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Original article

The role of cognitive factors in body-size perception and recall-size estimation in normal-weight women

L'influence de variables cognitives sur la perception et le rappel de la corpulence chez des femmes normopondérées

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ABSTRACT

Objective. – Based on the hypothesis that remembered body size differs from perceived body size, the objectives of this study were to assess the difference between body-size perception and recall size and to investigate the neuropsychological correlates of body-size estimation.

Method. – Ninety-one normal-weight women were randomized into three body-size estimation conditions: photo-size estimation, mirror-size estimation and recall-size estimation without a photo or mirror. All participants first estimated the size of a neutral object, then adjusted distorted images of themselves according to experimental conditions. Finally, the participants completed the Trail Making Test (TMT) as a neuropsychological measure.

Results. – Body-size estimations were influenced by the experimental condition in opposite directions for body-size perception and recall-size estimation. Participants who overestimated their body size took longer to complete the TMT-B, a measure of cognitive flexibility.

Conclusion. – Body perception and body memory are clearly separable components of body image. An individual's amount of mental flexibility appears to be associated with body-size distortions, particularly body-size overestimations. Further research is needed on the nature of potential causal mechanisms for this phenomenon, including the use of relevant tests to explore cognitive flexibility and the effects of potentially confounding variables.

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R É S U M É

L'objectif principal de cette étude était d'évaluer la différence entre perception et mémoire du corps, l'objectif secondaire d'investiguer l'influence de variables neuropsychologiques sur l'estimation de la corpulence du corps. Quatre-vingt-onze femmes normopondérées ont été réparties de manière aléatoire en trois groupes en fonction de trois conditions expérimentales : estimation de la corpulence du corps à l'aide d'une photographie, estimation de la corpulence du corps à l'aide d'un miroir et estimation de la corpulence du corps de mémoire. Toutes les participantes ont estimé préalablement la taille d'un objet neutre déformé. Elles ont ensuite ajusté leur propre photographie dans laquelle leur corpulence avait été modifiée, selon l'une des trois conditions expérimentales. Enfin, chacune a complété le Trail Making Test afin d'évaluer l'influence de variables neuropsychologiques potentiellement associées aux erreurs d'estimations de la corpulence du corps. Les résultats montrent que les estimations de la corpulence du corps sont influencées par la condition expérimentale. Les participantes qui surestiment leur corpulence mettent davantage de temps à compléter le TMT-B (flexibilité mentale) comparées aux participantes qui estiment correctement leur corpulence. Ces résultats suggèrent un lien possible entre le niveau de flexibilité mentale d'individus normopondérés et la surestimation de la corpulence. D'autres études, incluant une exploration extensive de la flexibilité mentale, devront être menées pour confirmer ces résultats préliminaires.

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Body image is a multifaceted construct that includes perceptual, attitudinal, cognitive, affective and behavioral components (Bergstrom and Neighbors, 2006; Slade, 1994; Thompson et al., 1999). Slade (1994) distinguished between two conceptual dimensions of body image: a perceptual component, which refers to “the accuracy of an individual’s body size estimation”, and an attitudinal component, which refers to “the attitudes/feelings an individual has towards his own body”. The perceptual component of body image has been thoroughly investigated (Thompson, 2000) in the context of the eating disorder spectrum, which includes anorexia nervosa, bulimia nervosa, and obesity. Studies have commonly compared patients with eating disorders to control samples of normal-weight women. However, the results are often discussed with regard to eating disorder pathology and are less frequently applied to normal-weight and non-eating-disordered individuals.

In considering the perceptual component of body image, four types of studies can be outlined: body-size perception as compared to reality; body-size perception as compared to object-size perception; body-size perception as compared to recall-size estimation; and d) internal and external factors influencing body-size perception.

The first type of research focuses on the comparison between body-size perception and actual body size. In one study assessing global body image, Collins (1987) presented women with a modified image of their own body on a digital screen and asked them to modify their image. The study included 60 obese women participating in weight-loss treatment, 25 individuals with anorexia nervosa and 50 normal-weight women. The authors found that normal-weight women underestimated their body size compared to individuals with anorexia nervosa and obese women (mean 0.88% body-size overestimation for normal-weight women compared to 12.22% overestimation for obese women and 1.04% for individuals with anorexia nervosa). In another study, Collins et al. (1987) compared 150 obese women participating in a weight-control program, 60 normal-weight women, 78 individuals with anorexia nervosa and 24 individuals with bulimia using a video camera distortion technique. Their results showed that fewer normal-weight women than eating-disordered patients overestimated their body size (10% of the normal-weight sample). Among normal-weight women, 10% overestimated their body size by at least 15% compared to reality, 10% underestimated by at least 15% compared to reality and 80% accurately perceived their body size.

Considering these results, some authors have questioned whether these distortions are related specifically to the body or to a more general perceptual deficit. Thus, a second generation of studies focused on comparing body-size and object-size estimates. Allebeck et al. (1976) compared body-size estimation and cube-size estimation in 23 severely obese women and 46 normal-weight women using a television screen method. Normal-weight participants tended to compress their images vertically more than obese patients did. Specifically, normal-weight women underestimated their body size by 0.4%, whereas 1.8% of obese participants showed overestimations. However, normal-weight participants also tended to underestimate cube size (mean 8.6% underestimation). In a study comparing body-size estimation and water-bottle-size estimation in 15 individuals with bulimia and 15 normal-weight volunteers using a video image distortion technique, Franzen et al. (1988) showed that normal-weight participants overestimated their body size by 1% and the water-bottle size by 9%. Subsequently, Probst et al. (1992) compared body-size estimation and dummy-size estimation in 67 individuals with anorexia nervosa and 105 normal-weight women using a video method. Normal-weight volunteers underestimated their body size by 0.74 to 7.64% and the dummy’s size by 3.83 to 11.74%. Probst et al. (1995) replicated their study using a circle as a control object. Body-size estimation results

showed that participants overestimated their body size by 0.54% and tended to underestimate the dummy’s size by 0.1%.

In a third generation of studies, some authors focused on the impact of visual information on body-size estimation, investigating the difference between perceived body size and remembered body size as indicated by recall-size estimation. Moyer et al. (1978) compared perceived size and remembered size and showed that judgments from memory tend to be larger than perceptual judgments for the same object. In contrast, after comparing body-size perception and recall-size estimation in 55 healthy women, Farrell et al. (2003) found the opposite effect; namely, judgments made from perception tended to be larger than those made from memory. More precisely, healthy women tended to overestimate their body size in the perception condition by 3.3% and underestimate it in the recall condition by 1.1%. The same authors also assessed object-specific effects on size estimation, comparing body-size estimation to the estimation of the size of a rectangle and a mannequin. The results showed that, in all conditions, the rectangle and the mannequin tended to be overestimated (by 3.2 and 2.9% for the rectangle in the perception and recall conditions, respectively, and by 4% for the mannequin in both conditions).

Finally, a fourth generation of studies focused on factors associated with body dissatisfaction, such as Body Mass Index [BMI] and self-esteem. Several variables have been examined in body dissatisfaction research, but evidence for their impact on body-size estimation has been scarce. Ricciardelli et al. (2003) proposed a biopsychosocial model to explain body-image distortions, postulating that body-size perception results from two major processes. Initially, the perception of physical body dimensions is possible through the reception and integration of a range of sensory input, including visual, tactile and kinesthetic inputs (Slade, 1985). Body-size perception and distortion may result from sensory factors such as stimulus intensity, visual and attentional factors (Gardner et al., 1997; Thompson and Gardner, 2002). In a second step, non-sensory cognitive and affective factors, such as an individual’s beliefs, drawings and bodily knowledge, may contribute to body-size perception (Thompson et al., 1999).

McCabe et al. (2006) proposed a method to assess sensory and non-sensory aspects of body image. The authors used an estimate of the perceived size of a control object (a vase) and included the influence of sociocultural messages in their assessment. Consistent with previous studies (Cash and Green, 1986; Gardner and Moncrieff, 1988), they concluded that individuals perceived the vase more accurately than they did their own bodies, suggesting that other factors could be involved in body distortion. Garner and Garfinkel (1981) postulated that accuracy of body-size perception may vary depending on the importance given to sociocultural messages. The results of McCabe et al.’s (2006) study supported this hypothesis, showing that a strong perception of social pressure to lose weight was associated with decreased accuracy in women’s body-size estimations. These results suggest that messages from peers and the media (McCabe and Ricciardelli, 2004; Thompson and Stice, 2001) are more strongly predictive of inaccurate body-size perception when they support behavioral stereotypes, such as increased muscle for males and weight loss for women.

As suggested by Smeets and Panhuysen (1995) and by Shafran and Fairburn (2002), the inconsistent findings on body-size estimation may be attributed to methodological problems. Despite the pivotal technological advances in computerized programs, significant conceptual and theoretical problems with this research remain. The major problem to date is that most research assesses body-size perception and recall-size estimation as the same construct. Although memory and perception are related, they are different constructs (Smeets et al., 1997).

To account for variations in the extent and direction of body-size estimations across studies, Farrell et al. (2003) provided important

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