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Mediating role of coping styles in the relationship between anxiety and health behaviors of obese adolescents

Obesity is one of the major health problems in adolescents. Health-detrimental lifestyle (i.e. lack of physical activity, inappropriate nutrition) as well as maladaptive styles of coping with stress are regarded as belonging among determinants of obesity. The aim of the study was to establish factors mediating between anxiety and diet-related health behaviors. Participants in the study were 113 adolescents with obesity whose body weight was over 97th centile. They were examined using a set of self-report questionnaires to measure anxiety, coping styles and health behaviors. Emotion-focused coping and seeking social contacts (social diversion) were found to act as mediators between adolescents' trait anxiety and their health behaviors. The findings suggest that to enhance obese adolescents' health-promoting behaviors appropriate conditions should be ensured that would not only enable them to express their emotions, but also promote their socializing with peers.

Keywords: coping, obesity, anxiety, health behaviors

Introduction

As estimated by the International Obesity Task Force (IOTF), in the 2004 there were about 155 million adolescents and school-age children with excessive body mass; in that number 30 to 45 million were obese. The proportion of overweight and obese children is significantly high. Since the range of this phenomenon is constantly growing, the tendency is worrisome. Studies systematically conducted in the USA since the year 1963 have shown an increasing prevalence of obesity among 6-11-year-olds and adolescents aged 12-19 years – the obesity rates estimated at 4% and 5%, respectively, in the years 1963-1970 have increased in both age groups to 16% in the years 1999-2002. Obesity is a major problem affecting the individual's biological, psychological and social functioning (Brownell, Kersh, Ludwig, Post, Puhl, Schwartz, & Willet, 2010; Ogden, 2007).

Medical complications of obesity with the onset in adolescence are severe and multifaceted. Some are reversible after a considerable body mass reduction.

Complications associated with obesity include: the metabolic syndrome, prediabetes, pseudo-Cushing's syndrome, premature thelarche, premature adrenarche with rapidly advancing bone age, gynecomastia in boys and polycystic ovarian syndrome in girls, as well as subclinical hypothyroidism (Gawlik, Zachurzok-Buczyńska, & Małecka-Tandera, 2009). Moreover, obese children as compared to those with normal BMI more often suffer from gallstones and gastroesophageal reflux disease (Fichna & Skwronska, 1996; Kalmus, in press). Anthropometric studies have indicated that in obese children not only the volume of the chest cavity and the lungs is reduced, but also there is fat accumulation in the laryngopharyngeal area. In more advanced cases this condition may result in the obesity hypoventilation syndrome potentially leading to development of pulmonary arterial hypertension and increased risk of sudden death (Mojs, in press).

Moreover, mental health is affected by obesity (Simon, von Korff, Miglioretti, Crane, van Belle, & Kessler, 2006). A variety of mental health problems were found to be associated with obesity that frequently leads to social

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isolation (Strauss & Pollack, 2003), low self-esteem (Strauss, 2000), a sense of inadequacy, dependence on others, etc., and thus, to affective disorders. Depression, more prevalent in the population of adolescents with abnormal BMI, is the more severe the higher is their BMI (Stunkard, Fatih, & Allison, 2003). Low self-esteem and a lack of acceptance from peers are responsible for obese children's low quality of life, and may also explain higher rates of suicide attempts in this group. Moreover, obesity was found to be associated with anxiety, e.g. relationships were documented between obesity and two types of anxiety: agoraphobia and panic disorder (Simon, von Korff, Saunders, Miglioretti, Crane, van Belle, & Kessler, 2006). Elevated anxiety levels related to their inability to refrain from eating were reported in adolescents with obesity (Desai, Miller, Staples, & Bravender, 2008). Obesity acquired in adolescence may persist in adulthood, contributing to health-related, psychological and social problems in subsequent stages of the life cycle (McTigue, Garrett, & Popkin, 2002). Adolescence is regarded as a period of high risk for the development of eating disorders and obesity (Łuszczynska, 2007). Therefore, it seems important to seek factors that would explain obese adolescents' engaging in health-promoting activities that lead to weight loss (Mojs, in press).

The etiology of obesity is considered to be complex, involving an interaction of physiological factors (e.g. genetic determinants, the metabolic rate and course of body metabolism, dysorexia, number of fat cells), behavioral aspects (e.g. systematic physical activity, nutritional behaviors), and environmental conditions (e.g. prices and availability of food, amount of food per serving) (Brownell, Kersh, Ludwig, Post, Puhl, Schwartz, & Willett, 2010; Ogden, 2007; Paharia & Kase, 2008). Research findings suggest that environmental and behavioral factors are stronger predictors of obesity than are biological factors (Stein & Colditz, 2005).

Among behavioral determinants of obesity diet-related health behaviors are considered to be important (Ogden, 2007). In studies concerning health behaviors and obesity attempts are made to establish the relationship between obesity and (1) diet composition, or (2) nutritional habits. As regards the effects of diet composition, obesity was found to be positively associated with high-fat diet (Łuszczynska, 2007), high intake of sugar, fat, animal proteins (Kelishadi, Ardalan, Gheiratmand, Gouya, Razaghi, & Delavari, 2007), and sweetened beverages (Jackson & Horner, 2005), being negatively related to fruit and vegetable consumption (Kelishadi, Ardalan, Gheiratmand, Gouya, Razaghi, & Delavari, 2007). Consumption of pharmaceuticals that modify the functioning of cardiovascular, hormonal and nervous systems is regarded as a risk factor in adolescents (Łuszczynska, 2007). Studies on the relationship between obesity and nutritional habits indicate that obesity is

directly proportional to irregularity both in the amount of consumed food and the length of intervals between meals (Łuszczynska, 2007). The latter may take the form of skipping meals (Terres, Pinheiro, Horta, Pinheiro, & Horta, 2006), eating out of home (Sealy, 2010), or alternating periods of overeating and starving (Stunkard, Faith, & Allison, 2003).

Another group of health behaviors related to obesity includes patterns of spending leisure time, with the emphasis on physical activity. Obesity is prevented by physical activities that result in burning about 150 kilocalories per day and require any type of moderate physical effort (e.g. window washing, riding a bike, running, gardening, etc.) (Łuszczynska, 2007). On the other hand, sedentary lifestyle including such activities as prolonged TV watching or using a computer predisposes to obesity (Kautiainen, Koivusilta, Lintonen, Virtanen, & Rimpela, 2005).

Obesity may be regarded as a specific source of stress, since it impairs the obese individual's somatic, emotional and social functioning (Corsicaand & Perri, 2003). Stressfulness of obesity is due to such social processes as stigmatization and discrimination of the obese, and to difficulties in performing a variety of tasks due to limited physical fitness. From the perspective of transactional theories of stress it is pivotal to determine how people cope with stress. This includes coping with chronic health problems (Sęk & Ziarko, 2009). According to the classic definition, coping consists in "cognitive and behavioral efforts to manage specific external or internal demands that are appraised as taxing or exceeding the resources of a person" (Lazarus & Folkman, 1984, p. 141; Hesen-Niejodek, 2000). Few studies deal with these issues in the context of obesity in adolescence. The available publications suggest that utilization of avoidant coping style increases the risk of overeating in stressful situations (Henderson & Huon, 2002).

The aim of this study was to indicate variables moderating the relationship between anxiety and health behaviors. Coping styles were hypothesized to act as moderators of the relationship in question. Our earlier studies conducted in different populations have shown that coping with stress may be an active component that explains relationships between some more general psychological health-related constructs, such as resilience and life satisfaction (Kaczmarek, 2009; Kaczmarek, Sęk, & Ziarko, 2011; Ziarko, & Kaczmarek, 2011; Ziarko, Kaczmarek, Mojs, Atarowska, & Samborski, 2011). Considering the developmental context of health-related activity, we expected that utilization of two types of coping styles: emotion- and avoidance-focused (as regards the latter, particularly social diversion or seeking social contacts) would facilitate health-promoting behaviors in high anxiety adolescents. Attempts to cope with tension due to obesity by means of socializing may be an effective coping style,

since it refers to one of the basic developmental tasks of adolescence, i.e. establishing one's place within the peer group (Bee, 2006).

Method

Participants and procedure

Participants in the study were 113 teenagers (53 boys and 60 girls) attending weight loss training programs for children and adolescents in Ciechocinek and Kudowa Zdrój sanatoriums. They had been diagnosed with obesity on the grounds of their BMI (over 97th percentile), and referred to the program by their family doctors. The participants were aged 11 to 18 years ($M = 14.97$; $SD = 1.73$), mean age of girls ($M = 15.05$; $SD = 1.75$) did not differ significantly from that of boys ($M = 14.88$; $SD = 1.72$; $t_{(104)} = 519$; $p = 0.83$). There were no statistically significant gender differences regarding their BMI.

Participation in the study was voluntary and anonymous. On the first day of their weight loss program the participants individually filled out a set of self-report questionnaires.

Measures

The following three questionnaires were used: *The State-Trait Anxiety Inventory* (Spielberger, Gorsuch, & Laushene, 1970; Sosnowski, Wrześniewski, Jaworowska & Fecenec, 2006) allows to assess the respondent's anxiety level. This 40-item questionnaire consists of two 20-item subscales measuring anxiety as a transient state (e.g. "I'm worried that something could go wrong"), and as a stable personality trait (e.g. "I tend to take everything too seriously"). The respondents use a 4-point rating scale, ranging from 1 - definitely no, to 4 - definitely yes.

The Coping Inventory for Stressful Situations (CISS, Endler & Parker, 1990; Strelau, Jaworska, Wrześniewski, & Szczepaniak, 2005) contains 48 items describing human behaviors in stressful situations. The tool measures three coping styles: task-focused (e.g. "Focus on the problem and see how I can solve it"), emotion-focused (e.g. "Feel anxious about not being able to cope"), and avoidance-focused (e.g. "Think about the good times I've had"). In the latter coping style two subscales are distinguished: of distraction (or engaging in substitute activities, e.g. "I watch TV") and social diversion (or seeking social contacts, e.g. "I try to be with other people"). Respondents use a 5-point rating scale, from 1 - never to 5 - very often.

Health Behaviors Inventory, (HBI, Juczyński, 2001) is a 24-item questionnaire with four subscales of 6 items each, measuring nutritional habits (e.g. "I eat a lot of fruit and vegetables"), preventive behaviors (e.g. "I attend medical check-ups regularly"), positive attitudes (e.g. "I think positively"), and health practices (e.g. "I get enough sleep"). Responses are given using a 4-point scale ranging from 1-almost never, to 5 - almost always.

Statistical analyses

Pearson's r correlation coefficients were calculated to estimate associations between anxiety levels, coping styles and health behaviors. The hypothesis about the mediating role of coping styles in the anxiety-health behaviors relation was verified using the mediation analysis as recommended by Preacher and Hayes (2008, 2004). The bootstrapping procedure applied in the analysis allows to calculate coefficients of: a) the effect of the predictor on the mediator, b) the effect of the mediator on the outcome variable, c) the global effect of the predictor on the outcome variable (without controlling for mediation, and c') the direct effect of the predictor on the outcome variable.

Results

Relationships of health behaviors with anxiety and coping styles

Health behaviors were found to be associated both with the anxiety level and with coping style (see Table 1). The anxiety level turned out to be inversely proportional to the global health behavior score, and this holds both for state ($r = -.25$; $p < .01$) and trait anxiety ($r = -.25$; $p < .01$). The strongest negative association of state anxiety turned out to be that with positive mental set ($r = -.32$; $p < .01$). It should be noted that no statistically significant correlation was found between nutritional habits (i.e. the group of health behaviors being major determinants of body mass reduction) and either trait or state anxiety.

All the measured coping styles were positively associated with health behaviors. The strongest associations were noted for task-oriented coping, related to the following variables: global health behavior score ($r = .47$; $p < .01$), nutritional habits ($r = .37$; $p < .01$), preventive behaviors ($r = .45$; $p < .01$), and positive mental set ($r = .40$; $p < .01$)¹.

Mediating role of coping styles in the relationship between state anxiety and health behaviors

The conducted analyses (see Table 2) indicate that the relationship between state anxiety and health behaviors is mediated by the emotion-focused style. Namely, a suppression effect was noted suggesting that the negative association of state anxiety with the number of health behaviors would be stronger if emotion-focused styles were not utilized by the teenagers ($a = 0.25$, $p < .01$; $b = 0.28$, $p < .01$; $c = -0.23$, $p < .01$; $c' = -0.30$, $p < .01$; $z = 2.02$; $p < .01$).

A similar suppression effect was noted in the relationship between trait anxiety and health behaviors, where emotion-focused coping styles turned out to be the mediator ($a = 0.32$, $p < .01$; $b = 0.32$, $p < .01$, $c = -0.25$, $p < .01$; $c' = -0.35$, $p < .01$; $z = 2.49$; $p < .05$). Thus, analogically, adolescents

¹ Due to an unsatisfactory reliability coefficient of the subscale, health practices were not included in the analyses.

Table 1
Descriptive statistics, Cronbach's reliability coefficients and correlations between measured variables.

	M	SD	a	1	1a	1b	1c	1d	2	3	4	5	6	7
1. Health behaviors – global score	79.44	14.87	.79											
a. Nutritional habits	19.19	4.98	.73	.77**										
b. Preventive behaviors	19.90	5.27	.61	.82**	.55**									
c. Positive attitude	21.00	4.63	.60	.77**	.41**	.48**								
d. Health practices	19.35	4.23	.34	.75**	.39**	.46**	.55**							
2. State anxiety	37.56	11.11	.91	-.25**	-.18	-.10	-.32**	-.21*						
3. Trait anxiety	41.60	9.94	.82	-.25**	-.17	-.06	-.28**	-.30**	.71**					
4. Task-focused style	53.73	10.99	.83	.47**	.37**	.45**	.41**	.20*	.25**	-.16				
5. Emotion-focused style	45.08	10.13	.78	.21*	.09	.24**	.07	.24*	-.27**	.32**	.07			
6. Avoidance-focused style	54.80	10.66	.80	.33**	.24*	.22*	.36**	.19*	-.37**	-.16	.52**	.17		
7. Substitute activities - distraction	25.10	6.31	.72	.24**	.14	.13	.30**	.20*	-.21*	-.09	.25**	.20*	.86**	
8. Seeking social contacts - social diversion	19.18	4.48	.74	.30**	.26**	.23*	.31**	.13	-.46**	-.25**	.66**	.01	.80**	.42**

* $p < .05$, ** $p < .01$

Table 2
Results of mediation analysis – variables mediating between anxiety x-1 and health behaviors.

Potential mediators	estimates				Sobel test		model summary			95% CI	
	a	b	c	c'	z	p	R ²	F	p	lower	upper
State anxiety and global health behavior (bootstrap 10000)											
Task-focused style	-.27**	.43**	-.25*	-.14	-2.52	.011	.22	17.08	<.001	-.24	-.04
Emotion-focused style	.25**	.28**	-.23*	-.30**	2.02	.043	.11	8.13	<.001	.03	.15
Avoidance-focused style	-.37**	.27**	-.25**	-.15	2.35	.019	.11	7.94	<.001	-.21	-.03
Substitute activities - distraction	-.21*	.19	-.25**	-.21*	-1.56	.118	.08	2.00	<.002	-.13	-.001
Seeking social contacts - social diversion	-.46**	.24*	-.25**	-.14	-2.15	.031	0.9	6.65	<.002	-.22	-.02
Trait anxiety and global health behavior (bootstrap 10000)											
Task-focused style	-.16	.44**	-.25**	-.18*	-1.61	.107	.24	18.45	<.001	-.17	.00
Emotion-focused style	.32**	.32**	-.25**	-.35**	2.49	.012	.14	10.08	<.001	0.5	.18
Avoidance-focused style	-.16	.29**	-.25**	-.20*	-1.52	.127	.13	9.42	<.001	-.12	.01
Substitute activities – distraction	-.09	.22*	-.25**	-.23*	-.91	.364	.10	6.87	<.002	-.09	.02
Seeking social contacts - social diversion	-.25**	.25**	-.25**	-.18*	-1.95	.051	.11	7.80	<.001	-.14	-.01

* $p < .05$, ** $p < .01$

with high trait anxiety would engage in even fewer health behaviors if it weren't for the fact that they utilized emotion-focused coping styles.

Moreover, the relationship between state anxiety and health behaviors is mediated by seeking social contacts (social diversion). This means that adolescents who experience anxiety in various situations engaging in more numerous health behaviors due to their coping style, i.e. seeking social contacts ($a = -0.25, p < .01$; $b = 0.25, p < .01$; $c = -0.25, p < .01$; $c' = -0.18, p < .01$; $z = -1.95; p = .05$).

Discussion

Results of this study indicate, firstly, a negative association between the level of anxiety and health behaviors, and secondly, a mediating role of coping styles in this relationship as regards health practices and behaviors including mental health protection. Obese adolescents with high levels of both state- and trait anxiety were found to less frequently engage in health-promoting behaviors. The relationship in question was mediated by emotion-focused coping styles (in the case of state anxiety), and besides, by seeking social contacts, or social diversion (in the case of trait anxiety).

Research findings suggest that obesity in adolescence may be considered as a long-term stressor (cf. Vgontzas, Lin, Papaliaga, Calhoun, Vela-Bueno, Chrousos, & Bixler, 2008). Obesity is associated with strong stigmatization (Muennig & Bench, 2009), that may lead to increased emotional tension and anxiety in the obese. Higher anxiety levels in obese adolescents may result also from messages they receive from their parents, who are afraid of risks involved in their child's physical activity and peer contacts. Consequently, parents may restrict these spheres of their adolescent children's functioning, thus evoking their groundless anxiety (Radoszewska, 2007). Parental communication patterns are regarded as another source of anxiety in obese adolescents. Such parents are described as unpredictable providers of emotional support, which may lead to their child's situational bewilderment and increased anxiety (Bruch, 1973; cited after: Moreno, Selby, Aved, & Besse, 2000). The results of our study suggest that high anxiety is a negative phenomenon, since it hampers adolescents' engaging in health-promoting behaviors – and this in turn may contribute to their overweight problem aggravation. This observation enlarges our knowledge about mechanisms underpinning the relationship between stress and body weight. There are reports in the literature that people in strongly stressful situations increase their consumption of high fat and high sugar foods, avoid physical activity, and quit the recommended diet (cf. Hye-cheon Kim, Bursac, DiLillo, Brown-White, & Smith-West, 2009). Our research findings suggest another possible mechanism underlying this relationship. Namely, obese adolescents can be assumed to experience anxiety hampering their readiness to engage in health-promoting activities. The question about sources of this anxiety remains open. The most probable hypothesis seems to be that the peer group is a major reference point in adolescence – and in many cases obese adolescents are not accepted and rejected by their peers. This contributes to increasing obese teenagers' anxiety due to the lack of social acceptance.

The performed mediation analyses suggest that in order to increase obese adolescents' engaging in health behaviors they should be provided with conditions that would enable them to express emotions they experience and to establish satisfactory peer contacts. This conclusion is concordant with findings reported in other studies on coping by the obese (Nilsson, Ericsson, Poston, Linder, Goodrick, & Foreyt, 1998).

Two limitations of our study due to the research procedure should be noted. Firstly, instruments recommended for subjects aged over 15 years (e.g. STAI) were administered to younger participants. This decision resulted from the fact that a majority of our respondents were over the age of 15. Moreover, although adolescence is a specific and highly differentiated period of life, there are no suitable methods to measure certain psychological constructs in

the early and late adolescence. The second limitation is related to age as the criterion of the sample selection. Participants in the study were in the 11-18 age group, i.e. in the period of adolescence. The criterion of age and our assumption that the adolescent participants constituted a homogeneous group could have been an oversimplification, since adolescence is characterized by extremely dynamic processes of identity formation as well as moral, cognitive and social development. Obviously, there are considerable differences between individuals entering adolescence and those in the final phase of this life stage. It should be noted however, that transformations occurring in adolescence are based on changes accompanying the body growth and functioning. Concentration on the body and on changes in the physical sphere is shared by all adolescents. Obesity as a problem of somatic nature may affect the course of developmental processes across adolescence, irrespective of whether it is experienced in its early or late phase (cf. Bee, 2006; Bardziejewska, 2005; Ziółkowska; 2005).

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