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## Angle paradigm A new method to measure right parietal dysfunctions in anorexia nervosa

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### Abstract

**Background:** A functional disturbance of the right parietal cortex (PC) is supposed to be responsible for the distorted body image in patients with anorexia nervosa (AN). Based on this assumption, we investigated changes in haptic perception with a new experimental design. **Method:** Thirty-two subjects (16 AN patients and 16 healthy controls) were asked to readjust a given angle adjustment without visual feedback. This arrangement allowed to measure the deviation of the adjusted angle from the locked angle on an interval scale. **Results:** AN patients performed worse when they were asked to readjust the angle with the right hand, i.e., the deviation of the readjusted angle from the given angle was higher compared to the healthy controls for right side tasks. **Conclusions:** The capacitive strain of the right PC is substantially stronger in right side tasks with the consequence that the functionally disturbed right PC of AN patients cannot provide enough processing resources. © 2002 National Academy of Neuropsychology. Published by Elsevier Science Ltd.

*Keywords:* Anorexia nervosa; Right parietal lobe; Haptic; Tactile; Haptic perception

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## 1. Introduction

Different studies confirm the hypothesis that anorexia nervosa (AN) is connected with a functional disturbance of the right parietal cortex (PC) (Bradley et al., 1997; Kinsbourne & Bemporad, 1984; Maggia & Bianchi, 1998). Furthermore, this functional deficit is supposed to be responsible for the distorted body image in AN, which Kinsbourne stated as “anorectic’s neglect.” Based on this assumption, further neuropsychological studies exploring perceptual–cognitive functions, especially of the right hemisphere in patients with AN (Bradley et al., 1997; Pendleton-Jones, Duncan, Brouwers, & Mirsky, 1991; Rovet, Bradley, Goldberg, & Wachsmuth, 1988), were conducted. Bradley et al. (1997) found changes in event-related potentials (ERPs) during perceptual–cognitive tasks supporting the hypothesis of a right parietal dysfunction in patients with AN. Significant differences were found in ERP amplitudes between an AN group and a control group in verbal as well as in nonverbal tasks. An interesting result of his study is that patients with AN showed no left–right asymmetry for the P3-amplitude in a nonverbal task. However, neither Bradley et al. nor Pendleton-Jones et al. (1991) found significant differences during neuropsychological examinations, that is no cognitive deficits were detected in patients with AN. By contrast, other studies (Brouwers, Duncan, & Mirsky, 1986; Laessle, Fischer, Fichter, Pirke, & Krieg, 1992; Pendleton-Jones et al., 1991; Small, Madero, Teagno, & Ebert, 1983; Szukler et al., 1992) have shown deficits in perceptual–cognitive tasks in patients with AN. Because these deficits could not be explained by deficits of the right hemisphere alone, it remains unclear whether patients with AN show deficits in perceptual–cognitive tasks based on deficits of the right hemisphere.

This served as a background to our investigations of changes in haptic perception in AN patients. The experimental design used in our studies consisted of sheets with sunken reliefs. The participants had to explore six individual sunken reliefs, which were presented to them in random order, with their eyes closed and their arms on the table. Following the haptic explorations, all participants were asked to reproduce the structure of the stimuli as closely as possible on a sheet of paper with their eyes open. All drawn reproductions were evaluated by a visual rating. Results of a longitudinal study with AN patients showed that there are definite deficits in haptic perception, which even persisted after weight gain (Grunwald, Ettrich, et al., 2001; Grunwald, Ettrich, Krause, et al., in press). In another study, for which we used the same experimental design of the sunken reliefs, we analyzed the spectral theta power of the quantitative electroencephalogram (qEEG) during haptic exploration tasks, which showed clear changes over the right PC of patients with AN (Grunwald, Ettrich, et al., 1999). All in all, the behavioral data, as well as the EEG data, confirm the hypothesis that multisensory integration in AN is impaired due to a functional disturbance of the right PC.

The experimental design of the sunken relief sheets provided only data of a nominal scale level due to the visual rating, which must be considered as a disadvantage. For this low data level concerning the assessment of haptic perception in AN patients, we have been looking for a new experimental design which allowed the measurement of the disturbed multisensory integration process on an interval scale. Thus, we developed an experimental

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