

Haptic perception in anorexia nervosa

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Introduction

In the mid 1990s we, at the Institute for Neurophysiology at the Friedrich Schiller University in Jena, Germany, conducted psycho-physiological trials into brain electrical changes during haptic examination [1, 2]. The experimental task consisted of having subjects haptically explore sunken reliefs with closed eyes and then reproduce the image presented upon them afterwards with their eyes open. The aim was to analyse the stimuli-dependant changes in the subjects EEG. The more than 30 probands in this trial had, as expected, no major problems meeting this demand. However, much to our surprise, one test subject was completely unable to perform the task. Her exploratory times were much longer than the average. Despite this, the drawn reproductions that she produced showed that her perception of the stimuli's entire structure was completely false and distorted. The subject, an intelligent, female university student in her third semester, had a good school record and was, in no way, neurologically conspicuous. She was, however, extremely thin and her skin's texture was abnormal. We wanted to explain these unexpected individual findings and followed a series of theoretical considerations and experimental studies which led us to the field of clinical-experimental psychology and an extreme mental disorder – anorexia nervosa.

Anorexia nervosa (AN) is one of the most severe mental disorders. For the most part, this illness affects young girls and 10–15% dies as a result of the physical effects over the course of time. The illness is characterised by extremely low body weight and with an obsessive fear of

gaining weight. Anorexia nervosa patients often control body weight by voluntary starvation, vomiting, purging, excessive exercise, sports or other weight control measures [3–5]. The illness often begins in puberty and the affected do not, as a rule, believe that they are sick despite their being extremely underweight. In various experimental studies it has been repeatedly observed that patients with anorexia tend to over-estimate the size or fatness of their own bodies [6–8]. Disturbances of body image are among the most important predictors for clinical severity of AN. However, current therapeutic approaches are relatively inefficient to this parameter [9, 10].

The reasons for the development of anorexia nervosa are still not fully explained. It is unanimously agreed that multifactorial conditions are responsible. Alongside psychological and social factors, genetic and patho-physiological processes are being discussed. Because body image and body schema distortion represent a critical factor in anorexia nervosa (and because the reasons for the disorder are still not completely understood as well as the fact that there is still no truly effective therapy for the disease) these aspects of the illness should be granted special attention. Especially body schema represents an absolutely central and basal aspect of one's mental bodily representation.

In the following article, we attempt to address the question of whether or not there are connections between body schema distortion and haptic perception in anorexia nervosa. Experimental and neuro-physiological data will be discussed and, in conclusion, a treatment attempt with the goal of reorganisation of the body schema in an anorexic patient is presented.

Body schema and body image

The scientific attempt to describe mental representation, the conscious and unconscious depiction and perception of one's own body, has a long history. Over the course of its development, in which various scientific disciplines have participated, a variety of concepts, and accordingly, terminologies have been developed which are not used uniformly. This is especially true of 'body image' and 'body schema' which are used differently not only in the German speaking world but also in English speaking circles. A comprehensive analysis of the history of terms is impossible here but more information on the subject can be found in [11, 12]. For the purposes of this article, only the basic principles and features of the usage of these terms and their current situation will be presented. This digression is necessary in order to correctly place our findings from anorexia nervosa patients into the current concepts of body schema and body image.

The German physiologist Hermann Munk (1839–1912) was the first to suspect that our body is depicted, as a mental representation, in the brain – particularly in the parietal cortex [13]. In 1908, the psychiatrist and neurologist, Arnold Pick (1851–1924) reported neurodegenerative illnesses in which the patients were no longer able to point out certain parts of their own body on demand. Pick suspected that the body representation in these patients was disturbed [14, 15]. Head and Holmes [16] established the term 'body schema'. They supposed that any sensory input generated a constantly changing postural model of one's own body which actively monitors body position and movements. Paul Ferdinand Schilder (1886–1940) adopted the term from Head and Holmes and introduced the term 'Körperschema' (body schema) [17] to the German language. However, Schilder also used the term 'Körperbild' (body image) as a synonym for 'Körperschema' as a way of describing the mental representation of one's own body. It is unclear, in both cases, if the terms body schema and body image are

meant to describe processes that are available to the conscious mind.

Following scientists from psychology, philosophy, medicine and brain research added more terms to the discussion of the mental depiction of the body: body concept, body experience, body perception, body image and schema. etc. The great confusion of the terms has, only in the last few years, led to an effort to create a uniform terminology to be used in all of these fields. With this in mind, and following H.B. Coslett [18], Buxbaum et al. [19] and Kammers et al. [20] one can use the term *body schema* to refer to an on line, real-time abstract, internal representation of one's own body in space which is derived from sensory input (including muscle, haptic, cutaneous, vestibular, tactile, visual, and auditory). This representation provides a three-dimensional, temporal, dynamic representation of the body in space and biomechanical properties of one's body, which articulates with motor systems in the genesis of action. The term *body image*, in contrast, refers to a conscious representation of the body; the private body-related concepts of oneself (attitudes, thoughts about and feelings towards one's own body) as well as conceptual knowledge about the body. Aspects of body image can be represented verbally or cognitively.

The two terms, therefore, essentially differentiate themselves in purpose and content of that which they are meant to describe. As a result, the methodological possibilities of scientific examination of related disorders are also correspondingly different. In the case of the analysis of body image distortions it is possible to use perceptions and verbal judgements. Within the framework of trials using questionnaires or visual projection processes patients are able to judge which attitudes they have towards their body and whether they associate positive or negative feelings with it. In this way, it is also possible to generate estimations and judgements regarding their own body's spatial dimensions. These methods are used primarily for the examination of body image distortions in patients with eating disorders but also in patients with depression [21, 22], body