INTRODUCTION

Even before Palahniuk's 1996 book and the 1999 film, underground fighting clubs were widespread. We might reasonably wonder why, and question the desire that underlies the above exchange, quoted from *Fight Club*. The unnamed narrator of the film (facing page right) begins the film as a chronic insomniac dragging himself through days devoid of challenge or stimulation, consoling himself by compulsively ordering furniture from the IKEA catalogue for his meticulous apartment. Tyler Durden (facing page left), a creation of the narrator's mind, is the solution; a whirlwind of violent contact, bloodied floors and liposuction fat; extreme, but perhaps nothing more than an understandable and proportional antidote to the narrator's sensation-deprived previous existence.

Diverse, rich stimulation from our environment, our products and each other is essential to human well-being and ability to develop, interact and function; some of the sensory modes are being deprived as a result of social and technological trends affecting our behaviour and the way we design our surroundings, causing a variety of problems.

PERCEPTION

On the simplest level, stimuli are necessary to allow us to form knowledge of our environment, but it is not only the most obvious senses that are used; Bigelow in 1981 discussed the need for a range of simultaneous stimuli presentation to allow formation of a 'perceived whole' by what is known as intermodal transfer. Evans in 2005 quotes the observation of a researcher at MIT that to fully sense even as simple an object as a cup, we take it in our hands and run our fingers over its surfaces and edges. Gustafson-Pearce in 2005 observed that even fully sighted people use their fingers to trace parts of their environment as they move through it, in the same way as a visually impaired person does, a form of subconscious reinforcing behaviour. One visually-impaired subject of her investigation described navigating with full confidence in open space using the heat of the sun, the contours of the terrain and the texture of the ground directly underfoot, a diverse and purely tactile range of stimuli that form a rich and believable 'perceptual whole'; a product should deliver this experience to the user.

We see then that touch can contribute a surprisingly critical component of our formation of perceptions of what we are doing and what is happening around us; Gustafson-Pearce's discussion of the reasonable functionality of visually impaired people compared to the permanent and dramatic disability of those who suffer absence of the tactile sense, known as sensory neuropathy, leads to the conclusion that touch is in fact less dispensable than vision. Boyd and Marlow in 2007 found results that support this, showing that tactile information affects our perception of aesthetic value more than visual. This rings true; think of the way we 'look' at clothes in a shop. Ripin and Lazarfield as early as 1937 similarly found the tactile sense becomes strongly associated in people's minds both with perceptual wholes and abstract concepts.

This knowledge suggests our tactile sense is more sensitive and capable than we give it credit for. This is true; visually impaired people are able to read patterns of dots by touch with surprising speed, and Gault in 1922 found subjects to be capable of 'hearing' human speech through vibration applied to the fingertips and identifying colours using only the olfactory sense, another mode that is considered peripheral and is underexploited in the design of products. Geldard in 1957 confirmed that the skin is capable of receiving information at high resolutions.

Another interesting finding concerning the relative senses was made by Lovaas et al in 1977; children classed as 'autistic' responded more strongly to tactile, gustatory (taste) and olfactory (smell) stimuli than to visual, auditory or pain stimuli.

TOUCHING: THE IMPORTANCE OF SOMATOSENSORY STIMULATION

A possible meaning for this is suggested by an understanding of the condition; the inability of an autistic person to engage in social interaction is due to an oversensitivity to, or lack of capacity to process, stimuli that involve complex mental processing. This seems to indicate that the tactile, gustatory and olfactory senses are our least stressful and most comfortable modes of perception and therefore ideal for transmission of reinforcing feedback, for example in association with control inputs to a product.

In summary concerning the strength of the influence of the tactile sense, I recall a wall-mounted illusion comprising an image that was painted onto a pyramidal surface to create a strong impression of a three dimensional image. On touching the physical surface, the illusion was immediately dispelled and was no longer effective. I immediately trusted that my tactile sense was providing an accurate perception and discarded without question my previous visual perception.

We should therefore be sure to consider the importance of the tactile sense in communicating the function, value and state of an environment or system to the user. One reason is for improvement of user performance and accordingly their perception of ease of use.

PERFORMANCE

Gladwell in 2004 wrote an article in the New Yorker on the subject of large, comfort-oriented vehicles and commented that they “isolate the biggest safety factor, the driver” by depriving them from feedback that should impart sensation of speed, danger and the current state of the vehicle, for example a slide condition, thereby allowing accurate control inputs to be made. Walker in 2002 researched this subject in some detail at Brunel University, discussing in his thesis the current trend for industrial design, in particular automotive design, to move away from design for ‘local manual control’, whereby the machine is merely an extension of the user, toward ‘supervisory control’, which requires the user to monitor a system which is semi-autonomous. Walker warns that relying on the attention of a user who is effectively ‘out of the loop’ is mentally stressful and leads to ineffective response to sudden changes of state. In a vehicle this can be catastrophic; in domestic products the result is rarely so drastic, but mistakes here can still be messy, expensive and inconvenient.

Regarding methods of delivering useful feedback to the user, Haughan and McIntyre’s findings in 1972 are simple, showing that development of speech in children is best reinforced by audible stimuli, suggesting that instructive and reassuring feedback presented by a product should be delivered primarily in the mode of the appropriate user input; for example, a control whose action is mechanical should be linked to a mechanically manifested feedback rather than, for example, an audible beep. This is not to recommend against deployment of supporting feedback by other modes; Spence et al’s 2000 and Cinel et al’s 2002 studies both indicate that multi-modal delivery serves to optimise task focus and therefore efficiency. Gustafson-Pearce expands on this, stating that “when senses agree, we do not further consider the issue”, known as ‘efficiency through reinforcement’.

Gustafson-Pearce continues to describe the confusion and frustration that users, particularly those with a certain sensory impairment, feel when a situation fails to offer the full range of stimuli that they have come to expect and rely on for information or confirmation. Behaviourally, frustration can result in stalled activity, feelings of alarm, and natural defensiveness if approached or questioned. In extreme cases, if unmitigated, aggressive venting behaviour can result, perhaps something that we might relate to the narrator in the film Fight Club that was mentioned in the introduction.

BEHAVIOUR

Ensuring provision of adequate stimuli has been shown by Hayes in 1980 to be effective in influencing behaviour, specifically aggressive behaviour in children, but as with the observations of visually impaired subjects, this is surely applicable to everyday behaviour and attitude and the effect a designed set of stimuli can have. Indeed, Smotherman and Robinson reported on an example of this in 1988, commenting that presentation of tactile stimulation results in direct increases in observed activity levels in mammals, indicating an underlying increase in alertness and respiratory rates, which can positively influence an individual's effectiveness, therefore their feeling of satisfaction and general mood.

DEVELOPMENT

Stimulation of the full range of senses is also pivotal in encouraging development of the capacity for intermodal transfer, the efficiency benefits of which have been discussed above; Bigelow emphasises the importance of this in her 1981 study of childhood subjects.

Touch in particular has been shown already to be important, but in examining the early stages of development we really see how fundamental the tactile sense is to our ability to perceive our surroundings. Gustafson-Pearce, again, provides useful insight here, quoting Hoffman's 2000 quotation of Berkely in 1709 making the observation "we don't see shape and space; we see only coloured patches; and then associate these patches through experience with the shapes and spaces we feel"; this is reinforced by Wilcox's rather more contemporary observations of infant-stage development. It is noted that children initially explore and identify their surroundings by tactual methods alone; by five months, babies are known to be able to identify objects by shape and size, but not visually. By twelve months most have learned to associate visual information with this tactile discernment, which is the beginning of being able to navigate three-dimensional space by sight.

As was mentioned in the section on perception, however, there remains a need to continually 'calibrate' and confirm the accuracy of this complex, associatively processed information. The initial stage of development underpins our lifelong perceptual abilities, and the stimuli presented at this stage have great influence, but we also know that development of the brain continues well into our adult life, so the importance of stimulation from the product landscape is not restricted to baby products. Flannery and Balling discussed in 1979 how heavily the spatial specialisation of the right brain hemisphere depends on continuous exposure to rich and varied stimuli from our activities, our environment and, of course, the objects we use.

INTERPERSONAL

The development of social abilities relating to touch also depends on exposure to stimuli. An article I read some time ago, which I think was published in a supplement of The Times but have been unable to relocate, was of interest; on the subject of human 'hugging', mention was made of a chemical which is released in the body and accounts for the positive emotional effect that is experienced, but also that this is not the case in all humans; we 'learn' to release this chemical by exposure to contact in the first five years of life.

Unfortunately, a reticence to engage with others emotionally and physically seems to have developed, in our culture particularly; A study that I have again been unable to relocate observed rates of touching between couples at tables in coffee shops in cities around the world; in Rio de Janeiro, 180 touches per hour were recorded on average; in London, no touches were typically recorded.

TOUCHING: THE IMPORTANCE OF SOMATOSENSORY STIMULATION

An underlying explanation for this example might come from a fear of transgressing social proxies; the strength of responses to images of intimacy reported by Derlega et al's 2001 study confirms the weight of meaning we attach to touch; in the past few decades, increasing attention has been drawn, in the media and our consciousnesses, to accusations of inappropriate touch, particularly toward children; this can only compound nervousness about interacting in a tactile way with others.

The likelihood that this is emotionally damaging is strengthened by Hertenstein et al's 2006 exploration of the diversity of emotions we are capable of understanding through tactile gesture alone, with reference to the prevalence of touch in the mating, comforting and reconciliatory interaction of a huge range of species. Recollection of a scene from the film *Amelie* comes to mind in consideration of this; *Amelie's* relationship with her emotionally awkward father, a doctor, is so devoid of tactile interaction that her intense emotional reaction to contact, at his annual examination of her health, raises her heart rate to the extent that he deems her suffering a cardiac disorder.

These discussions of interpersonal touch admittedly seem not to apply directly to the practise of industrial design, but they do underline the deep link our tactile sense has to our psychological well-being, and there could in fact be scope for design to address the encouragement of interpersonal interaction. A 'civilian' friend of mine recently expressed concern about a possible negative example of a product's impact; the effect of widespread personal stereo usage when walking in the street or travelling on public transport, where a vast array of stimuli, pleasant and unpleasant, are offered, including transient contact with potentially interesting strangers, but we seem to be choosing to preclude the possible satisfaction of these interactions in favour of a protective sensory bubble.

This issue of products providing a sensory bubble has been mentioned already in relation to user performance while controlling a car, but an encouraging example of user demand for feedback was encountered by Lexus in 1990 when they released what may be the most beautifully refined luxury car ever made, the LS 400. Willson in his 2001 book reports that several years after its release, the vehicle had to be de-engineered to allow some vibration and noise to reach the driver as its perfect isolation of sensation was found unsatisfying by European customers with their taste for the taut, reassuringly tangible body control of products such as the BMW 7 series.

SATISFACTION

Similarly, Evans et al in 2005 quotes a study of the perceived stresses of computer use, which seemingly expected to find information overload as a reported problem, but instead reported that "the most common complaint about computers is not about overload, but deprivation; it is about the inability to touch one's work", which accords with Evans' own assertion that traditional craft endures as a recreational activity only because it satisfies some deep need for 'direct experience', which in turn agrees with Gustafson-Pearce's observations of the frustration that results when a situation presents insufficient breadth or strength of physical feedback.

Alongside this discussion of examples of deprivation of stimulation, it is interesting to consider the behavioural trends that can be observed and perhaps described as the reaction of individuals to what Walker, in the above-mentioned 2002 thesis, described as lack of 'apparent risk', which correlates to stimulation density and intensity. One example of a visible trend is the growth of attendance of organised track driving days at an ever-increasing rate, an explanation being that as cars become ever more cossetting and road conditions disallow the style of driving which satisfies drivers' expected survivable risk level, track conditions fulfil this need, as do products that are designed to provide satisfying levels of stimulation in ordinary use conditions.

CONCLUSION

Gladwell makes observations that form a strong summary of this discussion; we're familiar with the term 'midlife crisis', a point in many people's lives marked by an impulse purchase or lifestyle change; Gladwell wrote about the psychological underpinning of two of the common purchase choices.

The acquisition of a large, imposing 'sports utility vehicle', he proposes, represents desire for perceived 'passive' safety, based on feelings of 'learned helplessness' through experience of vehicles that in the interest of ride comfort exhibit compromised handling security and system feedback quality, and therefore the capacity of the driver to respond to danger actively.

Conversely, the other classic choice, a small, noisy sports car, is described by Gladwell as showing a desire to overcome the disconnected, helpless feeling of larger, 'safe' cars by placing themselves closer to the road, physically and perceptually, increasing the perceived risk involved in driving by providing a stiffer and more direct link to the road beneath the vehicle and the vehicle's interaction with it. Gladwell continues to comment on the irony of the actual increased safety of the vehicle perceived to be less safe, because of the intrinsic dynamic benefits of reduced vehicle height and mass, and increased suspension stiffness, and also by the increased effectiveness of a driver who is included more firmly 'in the loop'.

It's clear which of the two Gladwell, as a sociologist, considers the most psychologically healthy choice. It seems clear to me too, as both consumer and designer, the importance of being willing to engage with the reality of what is taking place around me, both for the benefit of my own mental well-being and development, and to the end that awareness of the effects of my actions and the energy I am consuming might influence my behaviour in a way that reduces my negative impact on my surroundings.

Of course, You and I are unlikely to ever reach the extremes of stimulation-deprived psychological turmoil seen in *Fight Club*; we should, however, take care to avoid the less graphic but equally insidious fate of a once-pioneering jazz musician about whom Kerouac in the inimitable prose of his 1959 autobiographical novel *On The Road* sadly concluded "...and today wearing his thicksoled shoes so that he can't feel the sidewalks of life his horn held weakly against his chest and he blows cool and easy getout phrases and has given up".

TOUCHING: THE IMPORTANCE OF SOMATOSENSORY STIMULATION

- Bigelow, A. (1981) Children's tactile identification of miniaturised common objects. *Development Psychology* 17 (1) pp. 111-114.
- Boyd, C., Marlow, N. (2007) Not only in the eye of the beholder: Tactile information can affect aesthetic evaluation. *Psychology of Aesthetics, Creativity and the Arts* 1 (3) pp. 170-173.
- Cinèl, C., Humphreys, G., Poli, R. (2002) Cross-modal illusory conjunctions between vision and touch. *Journal of Experimental Psychology* 28 (5) pp. 1243-1265. *Creativity and the Arts* 1 (3) pp. 170-173.
- Derlega, V., Catanzaro, D., Lewis, R. (2001) Perceptions about tactile intimacy in same-sex and opposite-sex pairs based on research participants' sexual orientation. *Psychology of Men & Masculinity* 2 (2) pp. 124-132.
- Evans, M., Wallace, D., Cheshire, D., Sener, B. (2005) An evaluation of haptic feedback modeling during industrial design practice. *Design Studies* 26 pp. 487-508.
- Fincher, D. (1999) *Fight Club*. Twentieth Century Fox Film Corporation
- Flannery, R., Balling, J. (1979) Developmental changes in hemispherical specialisation for tactile spatial ability. *Development Psychology* 15 (4) pp. 364-372.
- Gault, R. (1922) An unusual case of olfactory and tactile sensitivity. Cambridge: Annual meeting of American Psychological Association, section for Clinical Psychology.
- Geldard, F (1957) Adventures in tactile literacy. *American Psychologist* 12 (3) pp. 115-124.
- Gladwell, M. (2004) Big and bad: How the S.U.V. ran over road safety. Available at: http://www.gladwell.com/2004/2004_01_12_a_suv.html [accessed 31 January 2008]
- Gustafson-Pearce, O. (2005) The application of the information architecture method to design an intuitive haptic interface. PhD Thesis. Uxbridge: Brunel University.
- Haughan, G., McIntire, R. (1972) Comparisons of vocal imitation, tactile stimulation, and food as reinforcer for infant vocalizations. *Developmental Psychology* 6 (2) pp. 201-209.
- Hayes, S., Rincover A., Volosin, D. (1980) Variables influencing the acquisition and maintenance of aggressive behaviour: Modeling versus sensory reinforcement. *Journal of Abnormal Psychology* 89 (2) pp. 254-262.
- Hertenstein, M., Keltner, D., Brittany, B., Jaskoka, A. (2006) Touch communicates distinct emotions. *Emotion* 6 (3) pp. 528-533.
- Kaitz, M., Lapidot, P., Bronner, R. (1992) Parturient women can recognize their infants by touch. *Developmental Psychology* 28 (1) pp. 35-39.
- Kerouac, J. (1959) *On the road*. New York: Viking Press. pp. 241
- Lovaas, O., Schreibman L., Koegel, R., Rehm, R. (1977) Selective responding by autistic children to multiple sensory input. *Journal of Abnormal Psychology* 77 (3) pp. 211-222.

Palahnuik, C. (1996) *Fight Club*. New York: Henry Holt and Company.

Ripin, R., Lazarsfeld, P. (1937) The tactile-kinesthetic perception of fabrics with emphasis on their relative pleasantness. *Journal of Applied Psychology* 21 (2) pp. 198.

Smotherman, W., Robinson, R. (1988) Behavior of rat fetuses following chemical or tactile stimulation. *Behavioral Neuroscience* 102 (1) pp. 24-34.

Spence, C., Pavani, F., Driver, J. (2000) Crossmodal links between vision and touch in covert endogenous spatial attention. *Journal of Experimental Psychology* 26 (4) pp. 1298-1319.

Walker, G. (2002) *User-centered car design and the role of feedback in driving*. PhD Thesis. Uxbridge: Brunel University.

Wilcox, T., Woods, R., Chapa, C., McCurry, S. (2007) Multisensory exploration and object individualisation in infancy. *Developmental Psychology* 43 (2) pp. 479-495.

Willson, Q. (2001) *Cars: A celebration*. London: Dorling Kindersley

TOUCHING: THE IMPORTANCE OF SOMATOSENSORY STIMULATION

