



SUBCLINICAL DISORDERED EATING AND BODY DISSATISFACTION IN NORMAL WEIGHT CHILDREN – THE ROLE OF PHYSICAL ACTIVITY AND MOTIVES TO EXERCISE

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Abstract

Body dissatisfaction is considered to be one of the most important risk factors for disordered eating. The role of physical activity in the context of body dissatisfaction and disordered eating is by and large ambiguous, even more so in childhood. Therefore, the aim of the present study was to explore the interaction effects between physical activity and motives for exercise and body dissatisfaction on restrained eating in normal weight children. The cross-sectional analyses refer to $N = 602$ primary scholars (7-12 years old). Multiple stepwise regression models showed that the enhancing effect of body dissatisfaction on restrained eating can be buffered by physical activity among boys ($R^2 = 0.15$, $F(1, 261) = 2.31$, $p = 0.05$). Among girls, physical activity in combination with body dissatisfaction increases restrained eating significantly ($R^2 = 0.26$, $F(1, 225) = 15.46$, $p < 0.0001$). Concerning the motives for exercise, the emotional motive and the health and fitness motive in relation with body dissatisfaction significantly increase restrained eating in boys ($R^2 = 0.23$, $F(1, 181) = 6.93$, $p = 0.05$). Similarly, for girls, the emotional motive and the health and fitness motive in relation with body dissatisfaction increase restrained eating significantly ($R^2 = 0.48$, $F(1, 131) = 15.60$, $p < 0.001$). Thus, the reflection upon the role of physical activity and motives for exercise in young children might be an approach to preventing disordered eating in relation to body dissatisfaction.

Key words: body dissatisfaction, physical activity, motives, disordered eating, children

Introduction

Body dissatisfaction is a phenomenon that may already occur in childhood. Around 40 to 45% of preadolescent children aged 8 to 14 seem to be affected [1]. In this age group, about 20% of the girls and boys also report disordered eating attitudes [2]. In this context, body dissatisfaction is considered one of the most robust risk factors for disordered eating [3]. Numerous correlation studies [4] have identified positive associations between body dissatisfaction and disordered eating, i.e., restrictive diets, binge eating, and purging, that are mediated or moderated by other factors like self-esteem and depression [5] or self-esteem and negative affect [6]. Furthermore, a five-year longitudinal study has shown for girls as well as for boys that lower body satisfaction predicts higher levels of dieting, unhealthy weight

control behaviours, and binge eating [7]. However, the association between body dissatisfaction and disordered eating must be seen in a sociocultural context: a thin-ideal internalisation (related to a beauty ideal represented in the media) predicts disordered eating attitudes directly and indirectly via body dissatisfaction, dietary restraint, and depression [8]. Due to different ideal body images, body dissatisfaction in girls and boys is often displayed in different forms of body dissatisfaction: girls tend to wish to be thinner and report more weight and shape concerns than boys, whereas boys are more affected by muscularity concerns [9].

Given the psychosocial developmental risks of disordered eating attitudes and body dissatisfaction, the detection of mechanisms as well as of protective factors in childhood be-

comes important. Physical activity is one of the factors discussed in the context of body dissatisfaction and disordered eating, even if its role remains contradictory or ambivalent. Sport can be subcultures focus on weight and body shape social practices [10]. However, higher levels of physical activity are associated with a protective effect regarding body dissatisfaction in adolescence and childhood [11]. In childhood, boys especially seem to benefit from engagement in physical activity as they are more satisfied with their bodies than boys who do not engage in physical activity, whereas girls who are physically active do not differ in their body satisfaction from girls who are not physically active [12]. Furthermore, body dissatisfaction, rather than the body mass index (BMI), is a statistically significant positive predictor for engaging in physical activity in adolescents, especially for boys [13]. Thus, physical activity might become instrumental in shaping the body or unhealthy weight control behaviour. This might result in excessive (pathological) physical activity and lead to exercise addiction [14], which has been identified as a risk factor in the context of disordered eating [15]. Therefore, engagement in physical activity might also be a risk factor for disordered eating. In this context, motives for exercise seem to play an especially important role regarding body dissatisfaction and disordered eating [12, 16]. Research indicates three motives for exercise: "health and fitness", "emotional aspects", and "social relationships". Children's main motives for exercise are mostly emotionally anchored in joy and experimentation, whereas teenagers' main motive, especially in females, is "health and fitness" in relation to body dissatisfaction [17].

Objective

While most of the reported studies are focused on adolescents (or young adults), the relationships between physical activity, body dissatisfaction, and disordered eating in children still remain unclear. However, it might be important to be aware of such alarming tendencies already in childhood to implement preventive programmes in the early years. At this stage, it is important to identify subclinical eating disorders. "Subclinical" means that the

observed behaviour in relation to eating habits or weight (control) management cannot (yet) be classified as clinically relevant. Therefore, subclinical disordered eating is characterised as disturbances in eating behaviour and weight control behaviour, like restricted food intake or occasional vomiting, without fulfilling the criteria for a clinically relevant disease [18].

The aim of the study presented here is to explore the role of physical activity in the context of subclinical disordered eating, precisely restrained eating, in relation to body dissatisfaction and motives for engaging in physical activity among normal-weight children. The focus of the study is exclusively on normal weight children as in this context the inclusion of underweight and overweight children would need different theoretical models and interpretations of the data. Based on a cross-sectional study with primary school children (aged 7 to 12 years), the question sought to be answered was if physical activity or motives for exercise might be moderator variables in the association of body dissatisfaction and subclinical disordered eating behaviour.

Materials and Methods

The presented data are part of a study called "Body dissatisfaction, physical activity and quality of life in children" conducted from April 2015 to March 2016. Various aspects of the study were addressed in subsequent papers [12, 19].

Participants

In total, a sample of 824 children aged 7 to 12 from 17 different elementary schools and 55 different classes took part in the study. From the recruited schools, 28.2 % of all potential study participants could not be included in the study due to missing informed consent from their parents.

Using the BMI reference values for German children and adolescents [20], children's weight status was classified as under-, normal-, and overweight. Thus, 53 children (6.5%) were identified as underweight, 602 (73.1%) were normal weight, and 163 (19.8 %) were overweight. The BMI values for six of the children (0.6%) could not be calculated

because their anthropometric values were missing. The following analyses refer exclusively to 302 girls (50.2%) and 300 boys (49.8 %) of normal weight status, aged 7 to 12 years ($M = 9.23$ years; $SD = .79$).

The study was reviewed and approved by the Ethics Committee of the Psychology Department at the University of Koblenz-Landau as well as by the relevant supervisory school authorities. Parents' informed consent for their children's participation was obtained before data collection; it was stressed that participation was voluntary and that the assessed data would be saved and processed anonymously. On the study day, pupils' informed assent was also obtained, and they were told they could quit the study at any time.

Study design

This cross-sectional study focused on different research questions concerning body dissatisfaction, physical activity, subclinical disordered eating and the quality of life in children. The children filled in the questionnaire in their classroom. To ensure high reliability and optimal supervision, the questionnaire study was conducted in small groups of three to six pupils and attended by trained research assistants. During their regular physical education (PE) lesson, the children participated in an adapted version of the German Motor Ability Test (GMT) [21]. Their anthropometric values (height and weight) were measured during the motoric test in the PE lesson.

Instruments

Height and weight were measured using a portable and calibrated stadiometer and a calibrated scale of 0.1 kg and 0.1 cm accuracies, respectively. Pupils were measured barefoot and in sportswear (most of them in t-shirt and shorts). Children's motor abilities data were acquired in four of the GMT test items [21]: jumping sideways, push-ups, broad jump, and a 6-minute run. Per item, the performance was classified in accordance with the age-specific norm values, which were summed up to a z-standardised total score. As an indication of the level of informal physical activity is difficult to calculate for children and as there is

a clear association between the motor ability level and children's engagement in physical activity [22], we decided to use the total score of the GMT as a more reliable source of information about children's engagement in physical activity. Based on age-normed values, this total score can be classified in five categories ranging from far below average (1) to far above average (5). The question-naire started with demographic variables (gender, age, and migration background). For analysing children's body dissatisfaction, the child-validated German version of the Body Esteem Scale (BES) [23] and the Muscularity Concern Scale (MCS) [23] were used. The subscale "weight and shape concerns" of the BES consists of seven items ($\alpha = .78$; e.g. 'I wish I were thinner'). The MCS consists of four items ($\alpha = .92$; e.g. 'I wish I were more muscular'). Both scales have a five-point Likert scale ranging from never (1) to always (5). The internal consistencies of all two scales are very good. Subclinical disordered eating was examined by the "restraint eating" subscale of the German version of the Dutch Eating Behaviour Questionnaire for Children (DEBQ-K) [24]. The scale comprises 10 items ($\alpha = .91$; e.g. 'I intentionally eat less to prevent weight gain') and the Likert-response scale ranges from never (1) to often (4). The internal consistency of the scale is very good. Children's motives for exercise were taken from the German Motoric Modul-Survey [25]. The 10-item scale includes three subscales (Likert-response scale, 1 = I totally disagree, 5 = I totally agree): "health and fitness" ($\alpha = .69$; e.g. 'I do sports to shape my body'), "emotional aspects" ($\alpha = .55$; e.g. 'I do sports to power off'), and "social relationships" ($\alpha = .53$; e.g. 'I do sports to meet others'). The internal consistency of the scale "health and fitness" is good; the two others are acceptable.

Data analysis

To give an overview of the sample, we firstly calculated independent t-tests for the included variables "weight and shape concerns", "muscularity concerns", "restraint eating", "physical activity", and "motives for exercise", assuming that gender is highly relevant in the research field of body dissatisfaction and subclinical disordered

eating. Then, we examined with step-wise regression models, procedure “stepwise”, whether physical activity plays a moderating role in the context of body dissatisfaction and restraint eating. As longitudinal studies show that body dissatisfaction is a predictor of disordered eating behaviour, we set “restraint eat-ing” as dependent variable and “weight and shape concerns”, “muscularity concerns”, “physi-cal activity” as well as the interaction between the body dissatisfaction scales and physical activity as independent variables. To test the moderating role of motives for exercise in the relationship between restraint eating and body dissatisfaction, we calculated stepwise regres-sion models with a stepwise procedure in the same manner as described above. We included all motives for exercise and the two body dissatisfaction types as well as their interactions in one model. In this, we controlled for the level of physical activity as we set a level of an aver-age performance (category 3) in the GMT as a minimum level. Beforehand, we tested for the lack of multicollinearity, the presence of homoscedasticity (Breusch-Pagan-

Test), and the in-dependence and normal distribution of residuals. No violations were found. All analyses were calculated with IBM® SPSS® Statistics Version 25. The alpha level was set at 0.05.

Results

Body dissatisfaction, restraint eating, physical activity, and motives for exercise in boys and girls

Independent t-tests revealed that there is a significant difference in the type of body dissatis-faction between boys and girls: boys report significantly more muscularity concerns than girls, who report significantly more weight and shape concerns. However, boys and girls do not differ in restraint eating or in their physical activity level. Concerning the motives for exercise, boys seem to be significantly more motivated by health and fitness reasons than girls are; as concerns the other motives, there are no gender differences. Table 1 shows statistics from in-dependent t-tests.

Table 1. Body dissatisfaction, restraint eating, physical activity, and motives to exercise in boys and girls

| Measure | boys | | girls | | t |
|------------------------------|------------------|---------------|-------|---------------|---------|
| | n | M (SD) | n | M (SD) | |
| Weight and shape concerns | 280 ^a | 2.04 (0.85) | 260 | 2.22 (0.93) | -2.34* |
| Muscularity concerns | 288 | 3.12 (1.43) | 284 | 1.94 (1.11) | 10.98** |
| Restraint eating | 291 | 2.01 (0.82) | 279 | 2.01 (0.83) | .01 |
| PA-GMT Total score | 300 | 102.00 (8.22) | 298 | 100.00 (9.07) | 1.42 |
| Motive: Health and fitness | 297 | 3.83 (1.00) | 299 | 3.64 (1.08) | 2.13* |
| Motive: Emotional aspects | 297 | 2.51 (1.18) | 299 | 2.43 (1.15) | .86 |
| Motive: Social relationships | 298 | 4.17 (1.03) | 299 | 4.12 (0.93) | .63 |

Notes: SD = standard deviation; ^a Sample sizes vary due to missing data; *p = 0.02; **p < 0.001.

Physical activity as a moderator in the context of body dissatisfaction and restraint eating

In boys, a stepwise regression analysis showed that weight and shape concerns (WSC) signifi-cantly influence restraint eating as well as the interaction of weight and shape concerns with physical activity (PA) ($R^2 = .15$, $F(1, 261) =$

2.31 , $p = .05$; $N = 265$). In girls, a stepwise regres-sion analysis showed that physical activity as well as the interaction of weight and shape concerns or muscularity concerns (MC) with physical activity have an impact on restraint eating ($R^2 = .26$, $F(1, 225) = 15.46$, $p < 0.0001$; $N = 231$) (see Table 2).

Table 2. Body dissatisfaction and restraint eating in boys and girls

| Restraint eating (boys) | | Restraint eating (girls) | |
|-------------------------|-------------------------------|--------------------------|-------------------------------|
| Measure | β (<i>p</i>) [95% CI] | Measure | β (<i>p</i>) [95% CI] |
| WSC | .92 (0.02)* [0.33, 1.43] | PA | -.19 (0.001)* [-0.03, -0.01] |
| WSC * PA | -.57 (0.05)* [-0.01, 0.00] | WSC * PA | .34 (0.000)** [0.002, 0.004] |
| | | MC * PA | .24 (0.000)** [0.001, 0.003] |

Notes:****p* < 0.001; ***p* < 0.01; **p* < 0.05.

Motives for exercise as a moderator in the context of restraint eating and body dissatisfaction

In boys, a stepwise regression analysis showed that the emotional motive, the interaction of weight and shape concerns with the emotional motive, as well as the interaction of muscularity concerns with the health and fitness motive and with the emotional motive

significantly influence restraint eating ($R^2 = .23$, $F(1, 181) = 6.93$, $p = 0.05$; $N = 187$) (see Table 3).

In girls, a stepwise regression analysis showed that the interaction of the emotional motive with weight and shape concerns as well as the interaction of the health and fitness motive with muscularity concerns and the interaction of the emotional motive with muscularity concerns have an impact on restraint eating ($R^2 = .48$, $F(1, 131) = 15.60$, $p < 0.001$; $N = 137$) (see Table 4).

Table 3. Motives for exercise and restraint eating in boys

| Restraint eating (boys) | |
|--------------------------------|-------------------------------|
| Measure | β (<i>p</i>) [95% CI] |
| Emotional motive | .28 (0.03)* [0.02, 0.36] |
| Emotional motive * WSC | .44 (0.000)** [0.05, 0.16] |
| Health and fitness motive * MC | .40 (0.001)** [0.02, 0.08] |
| Emotional motive * MC | -.56 (0.004)** [-0.13, -0.03] |

Notes:****p* < 0.001; ***p* < 0.01; **p* < 0.05.

Table 4. Motives to exercise and restraint eating in girls

| Restraint eating (girls) | |
|--------------------------------|-------------------------------|
| Measure | β (<i>p</i>) [95% CI] |
| Health and fitness motive | .10 (0.30) [-0.07, 0.24] |
| Emotional motive * WSC | .63 (0.000)** [0.10, 0.21] |
| Health and fitness motive * MC | .59 (0.000)** [0.05, 0.17] |
| Emotional motive * MC | -.56 (.001)** [-0.19, -0.05] |

Notes:****p* < 0.001; ***p* < 0.01; **p* < 0.05.

Discussion

The purpose of this study was to examine the role of physical activity as well as motives for exercise in the context of restraint eating in relation to body dissatisfaction among normal weight boys and girls in childhood as opposed to existing studies which mostly focus on adolescents. As indicated by other studies [9], boys report muscularity concerns significantly more often than girls, who tend to report weight and shape concerns significantly more often. However, the two groups do not differ in restraint eating behaviour, which is consistent with previous findings which suggest that gender differences in dieting and eating-related problems are, on the whole, not manifested until children are 10 years old [26, 27]. Concerning the motives for exercise, we can see that boys are significantly more often physically active due to health and fitness reasons than girls. For the other motives, there are no gender differences. In contrast to other studies [17], the subjects in this study do not mention emotional motives as being most important for exercise; instead they see social relationships and health and fitness as incentives.

Exploring the role of physical activity in the relationship between body dissatisfaction and subclinical disordered eating behaviour, a stepwise regression model with a low model fit showed that weight and shape concerns as well as the interaction of weight and shape concerns with physical activity significantly influence restraint eating in boys. This would suggest that the increasing effect of weight and shape concerns on restraint eating can be counteracted by physical activity, which could be interpreted as a protective effect of physical activity. For girls, a stepwise regression model with a low model fit showed that physical activity alone significantly decreases restraint eating, whereas physical activity in combination with both types of body dissatisfaction increases significantly restraint eating. So, young girls who are dissatisfied with their bodies and who are physically active should be the particular focus of prevention work, as in this combination physical activity seems not to be a protective factor but rather a risk factor.

Regarding the role of motives for exercise, a stepwise regression model with a low model fit showed that for boys emotional motives (for exercise) increase restraint eating significantly. However, considering the coefficients, the increasing impact of the interaction of the emotional motive with weight and shape concerns as well as the interaction of the health and fitness motive with muscularity concerns on restrained eating is higher than that of the emotional motive alone. In contrast, the interaction of the emotional motive with muscularity concerns decreases restrained eating significantly. This means that if boys who are worried about their weight and exercise for emotional reasons, or who are worried about their muscle mass and exercise due to health and fitness reasons, display a higher level of restrained eating. However, these risky relationships are counteracted if boys worry about their muscle mass and exercise due to emotional reasons (to test their limits or to relax). So, it seems that the emotional motive is ambivalent: it is risky in combination with weight and shape concerns but irrelevant in combination with muscle-related body dissatisfaction. For girls, a stepwise regression model with a medium model fit showed that the interaction of the emotional motive with weight and shape concerns as well as the interaction of the health and fitness motive with muscularity concerns significantly increase restrained eating. These risky relationships are counteracted if girls who are dissatisfied with their muscle mass exercise for emotional reasons. However, as the presented findings exist in a correlational research design, we need longitudinal studies to explore in detail the relationship between body dissatisfaction, physical activity, motives for exercise, and (sub)clinical disordered eating in both childhood and adolescence.

Conclusion

As the model fits of our regression models are mostly low, the results only give a first hint. We could show that already in childhood the role of physical activity and motives to exercise must be considered as important factors for the development of body dissatisfaction and (sub)clinical disordered

eating, and should therefore be included in prevention programs. Re-garding the different forms of body dissatisfaction as well as the different roles of physical activity and motives in relation to restraining eating among boys and girls, gender-specific approaches might be appropriate. As physical education programmes provide a context in which children should be educated to become critically reflective citizens capable of making responsible decisions for their health, physical education teachers should make children reflect upon the function of physical activity in relation to the desired body ideals in combination with risky eating and weight control behavior.

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