CONSTRUCTED BODIES: HOW CAN PHYSIOLOGICAL INSTRUMENTS BECOME TOOLS OF SELF PERCEPTION?

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‘The invalidity of the sick man’s judgement concerning the reality of his own illness is an important theme in a recent history of disease. [...] “Health,” says Leriche, “is life lived in the silence of the organs”... The state of health is one in which the subject and his body are one. Conversely, the awareness of the body consists in a feeling of limits, threats, obstacles to health.’ (Canguilhem 1981, p.91)

Rene Leriche’s phenomenally based image of health serves to frame a concern regarding the integration of physiological sensor technologies into the consumer market. However, this analysis is not so concerned with the body in a state of illness, when normal life is interrupted, but at the point when physiological instrumentation is diffused into what Don Ihde refers to as the ‘technological texture’ (Ihde 1979) of our day to day environment. It is this possibility that demands an enquiry into what may happen when instrumentation gives the body a voice.

What happens when the organs break their silence?

Currently physiological sensors are found mainly where the normal limits of the human body are tested or compromised: space or deep sea exploration, military, sports and medicine. However, there is an ever growing market in the western world for home consumer medical technologies, and here, the usual forces which appear to drive the diffusion of computer based technologies into consumer markets appear to be at work: miniaturization, falling costs, increase in processor power. These factors, in addition to the adoption of paradigms such as ubiquitous, affective and physiological computing, appear to justify the very common expectation that there will be an increasing prevalence of these instruments in everyday life. In addition to the medical applications of these devices such as wearable heart, blood glucose, galvanic skin response monitors; there are also applications in the

entertainment sectors as game controllers, emotion or brainwave responsive entertainment systems as well as sports and wellness applications.

This paper is not concerned however, with specific technological products, but instead aims to consider the general effects of an integration of physiological sensors into the 'technological atmosphere'. What effects will objective, medically significant information about the body have upon subjective perception of embodiment? How can we consider its integration into perception? Adopting a theme from Canguilem's reading of Leriche it is hoped that we may explore a question which, while accompanied by much expectation, is surrounded with uncertainty.

Incorporating technological information into the phenomenal world; how will organs speak?

Let us first turn to the question of how physiological instruments might allow organs to 'speak'. The Philosophy of Technology provides some structures describing how technological data is incorporated into the phenomenal world. I will first comment upon the phenomenological method as it relates to our study and some of the attempts to characterize human-machine interaction.

Ihde's analysis adopts Merleau-Ponty's 'perceiving body-subject' – the human as an active perceiver. This definition of the technology user is a constructive model, as it makes possible a unitary rather than reductive analysis of the subject's interaction with physiological data. It also follows Canguilhem's analysis, defining illness as a state experienced by the 'sick man' (1989 p.90) rather than through physiological or medical definition.

Some thinkers from the lineage of Phenomenology have considered technology as a negative force within the domain of lived experience, or 'lifeworld'. Following Heidegger's assertion that technology treats everything in the world as a 'standing reserve' - basically a raw material to be used up, writers like Winner (1977) view technological activity as one of constant colonization, 'technology goes where it has not yet been'. Albert Borgmann's thought takes a particularly dystopian position when reviewing the effects of modern technology on the lifeworld. Using a 'device paradigm' - examining individual devices modifications upon human experience; Borgmann's work characterizes technology as 'disembodying', in that it creates devices that are a means to an end, removing active input from their user. He argues that as technology becomes invisible, technological devices 'alienate' their uses from the lifeworld and its focal practices (Veerbeck 2002).

Applying 'disburdenment' to physiological sensing might suggest that technological access to bodily information might supersede or interfere with somatic perception, resulting in a diminished reliance upon inherent sensory capacities. However, psychological studies have suggested that this is not the case, diabetic patients who use blood glucose monitors to regulate their food and insulin intake have been found to still 'rely on symptoms' and that 'subjective cues win out over the procedures guided by abstract knowledge'. This shows that in day to day use, somatic information takes precedence over objective, instrumentally derived information about the body (Baum et. al. 2001, p.23). However, this precedence of one modality of information over another - somatic over instrumental - may be attributable to features of the interface.

Ihde clarifies this interface difference with an analysis which takes a more specific approach to the incorporation of technology into phenomenal experience. In his earlier work he makes a distinction between *hermeneutic* and *embodied* relations with technology (Ihde 1979). *Hermeneutic relations* are textual, semantic interactions. Here, as in the earlier example of blood-glucose monitors, information from the device is assimilated through cognitive engagement. As in the common conception of scientific instruments as producers of dials and graphs, technological devices that fit this category are *read* by the user.

In contrast *embodiment relations* are the product of the incorporation of a technology into the activity of living. Heidegger's famous example of his father's hammer typifies this, where the tool is treated more like an extension of the user's body. The difference between these two forms of interaction allows the speculation that physiological devices which have the correct *interfaces* may integrate into somatic perceptions.

In fact, this integration may be a two way process. Commenting on a number of technological projects utilizing prosthetic, brain-computer and haptic feedback for rehabilitation and sensory enhancement, Andy Clark argues that the neural plasticity of the brain demonstrated by the success of these experiments shows how non-biologically derived sensor data is easily incorporated into active bodily schema. He points out that '[t]he key to effective sensory substitution is goal-driven motor engagement' (Ihde 2000, p.269), which allows the user's brain to test the boundaries and significance of the incoming data and their interaction with it. Initially, this appears not to apply to physiological processes which we might consider non motor-driven, but in fact the paradigm of biofeedback therapy has successfully demonstrated that physiological instruments can help users learn to actively and intentionally modify their own physiological functions.

Ihde also delimits the contents of perception of the body, according to the information sources that influence it. He refers to what we might consider the authentic or directly perceived body as *Body One*. In contrast *Body Two* is comprised of cognitive information, such as cultural and social knowledge and judgments, memory and expectation (Ihde 2002). It is possible to shoehorn our definitions of embodiment relations into bodies one and two, Body One is where we might find the direct perception of embodiment relations, whereas Body Two would be the arena in which hermetic relations took place and modified self perception based on cognitive data. The fact that this seems so messy a tactic is that our perceiving body-subject resists this division. The apparently *direct perception* of Body One is contested as it incorporates unmediated sensory data.

This problem comes about because what we might imagine are distinct mental contents, such as abstract knowledge or somatic cues, are incorporated within perception. We can see this clearly in Wittgenstein's Duck/Rabbit illustration and other visual illusions which defy visual categorization or shift between different perceptual interpretations. These examples demonstrate that abstract knowledge influences how perceptual cues are interpreted at the moment of perception. Therefore as far as a delimitation of phenomenological embodied experience, Body One and Body Two can be useful to categorize incoming information, but not to prioritize its effects or even to separate them within subjective experience.

Assigning meaning to somatic information; significance and symptoms

Whether the organs have anything to say is dependent upon who is listening. Leriche draws a distinction between illness from the perspective of the doctor and that of the patient;

The idea must be accepted that the disease of the sick man is not the anatomical disease of the doctor. A stone in the atrophic gall bladder can fail to give symptoms for years and consequently create no disease, although there is a state of pathological anatomy... The difficulty must no longer be conjured away by simply saying that there are silent and masked form of disease: these are nothing but mere words. (Leriche 1981, p.94).

As we see, the physician's definition of pathology is situated on a different part of the continuum of physiological normality to that of the experiencing man. The instrumentation of medical practice; both as a knowledge system,

and a set of technologies which render visible the functions of the body, allow the physiologist to discover functional irregularities which have not yet, or may not ever, manifest themselves as the phenomenal experience of illness. These deviations from the norm are recognised 'because today's practitioners are the heirs to a medical culture' which allows them to recognise the possible outcome of certain symptoms or abnormalities based upon historical knowledge and the fact that 'at one time this experience gave rise to, summoned up, that knowledge' (Leriche 1981, p.95).

In a study similar to that of the diabetes patients above, patients being treated for hypertension (physiologically classed as high blood pressure but not severe enough that it produces any symptoms) found 80% of patients reporting that 'a variety of somatic cues such as heart palpitations, warm face, and headache' allowed them to tell if they had elevated blood pressure, even when they were aware that the disorder was asymptomatic. It appears therefore, that the condition of diagnosis leads patients to assign symptomatic significance to observed bodily events.

The field of health psychology acknowledges the complications presented by the mixing of information and experience Body One and Body Two within perception. As a discipline Health Psychology considers that 'much of the decoding process takes place outside awareness' (Baum et. al. 2001, p.26) during the interpretation of somatic experience into symptoms. Research here makes a further division of somatic experiences similar to Ihde's which can assist in an analysis of how health significant information is dealt with by patients, and makes a distinction between somatic sensations which have reference to patients' past illness experiences and somatic memory, and those which do not.

Baum et. al. explain that;

'The knowledge base used to transform a somatic sensation into a symptom includes both semantic memories (e.g., memories of labels such as heart disease, cancer, and colds) and concrete, perceptual memories of personal somatic experiences (e.g., memory of painful sensations in specific parts of the body during specific illness episodes).'

Whilst cognitive and abstract strategies for illness management are elicited by patients semantic knowledge of medical schema, '[p]erceptual memories of specific episodes... appear to generate an immediate, sensory link to appraisals of health status and treatment efficacy...' In addition to this, somatic cues which access memory 'play a central role in the elicitation and maintenance of emotional reactions.' (Baum et al. 2001, p.23).

This memory based somatic response can be linked to Clark's discussion of how technologies become integrated into active bodily schema through a process of motor engagement. Learned responses to bodily sensations linked to illness may operate in a similar fashion, allowing physiological sensor technologies with embodied interfaces to generate 'immediate, sensory link(s)' which will influence emotional reactions and appraisals of health status in their users.

Conclusion

There are a number of implications proceeding from the ideas we have tested to define phenomenal interactions - interactions with technology and with health significant somatic experiences.

Physiological instrumentation allows the detection of medically defined abnormalities which are not accessible to normal perception. In everyday use however, there is a possibility that medical instruments may diffuse physician's definitions of illness, and with them, the broader possibility of pathology, into phenomenal experiences of somatic events. Research with patients who are currently using technologies of these types suggests that embodied somatic information have far more affective power over users, which may also result in stress responses to information which is diagnostically loaded from a medical perspective, but may never result in illness.

However these technologies represent a potential interface of the user to somatic information that may be able bypass semantic medical schema and definitions through embodied interfaces. We can suppose that this will result in more affective and instinctive responses to objective body information from instruments. An effect such as this may allow patients to engage more easily in their own health management, for example to use medications correctly - as in the case of the diabetics discussed earlier.

While this is only the opening of a conversation about the effects of these devices, we have seen how organs might speak through technologies, and begun to understand from a phenomenological standpoint how they might be interpreted.

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