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Diagnosing underweight in adolescent girls: Should we rely on self-reported height and weight?

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ABSTRACT

This study examines the reliability of self-reported height, weight and weight change in underweight versus normal weight adolescent females. Self-reported height and weight were obtained from 162 schoolgirls without an eating disorder (12–16 years), and compared to objective measurements afterwards. Weight change was assessed 4 months later. The influence of age and current BMI on the reliability of self-reports was analyzed by linear regression analyses. With increasing age, height and BMI were reported more accurately. With increasing BMI, the *under*estimation of weight increased. Underweight girls *over*estimated their weight significantly compared to normal weight girls. Only 41% of the girls with a weight loss (>1 kg) in the past 4 months reported this accurately. Therefore, especially in younger girls with low body weight, information on height and weight as well as weight changes should be obtained objectively to identify a developing or subthreshold anorexia nervosa.

1. Introduction

Height and weight are important indicators of underweight, which represents an early symptom of a developing anorexia nervosa. In females aged 12 to 16 years, the only predictors for the development of anorexia nervosa in early adulthood were low Body Mass Index (BMI) and perfectionism (Tyrka, Waldron, Graber, & Brooks Gunn, 2002). Compared to other risk factors, height and weight seem to be easily obtainable by questioning the participants. However, several studies suggest that self-reported data may be less reliable than objectively obtained data. Although high correlations for objective measurements and self-reports of $r \geq .87$ were found in 9th to 12th grade students (Brener, McManus, Galuska, Lowry, & Wechsler, 2003), students overestimated their height by 1.8 cm and underestimated their weight by 1.6 kg on average. Despite an overall *under*estimation of weight, about 15% of the participants *over*estimated their weight by more than 2.3 kg and 6.6% by more than 4.5 kg, respectively. This, in turn, could lead to a severe overestimation of the BMI and therefore, preclude a possible diagnosis of anorexia nervosa and delay necessary early interventions.

Even though the risk of developing an eating disorder reaches its peak in adolescence (Hoek & van Hoeken, 2003), research on adolescents' estimation of height and weight is scarce. In a meta-analysis on the accuracy of self-reported height and weight (Engstrom, Paterson, Doherty, Trabulsi, & Speer, 2003) only four out of 34 studies included adolescent populations. In these studies, adolescents' misestimations of height ranged from overestimations of 1.5 cm (SD = 5.9) to underestimations of 0.5 cm (SD = 2.7), whereas in adult women they were more pronounced with overestimations up to 2.0 cm (SD = 2.6) in a sample of college students and underestimations up to 1.7 cm (SD = 2.4) in a sample of Scottish women. Regarding weight, adolescents underestimated their weight between 0.6 kg (SD = 3.8) and 2.1 kg (SD = 5.9) on average, whereas adult women also showed more pronounced underestimations up to 3.5 kg (SD = 2.9) in dieting college students.

Engstrom et al. (2003) also tried to examine associations between age and BMI and the accuracy of height and weight estimations. The majority of studies reported an increasing overestimation of height with increasing age in adult women. Results regarding associations between age and self-reported weight were heterogeneous. There is no evidence regarding potential effects of age on the accuracy of height and weight estimations in adolescents. As to BMI, almost all of the 20 studies examining this association showed a lower reliability of weight estimations in heavier adult women. The latter effect has also been found in adolescents (Abraham, Luscombe, Boyd, & Olesen, 2004; Strauss, 1999). Studies addressing the reliability of self-reported weight change could not be found.

Although actual and self-reported data were highly correlated in previous studies (Brener et al., 2003; Engstrom et al., 2003; Strauss, 1999), misestimations of height and weight might be substantial enough to be of clinical relevance. We therefore analyzed the influence

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Table 1
Effects of height and weight misestimations in short, middle-sized and tall girls with objective underweight.

Actual height	Actual weight	Height or weight misestimation	Impact on BMI	
			Actual BMI percentile	Self-reported BMI percentiles
1.50 m	37.5	−1/−2/−3/−4 cm	10	12/14/17/20
1.65 m	45.5	−1/−2/−3/−4 cm	10	12/14/17/19
1.80 m	54.0	−1/−2/−3/−4 cm	10	11/13/16/18
1.50 m	37.5	+1/+2/+3/+4 kg	10	14/19/26/32
1.65 m	45.5	+1/+2/+3/+4 kg	10	14/18/23/28
1.80 m	54.0	+1/+2/+3/+4 kg	10	13/16/20/24

of height and weight misestimations on the resulting BMI percentiles of adolescent girls to appraise the usability of self-reported data for the diagnosis of underweight.

1.1. Critical limits of height and weight misestimation

On the basis of the few previous findings in adolescents, misestimations in self-reported height and weight are to be expected. However, nothing is known about how misestimations can affect the classification of weight status, especially diagnosing underweight in adolescents. To demonstrate this potential influence and to define critical limits for misclassifications based on self-reported height and weight, we calculated age adjusted BMI percentiles (Kromeyer-Hauschild et al., 2001) based on fictive data for a 14-year old girl and a BMI percentile of 10, which equals underweight (<15th percentile) (World Health Organization, 1995).

Table 1 demonstrates the impact of misestimations of 1–4 cm in height and 1–4 kg in weight on the resulting BMI percentiles assuming different heights. Especially in short girls, an overestimation of weight of only 2 kg can become precarious. The resulting BMI percentiles will misclassify the participant as of normal weight instead of as underweight, whereas the impact of the misestimation of height on BMI classification is rather minor.

Height and weight are considered to be correctly reported, if their deviation from the actual value does not lead to a considerable deviation of the resulting BMI percentile (>15th percentile in cases of actual underweight). In the present study, deviations up to ±2 cm, ±1 kg are considered to be correct.

In general, while previous studies reported high correlations between actual and self-reported data, considerable weight overestimations have also been observed. Especially in the phase of adolescence with its challenge of mastering bodily changes and thus elevated risk of eating disorder onset, precise knowledge of body weight can enable early interventions. However, research on the reliability of self-reported height and weight of this age-group is scarce. In addition, because misestimations of height and weight may have different clinical implications in underweight girls compared to normal weight girls (e.g., result in the false negative classification of underweight as core symptom of anorexia nervosa, as demonstrated above), the knowledge on misestimations in underweight girls is of crucial importance. Potential moderators of the accuracy of self-reported height and weight could be age and actual BMI (Abraham et al., 2004; Engstrom et al., 2003).

Accordingly, the purpose of this study is to examine the reliability of self-reported height, weight, and weight change in adolescent girls of different age and weight groups (underweight versus normal weight).

2. Methods

2.1. Study design and procedure

Data for this study were collected longitudinally at baseline (t_1) and 4 months later (t_2). The study was approved by the human subjects committee of the Technische Universität Dresden. Headmasters and teachers of the respective schools were informed about the study. Teachers forwarded consent forms for both students and parents to the potential participants, who brought them to their assessments. Eating disorder risk status and self-reported height and weight were assessed by self-report questionnaires; height and weight were measured objectively within 30 min thereafter. Assessments took place in the schools' assembly halls, measurements were taken separately and confidentially for each girl.

2.2. Participants

The sample consisted of 162 girls, recruited from ten different high schools in Dresden, Germany. Participants were included if they did not fulfill criteria for eating disorder high risk (defined by scores>20 in the German version of the Eating Attitudes Test-26 (EAT-26) (Meermann & Vandereycken, 1987) *and* a negative response to the Eating Disorder Examination Questionnaire (EDE-Q) diagnostic items (Garner, Olmsted, & Polivy, 1983)). At baseline, mean age of participants was 13.8 years (SD = 1.1), mean BMI was 18.7 (SD = 2.3). At the time of the second assessment 4 months later, 51 girls could no longer be reached. As a result, data from 111 girls (mean age = 13.8, SD = 1.2; mean BMI = 18.7, SD = 2.4) were available at t_2. Girls who could not be reached for follow-up did not differ significantly in weight status (underweight versus normal weight), EAT scores or other relevant variables such as age, BMI percentiles, or EDE-Q diagnostic items.

2.3. Measures

As part of a larger set of questionnaires, participants' age, EAT-26 and EDE-Q scores were obtained by self-report. Self-reported height and weight were used to calculate self-reported BMI. At t_2, girls were asked about any weight change in the past 4 months. Self-reported data were verified after both points of assessment by objectively measuring their height using an ultrasonic measuring device (0.5 cm precise, rounded to whole cm) and weight using a digital scale (0.05 kg precision, rounded to 0.1 kg). For reasons of comparison, participants were asked to remove shoes, headpieces and heavy jackets. To control for the remaining clothes, 1 kg of the objectively obtained weight was deducted from each participant's weight.

2.4. Data analysis

The reliability of the participants' self-reported height and weight was examined by an intra class correlation of actual and self-reported data. The influence of age and BMI on the reliability of self-reported height and weight was assessed via linear regression analysis using age and BMI as predictors and the difference between actual and self-reported data (height, weight, and BMI) as outcome. In addition to the linear regression analysis, we compared categories of normal weight an underweight girls by *t*-tests. Because only four of the included participants had a weight of >85th percentile, overweight was not included as a separate weight group in these analyses.

3. Results

3.1. Reliability of self-reported height and weight

Average measured height was 1.66 m compared to an average self-reported height of 1.65 m, while average measured weight was 51.7 kg compared to an average self-reported weight of 51.2 kg. On the basis of these data, mean actual BMI was 18.7 kg/m² (corresponding the 40th percentile), and mean self-reported BMI was 18.8 kg/m² (corresponding the 44th percentile).