



Reduced Early Visual Processing of Own Body Images in Anorexia Nervosa: An Event-Related Potentials Study

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Introduction

Anorexia nervosa (AN) is an eating disorder characterised by a seriously low body weight achieved through strict fasting.

➤ DSM-V criteria for AN:

- ✓ BMI < 18.5
- ✓ Fear of fatness, body image disturbance

➤ Overestimation of body size is a frequent symptom of AN [1,2,3].

➤ Individuals with AN show structural and functional alterations in the extrastriate body area, a brain area crucially implicated in the visual processing of human bodies [4,5,6].

Early visual body image processing is mainly characterised by two event-related potential (ERP) components in the EEG:

➤ **Featural processing** → P1 at 100 ms: low-level image properties, such as luminance and contrast [7,8]

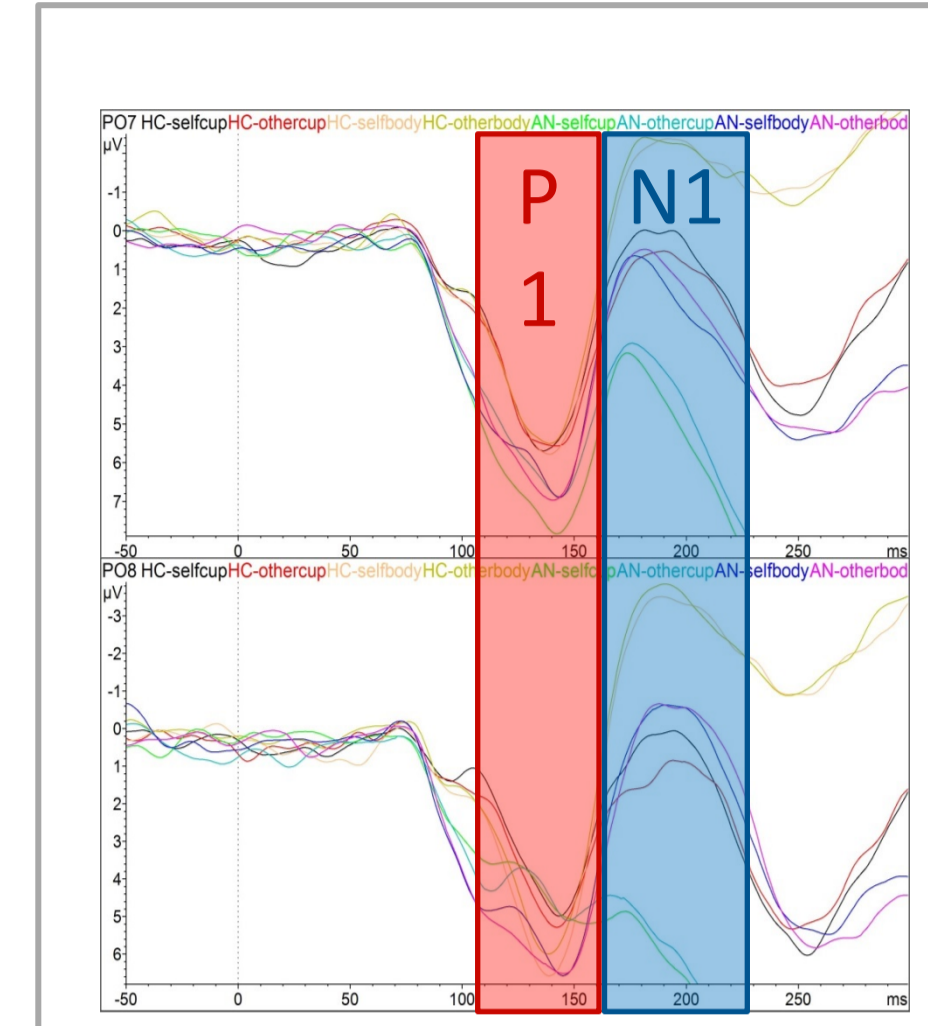
➤ **Configural processing** → N1 at 170 ms: construction of figures from features; preferential processing of human bodies and faces [9,10,11]

→ source: extrastriate body area [12,13,14,15]

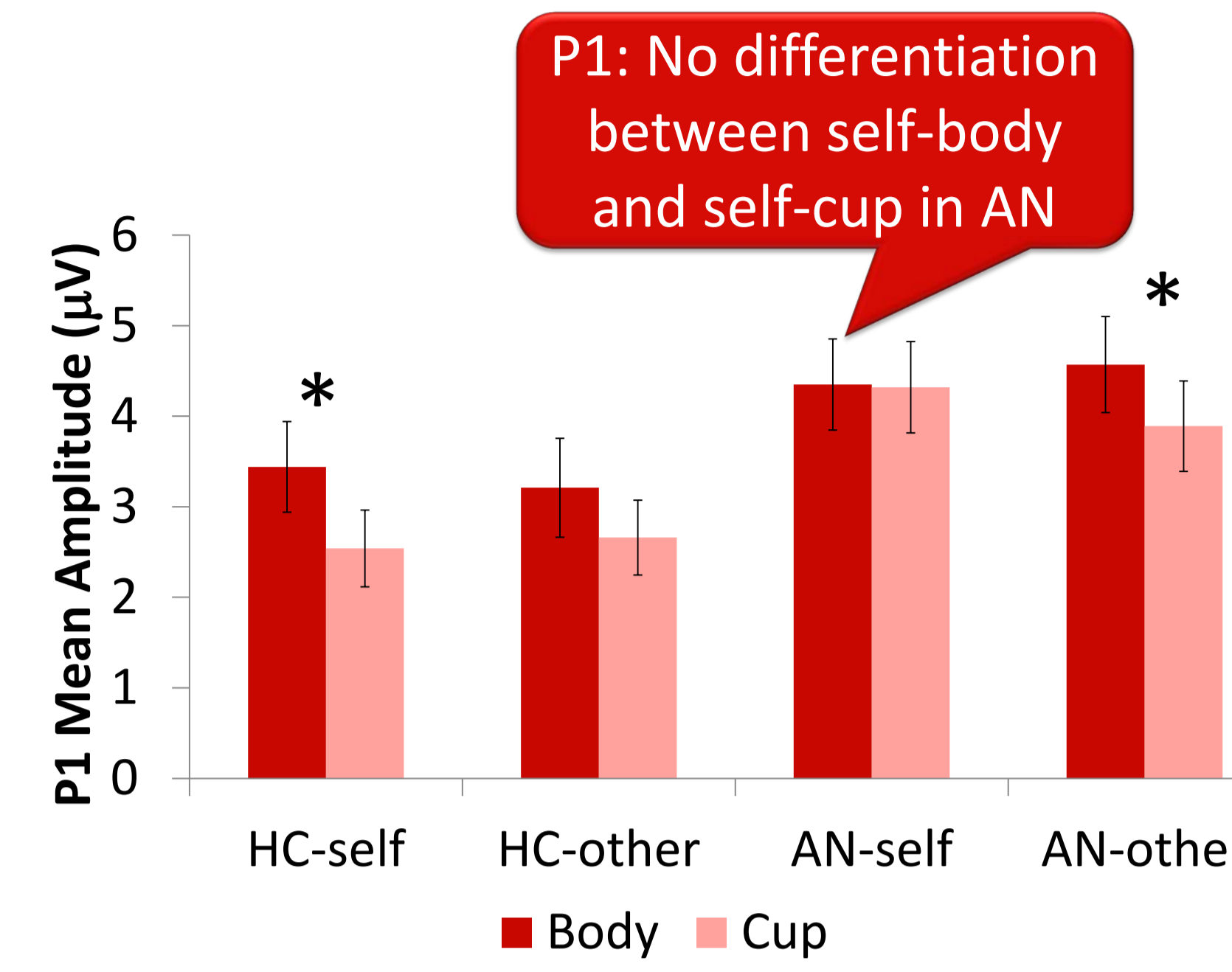
The mechanisms underlying body image disturbance in AN remain poorly understood. Especially the possible involvement of perceptual processes has been heavily debated. Imaging studies indicate alterations in areas implicated in the visual perception of human bodies. Building on these findings, we explored early visual processing, i.e., featural and configural processing, of body images in AN.

Is early visual processing of body images altered in individuals with AN?

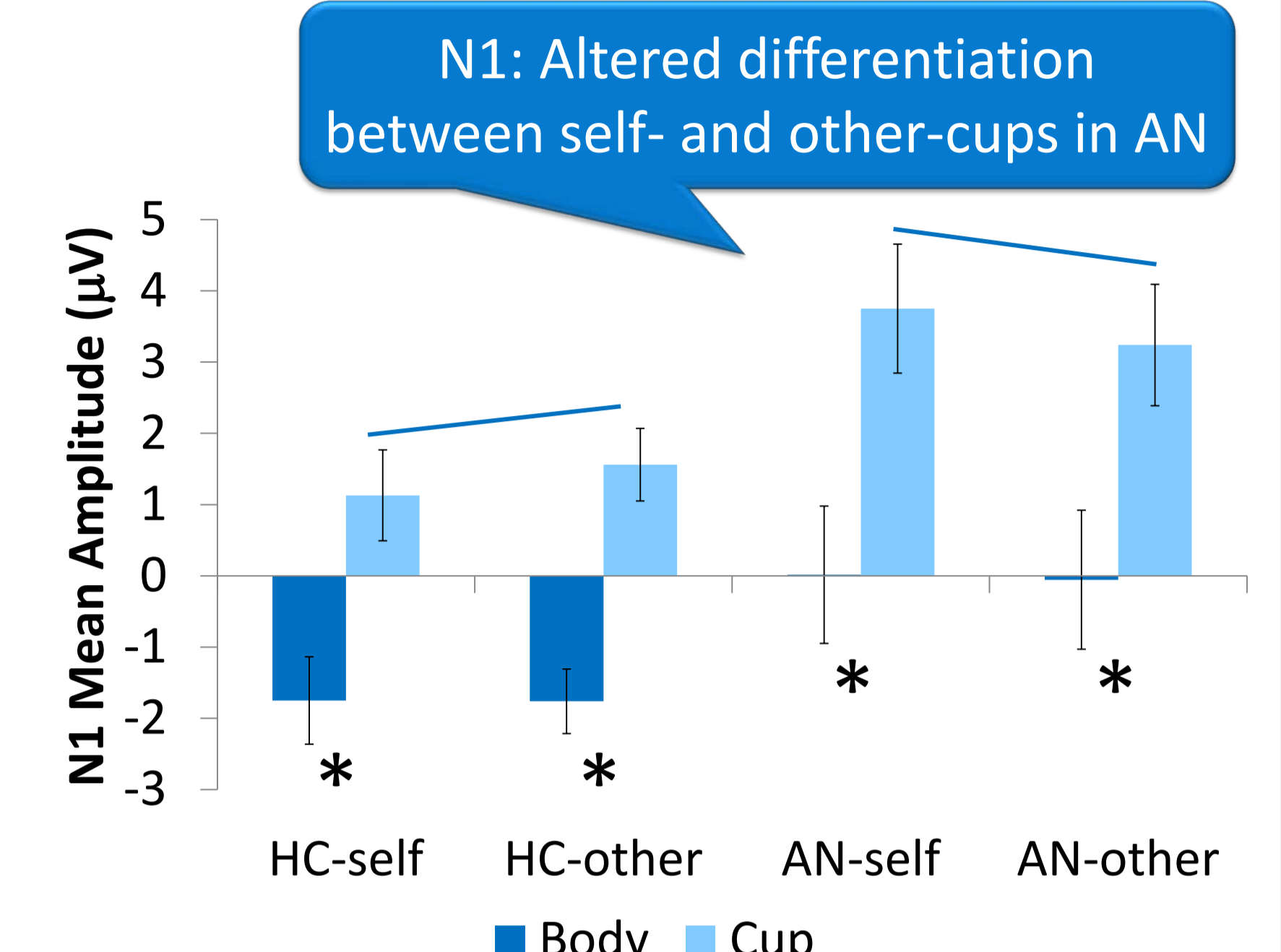
Results



ERPs elicited by body and cup images in the anorexia nervosa (AN) and healthy control (HC) groups.



P1:
Main effect stimulus type:
 $F(1, 31) = 13.62, p = .001, \eta_p^2 = .31$
→ Body > cup
Interaction group x stimulus type x self-reference:
 $F(1, 31) = 6.99, p = .013, \eta_p^2 = .18$
→ AN: self-body = self-cup, other-body > other-cup
→ HC: self-body > self-cup, other-body = other-cup



N1:
Main effect stimulus type:
 $F(1, 31) = 247.29, p < .001, \eta_p^2 = .89$
→ Body > cup
Interaction group x stimulus type x self-reference:
 $F(1, 31) = 5.43, p = .027, \eta_p^2 = .15$
* $p < .0125$ for post-hoc comparisons

Methods

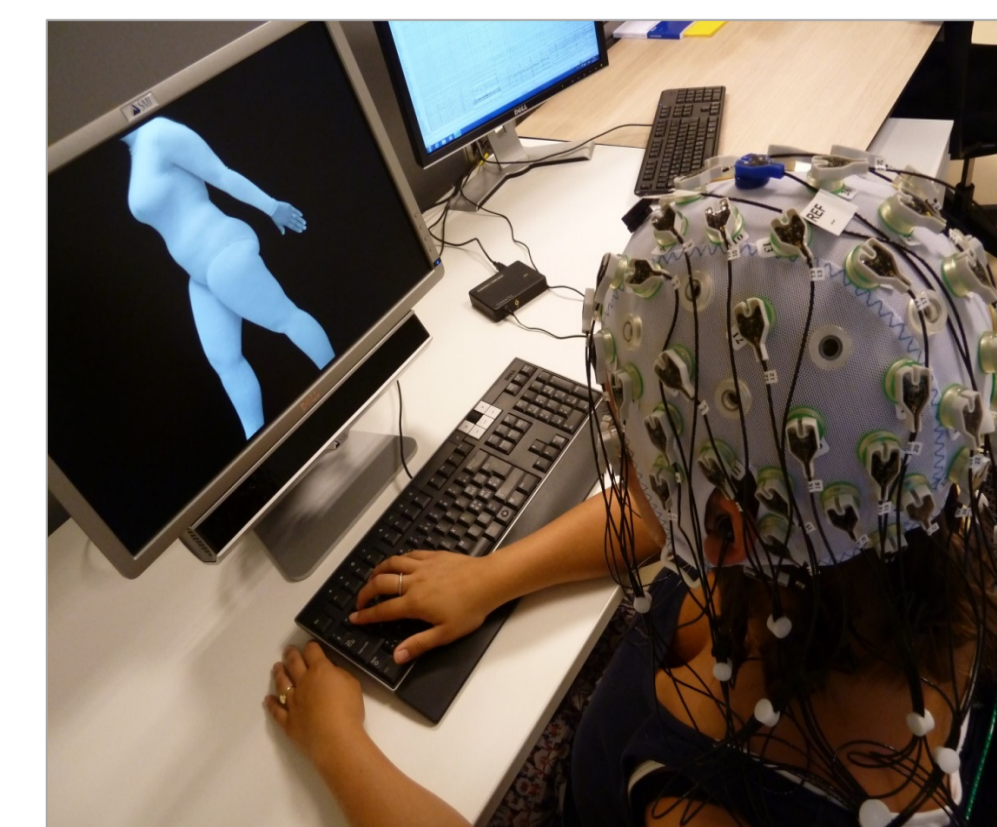
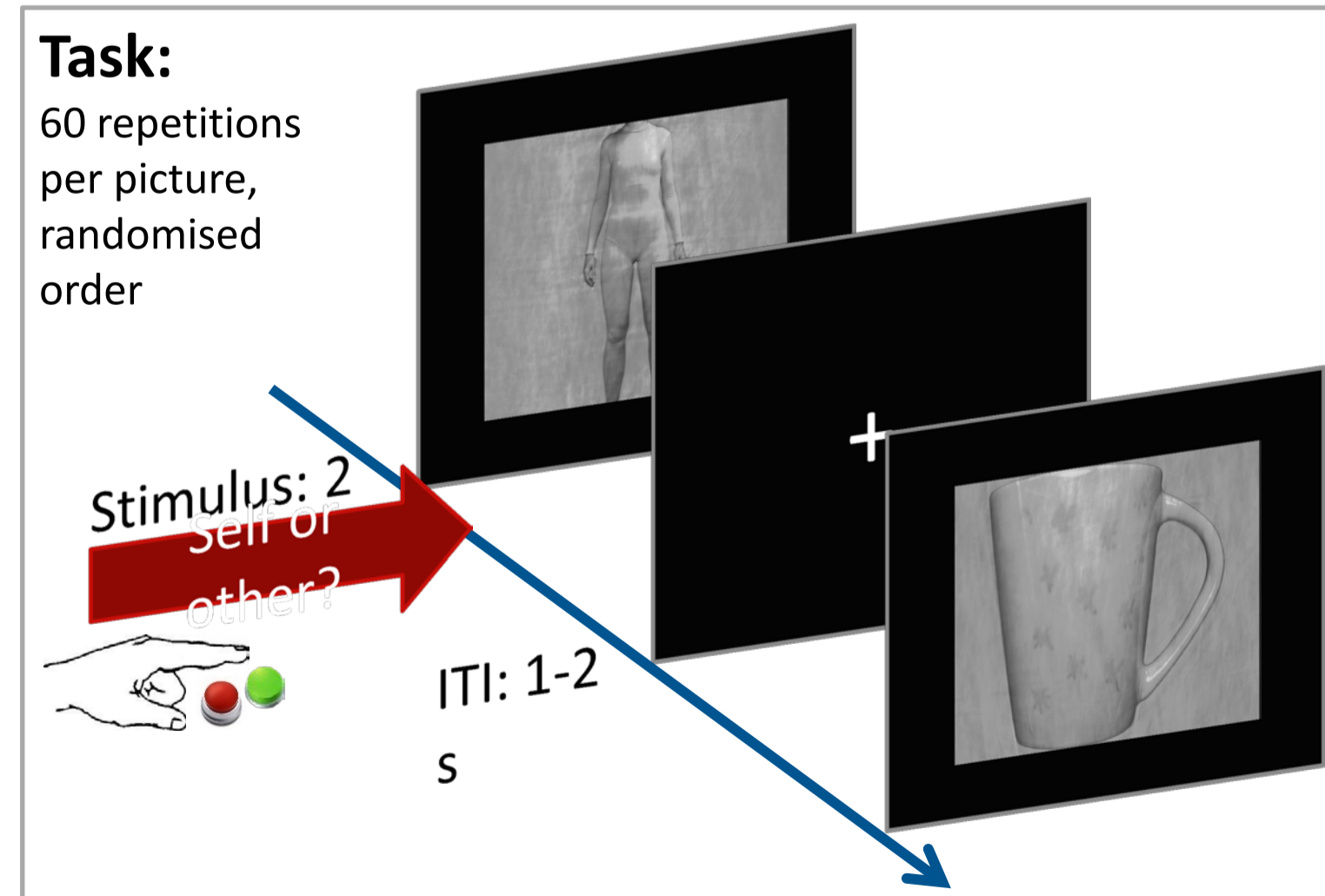
Sample characteristics	Anorexia nervosa n = 16	Healthy control n = 17
Age	24.28 (4.67)	24.92 (4.05)
BMI	15.64 (1.76)	22.53 (3.32)
Years since symptom onset	9.06 (6.57)	

Participants saw a photograph of themselves and one of a person with similar BMI

Stimulus material	Body	Cup
Self		
Other		

Low-level image properties were controlled with SHINE toolbox [16]

Participants personalised their cups with drawings



EEG data:

64-channel EEG
Data processing: average reference, bandpass filter 0.1 to 35 Hz
Electrode locations used for analysis: P7, P8, PO7, PO8
Time windows for ERPs:
P1: 105-160 ms (mean amplitude)
N1: 160-225 ms (mean amplitude)

Statistical analysis:

mixed-design 2 x 2 x 2 x 2 ANOVA with the between factor group (healthy control vs. anorexia nervosa) and the within factors stimulus type (body vs. object), self-reference (self vs. other), laterality (left vs. right), and scalp location (parietal vs. parieto-occipital)

Discussion

Replication of previous findings: larger amplitudes for bodies vs. cups in P1 and N1
→ Bodies are processed differently from objects [9]

Featural processing (P1):

No differentiation between self-body and self-cup in AN
→ Objectification of one's own body?
→ Possibility of top-down modulation by attentional processes occurring before stimulus onset [8,16]

Configural processing (N1):

Altered differentiation between self- and other-cups in AN
→ Reduced processing of (or absence of processing advantage for) self-related information?

Already at 100 ms after image onset, participants with AN showed alterations in the processing of their own body. This would imply that all subsequent processing, such as affective and higher cognitive processing, is based on altered visual information. Consequently, alterations occurring early in the visual processing stream might contribute to or be a result of AN symptoms, such as body size overestimation [1,2,3] or an overly analytical and objectifying approach to one's own body [18,17]. Future research should try to elucidate the possible influence of attentional processes occurring before image onset on early visual processing of body images. These attentional processes are a potential target for the treatment of body image disturbance in AN.

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