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Review

An update on obesity: Mental consequences and psychological interventions

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ABSTRACT

Besides physical consequences, obesity has negative psychological effects, thereby lowering human life quality. Major psychological consequences of this disorder includes depression, impaired body image, low self-esteem, eating disorders, stress and poor quality of life, which are correlated with age and gender. Physical interventions, mainly diet control and energy balance, have been widely applied to treat obesity; and some psychological interventions including behavioral therapy, cognitive behavioral therapy and hypnotherapy have showed some effects on obesity treatment. Other psychological therapies, such as relaxation and psychodynamic therapies, are paid less attention. This review aims to update scientific evidence regarding the mental consequences and psychological interventions for obesity.

1. Introduction

Obesity, a metabolic disorder due to body fat accumulation, is often identified using the WHO classification of body mass index (BMI). BMI is calculated as the ratio of body weight in kilogram (kg) to height in meter squared (m^2). In particular, an adult with a BMI of $<18.5\ kg/m^2$ is classified as underweight, $18.5–24.9\ kg/m^2$ is identified as normal weight, $25.0–29.9\ kg/m^2$ is overweight, and $>30\ kg/m^2$ is classified as obesity [1]. Overweight and obesity are described as a risk factor of a subset of diseases, including cancer, type II diabetes, high blood pressure, heart diseases and stroke [2–7]. Due to imbalances in calories intake and daily energy consumption, obesity interventions have been focused on dietary and lifestyle changes, physical exercise or surgery.

Besides physical diseases, overweight and obesity were strongly associated with serious psychiatric disorders [8]. Obesity has several psychological consequences, including depression, emotional and behavioral disorders, low self-esteem, motivational disorders, eating disorders, impaired body image and low quality of life. Medicine is used to treat obesity; however, it alone is inefficient

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in many cases. Psychological interventions among many other therapies are, therefore, employed in obesity treatment. They include behavioral therapy, cognitive behavioral therapy and hypnotherapy, which, to a certain extent, have proved to be successful in helping people to re-control their BMI. As a consequence, their mentality, lifestyles and behaviors are positively adjusted, i.e. they are able to control their food intake for desire and increase physical activity, to prevent continued obesity.

This review aims to dissect mental consequences of obesity and some common psychological interventions in controlling and decreasing this metabolic disorder.

2. Mental or psychological consequences of obesity

Apart from physical consequences, obesity is also associated with a wide range of mental consequences such as depression, low self-esteem (LSE), eating disorders (ED), body image disturbance (BID), stress and lowered quality of life (QoL) [9].

2.1. Depression

The relationship of depression to obesity is not unidirectional, and it varies by sex and age. On the one hand, some studies showed that depression [10–12] and antidepressant use [13] increased the risk of developing obesity. Childhood depression led to higher risk of obesity in adulthood [14]. Obesity was found higher in depressed women than depressed men, irrespective of age, the prevalence of this metabolic disorder in adults increased with depressive symptoms of higher levels [15]. A person with depressive disorder has a higher risk of overweight and obesity than the one with only depressive symptoms [16]. A study pointed out that overweight was statistically significantly correlated with depression when it came to people at 20 years old or above, but not to younger groups [16].

Furthermore, some researches indicated that obesity is the cause of depression [10,12,16,17]. Obese people were at higher risk of either current or lifetime depression than their normal-weight counterparts. Women with obesity were more inclined to suffer from depression within the past month, compared to obese men. Severe obesity (BMI $\geq$ 40 kg/m^2) was strongly associated with past-month depression [11]. In the younger group of adolescents, depressive symptoms were more commonly found in obese ones than in normal ones [17]. A report showed that non-clinical obese and normal-weight adolescents had lower depression scores than clinical obese ones [18]. Due to their weight, obese children and adolescents had difficulty making friends, as they were considered by their peers as physically unaccepted, less sociable and more aggressive [19]. Besides, familial teasing [20] and peer teasing [21] increased the risk of depression in obese children. Furthermore, suicidal ideations and attempts, the possible consequences of depression, were found more common among obese children [22,23], and obese people aged 15 or above [24], females perceiving themselves as overweight [25], and women with Class I and III obesity [26].

The causal relationship between obesity and depression was quite controversial, as some studies concluded that young people with obesity were not more vulnerable to depression than non-obese ones [12]. BID with obesity was associated with depression [27], and the association between obesity and depression no longer existed after controlling BID [28]. Obese females were more prone to present depressive symptoms, when compared to non-obese ones, while no association was found among males [14].

2.2. Low self-esteem (LSE)

The association between BMI and LSE has been debated. It was reported that overweight and obesity (OW/OB) was a risk factor for LSE in some studies [29,30]. More precisely, OW/OB children [30] and adolescents [29] had lower self-esteem compared to normal-weight counterparts. The relationship between LSE and obesity varied by gender and ethnic subgroup. More specifically, boys with high BMI had LSE, but no link between the two factors was found among girls. When compared to those with normal weight, obese Bangladeshi children and obese white British boys had LSE, whilst obese black African girls had higher self-esteem [31]. A study in Norway showed that children with high BMI had LSE than those with healthy weight in all evaluated aspects of self-esteem, including body image, physical exercise, eating disturbance, academic performance, and communication. Additionally, children whose parents perceived them as overweight were less satisfied with their body image than those who received no such comment from their parents [32]. However, self-esteem was not found to associate with weight status in some other reports [28,33] when BID was controlled [28]. Sylvia Herbozo et al. has indicated that OW/OB women with BED experienced lower BID and self-esteem than those without BED [34]. Obese pregnant women felt less satisfied about their body image and had LSE than health weight ones [35]. A study in Iran by Seyed Reza Alvani et al. revealed that despite being healthier, men had lower self-esteem than women [36]. LSE led to low QoL in terms of the frequency of sexual intercourses and sexual desire [37].

2.3. Eating disorder

Eating disordered behaviors such binge-eating disorder (BED) and night eating syndrome (NES) are more commonly found in OW/OB individuals, regardless of gender and age. Adolescents [38] and females [39] with higher BMI were more susceptible to eating disorder traits than normal-weight ones. Some studies showed that the rate of eating disorders in obese youngsters was high [40,41], and childhood obesity may result in the induction of eating disorders in adulthood [42]. According to an online survey on college students, perceived overweight or obesity led to a higher likelihood of having binge eating behaviors [43]. BED prevalence among students who perceived themselves as overweight exceeded that among those who did not think they suffered from the condition, whether they were actually overweight or not [43]. Individuals who were younger, female, obese, or aspired to lose weight were more likely to have BED [44]. BED was associated to both global and central obesity [45]. The levels of eating disorders among obese women (aged 18–42 years) were higher than those of normal-weight ones. They were more inclined to reduce the food consumption in favor of losing weight, having healthy attitudes and perceptions toward food and weight, binge eating, use pills that help them control their food intake, and fast (or abstain from all types of food) [46]. A phone-based survey of adult patients with obesity in Greater Boston (2009–2011) found a high proportion of respondents who reported to experience eating disorders (approx. 80%) [47].

2.4. Body image dissatisfaction (BID)

Body image is defined as one's personal judgment of one's own physical appearance, which is typically negative [48]. People with BID feel dissatisfied with their weight and body shape because of such factors as cultural perspective of beauty, gender, early onset of obesity, and weight-based teasing. According to Western cultures, females should have a slender figure, while men should be lean and

muscular [49,50]. For boys, the association between body weight and that aspiration was not linear; overweight boys preferred thinness while underweight ones wanted a larger body size [50]. This, therefore, explains why females with high BMI and males with extremely low or extremely high BMI have a proclivity to feel more dissatisfied with their bodies compared to the ones with normal-weight [49–51]. This ideal of beauty in males and females was confirmed by a study in Taiwan [52]. Some studies showed a high prevalence of people [51], especially females [52], expressing dissatisfaction with their body shapes. OW/OB people, irrespective of sex, had higher BID than their non-OW/non-OB counterparts [52–55].

The earlier onset of obesity also increased the level of body dissatisfaction. For example, Wardle, J., et al. reported that women started to develop obesity at the age of 16 years expressed a higher level of BID than those with onset of obesity at a later age [56]. The rate of obese women being teased about their weight and size [57] or being teased during their childhood [56] was higher than that of non-obese ones. Furthermore, those who developed obesity earlier tended to report being teased about their size and weight. Obese women who reported more teasing about their general appearance had a higher tendency to engage in BED [57].

2.5. Quality of life (QoL)

Obesity may cause its sufferers to lead a life of low quality in terms of discrimination, education, income or chance of marriage. Patients with class II/III obesity received more interpersonal discrimination and self-stigma than their normal-weight counterparts, obese professionals (with BMI $\geq 35\ kg/m^2$) reported more discrimination at work and compared to obese non-professional workers [58]. OW/OB people also were discriminated by being considered as unsuitable for jobs they applied for [59]. In terms of education, people with early onset of obesity (at 16 years of age) had less schooling than those with later onset of obesity [60], and obese females had less chance of completing an advanced education program [61]. For OW/OB children, they tended to withdraw from making friends and become less sociable [62]. Their performance at school was also negatively affected with more trouble at school than normal weight schoolmates [63], higher absenteeism and higher dropout rates. Adolescents, especially white American, whose onset of obesity initiated during early adolescence were more likely to drop out of school than those with obesity only during their childhood and non-obese ones [64]. Obese children had poorer QoL and higher BID than normal-weight ones, and BID mediated the association between body weight and QoL [65].

Besides, obese females were poorer and had lower household income than their non-obese peers, while males' onset of obesity was not associated with their earnings [60,61]. According to the National Longitudinal Survey of Youth, obese females in the USA were less likely to get married than those without obesity, while obese males saw no such association [61]. However, according to a study in Sweden by Kark M et al., OW/OB men had the least chance of getting married than those with normal weight [66].

2.6. Stress

Obesity is believed to result from various factors, including lack of physical activity, sedentary activities [67–69] and unhealthy dietary practices [69]. Apart from these factors, stress is also a significant contributor to weight gain [70,71] and the onset of obesity [71], because stress can cause overconsumption of foods and drinks [72] and influence the choice of foods [73]. According to some studies, stressed individuals had higher intake of energy (adolescents and children) [73,74] and consumed more fatty food (children and adolescents) [73,74], more snacks (children) [68,73], more potato crisps and chips, takeaway foods, and sugary drinks [75], but less fruits and vegetables (children and 45-75-year-old adults) [68,73], and less proteins [68] or even skip breakfast (children) [73]. Those unhealthy eating habits lead to higher BMI, ultimately resulting in the development of OW/OB. According to Jaarsveld et al. moderately or severely stressed adolescents had much higher BMI than those with mild stress [76].

Besides stress at school (due to examination) [74], weight gain in children can be attributed to the degree of family stressors and parent-perceived stress [77]. Other stressors include poor family functioning, namely general family functioning and parental psychological distress, that promoted unhealthier dietary intake [75]. Fewer positive family meal practices and more depressive symptoms in families with both overweight parents [78], traumatic experiences during childhood, including child sexual abuse and having jobless parents, that caused overweight and obesity later in life [79]. Stressors were related to the transition to adolescence and study at school suggested as predictors of overweight in girls [80]. For adults, work stress was slightly associated with employees' BMI. More specifically, employees with "*lower job control, higher job strain, and higher effort-reward imbalance*" were a higher risk of overweight, and male employees with lower job demands had higher BMI. Increased stress at work can disturb eating habits and promote sedentary activities [67].

The biological mechanism of stress inducing overeating lies in the changes in the level of hormones and chemicals in the body, such as increased cortisol [81] and decreased serotonin [82], which in turn prevent insulin from being released [83], but increase the secretion of ghrelin [84] and at the same time activate the brain reward system. According to Adam et al. (2007), the system interacts with the stress-induced hypothalamic-pituitary-adrenal (HPA) axis, leading to increased food consumption [85]. In turn, the obese people's stress system can be activated by increased 11 b-HSD1 activity [86], inflammation activation [87] and increased secretion of leptin [88]. Stress, therefore, is both a cause and a consequence of obesity [89].

3. Psychological interventions in obesity treatment

The treatment of OW/OB is based on the maintenance of energy balance – the relationship between caloric intake and expenditure [90]. A wide variety of interventions, including lifestyle, medical and surgical interventions have been applied to treat OW/OB. Lifestyle interventions address two aspects, namely dietary patterns and physical exercise regimes. While dietary interventions aim to cut down the amounts of high-fat food intake and promote a low-fat eating plan, thereby lowering the energy intake [91], exercise interventions target at spending energy. Both types of intervention have proven to be ineffective, as they lead to minimal losses of weight over short periods, whereas in a long run in case of dietary interventions, weight regain is typically inevitable [92]. Weight losses can be achieved by medicines, but according to a Cochrane review, minimal effects have been achieved so far in reducing obese children's and adolescents' BMI, and only a few types of medicine have been approved to be used in obesity treatment [93]. The largest weight losses as a result of surgical interventions (e.g. bariatric surgeries) can be achieved and sustained for a longer period. However, the trade-off is that their health risks are the most substantial [94].

Apart from the interventions mentioned earlier, a spectrum of psychological interventions have been developed to treat OW/OB. The most commonly used in OW/OB treatment are cognitive behavioral therapies in combination with lifestyle interventions [95]. Other psychological interventions, which have been limited

researched, include cognitive therapy, psychotherapy, relaxation therapy and hypnotherapy [95].

3.1. Behavioral therapy

Behavioral therapy (BT) aims to increase a patient's capacity for self-control. It is used to manage obesity in people with disturbed eating and physical behaviors which can be changed; this means obese people can be trained to adopt behaviors that promote physical activity or energy intake [96]. Weight loss interventions often contain two phases - an initial phase and a maintenance. The initial phase lasts 3–6 months, and participants have a group meeting every week. Meanwhile, the maintenance phase lasts from 6 to 12 months during which meetings are held every two weeks. After the interventions finish, meetings are held every month. According to a review in the late 1990's, behavioral programs helped participants to lose 9 kg, nearly one tenth of their body weight before interventions [97]. Behavior therapy with dietary or exercise interventions was more effective in reducing weight than dietary or exercise interventions used alone [95]. Although BT leads to short-term weight reductions, it is no easy task to maintain them in a long term [98], and cognitive behavioral therapy unnecessarily succeeds in aiding weight loss [99]. Another drawback of this psychotherapy is that weight is commonly regained [100,101].

3.2. Cognitive behavioral therapy (CBT)

This intervention is comprised of both cognitive therapy and behavioral therapy [102]. It is depended on three assumptions: "*a) cognitions affect behavior, (b) cognitions can be changed, and (c) cognitive change can effect behavior change*" (46). CBT when used in combination with dietary or exercise interventions led to more weight loss than when only using dietary or exercise interventions [95]. In both cognitive dietetic treatment and the exercise dietetic treatment, BMI and psychological disorders decreased in a short period, but over a longer period of treatment, the former proved to be more effective than the latter. Indeed, participants in the cognitive treatment combined with dietary practices were able to maintain their weight loss, while regain of 25% the lost weight was found in those only applying dietary and exercise interventions [103]. Unlike behavior therapy, CBT focuses on cognitive changes rather than only on behavioral changes in eating and physical activity. In other words, it aims to fix the negative thoughts and beliefs of overweight and obese people [104]. With this approach, cognitive behavioral therapy can help maintain weight loss more efficiently.

3.3. Hypnotherapy

Hypnosis is a method of inducing deep relaxation which can sometimes be used to aid psychotherapy in order to help patients change their behavior or relieve their symptoms [105]. It is proved that hypnosis supports psychotherapy more effectively. A meta-analysis noted that the combined intervention improved weight loss in obesity treatment than non-hypnotic intervention. Long after their treatment, patients provided with the combined intervention continued to lose weight [106]. Manzoni GM et al. stated that relaxation exercise supported with virtual reality and portable mp3 players proved to be effective in reducing emotional eating behavior among obese female patients [107]. However, hypnotherapy might be ineffective unless patients were successfully in deep hypnotic state [108]. Besides, if hypnosis is used for children during their early adolescence, they might face negative effects of this method [108].

Other psychological interventions less commonly used in obesity treatment include interpersonal psychotherapy, relaxation therapy, psychodynamic therapy, eye movement desensitization and reprocessing, emotion freedom methods, and emotion-focused intervention, whose mechanisms have not consistently been clarified.

4. Conclusions

Detrimental effects of overweight and obesity on mental health include depression, body image dissatisfaction, eating disorder, and stress. Although the consequences of OW/OB affect males and females at different levels and vary by age and culture, obesity has negative effects on mental health and influences health status both directly and indirectly. Conventional methods for preventing or interfering overweight and obesity, namely dietary and lifestyle changes as well as proper physical exercise, have effects on obesity. Beside these methods, psychological interventions, such as behavioral therapy, cognitive behavioral therapy, and hypnotherapy, prove to have effects in a longer term, thus more development is required.

Compliance with ethical standards

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Conflict of interest

The authors declare that there is no conflict of interest.

Ethical approval

This article does not contain any studies with human participants or animals performed by any of the authors.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.dsx.2018.07.015.

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