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Association between accuracy of weight perception and life satisfaction among adults with and without anxiety and mood disorders: A cross-sectional study of the 2015-2018 Canadian Community Health Survey

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Abstract

Background: Weight status and weight perception have a significant impact on life satisfaction. As overweight prevalence increases in Canada, it is important to understand how accuracy of weight perception (AWP) is associated with life satisfaction. This study explored the association between AWP and life satisfaction among Canadian adults with and without anxiety and/or mood disorders.

Methods: Using data from the 2015-2018 cycles of the Canadian Community Health Survey, an indicator of AWP was created to capture concordance between perceived weight and actual weight status. Univariate and multivariate Gaussian generalized linear models were assessed while stratifying by sex and presence of anxiety and/or mood disorders.

Results: Our sample included 88,814 males and 106,717 females. For both sexes, perceiving oneself as overweight or underweight, regardless of actual weight status, was associated with lower life satisfaction ($\beta = -0.93$ to -0.30), compared to those who accurately perceived their weight as "just about right". Perceiving oneself as overweight or underweight was associated with more pronounced differences in life satisfaction scores in those with anxiety and/or mood disorders ($\beta = -1.49$ to -0.26) than in those without these disorders ($\beta = -0.76$ to -0.25).

Conclusion: Weight perception is more indicative of life satisfaction than actual weight status, especially in those with anxiety and/or mood disorders.

Keywords: Weight perception, body mass index, life satisfaction, anxiety disorders, mood disorders

Introduction

Like many other countries around the world, the prevalence of adults classified as overweight and obese has been increasing in Canada. The most recent available data estimate the prevalence of obesity in Canadian adults to be 26.8% and the prevalence of being overweight to be 36.3% (1). The way a person perceives their own weight may not match their actual weight status. Accurate weight perception is defined as concordance between self-perceived weight and actual weight status. Accuracy of weight perception (AWP) has been found to be associated with being female and younger, as well as with having a normal weight and higher socioeconomic status (2). In contrast, misperception has been found to be associated with being male, older, of African American descent, of lower socioeconomic status, and having a non-western lifestyle (2). Males tend to underestimate their weight, while females, despite having more accurate weight perceptions, tend to overestimate their weight (2, 3). Studies from Denmark, South Korea, and Spain have found trends in weight misperception to be heterogeneous across genders (4-6), however, there are no comparable data from Canada.

Actual weight status and weight perception can both influence life satisfaction. The subjective comparison theory explains the association between life satisfaction and accuracy of weight perception. It posits that individuals use others as a standard to assess their own weight; if one perceives their weight to be 'better' than the standard, they tend to have greater life satisfaction (7). Although the relationship between AWP and life satisfaction may differ across subpopulations, there is a lack of research in this area. Individuals with anxiety and/or mood disorders are of particular interest as this subpopulation tends to have lower life satisfaction scores compared to those without any mental health disorders (8). Lower life satisfaction in adults with anxiety and/or mood disorders may be at least partially attributed to body dissatisfaction which has been associated with social anxiety disorder and major depressive disorder (9). It has also been found that adults with anxiety and/or mood disorders are more likely to have inaccurate weight perception (10).

While it has been demonstrated that AWP is associated with life satisfaction in the general population (11), there is currently no evidence on the magnitude of this association among adults with anxiety and/or mood disorders. Given that the most common mental health disorders in Canada are anxiety and mood disorders (12), it is important to understand factors influencing life satisfaction in this subpopulation and whether it is particularly vulnerable to the

effects of AWP. Thus, this study aimed to 1) assess the association between AWP and life satisfaction in Canadian males and females, and 2) assess whether this association differs between those with anxiety and/or mood disorders and those without. We hypothesized that the association between AWP and life satisfaction is more pronounced among those with anxiety and/or mood disorders.

Materials and Methods

Data source

This cross-sectional study included data from the Canadian Community Health Survey (CCHS), an annual survey that collects health-related data on individuals 12 years or older living in Canadian provinces and territories. The CCHS sampling frame covers 97-98% of the target population and excludes those living on reserves and other Aboriginal settlements, full-time members of the Canadian Forces, institutionalized individuals, children in foster care, and individuals living in remote regions of Quebec. Interviews were conducted in one of the official languages of Canada (English and French) using computer-assisted interviewing (13, 14). For this study, we used the CCHS public use microdata files from the 2015, 2016, 2017, and 2018 cycles.

Sample population

Our sample included 88,814 (45%) males and 106,717 (55%) females. Exclusion criteria included being less than 18 years of age and being a resident of one of the three territories, as a variable measuring household income distribution could not be derived for these residents. Proxy respondents were also excluded from this study because they were not asked about self-perceived weight (see Figure 1).

Measurements

Two CCHS instruments were used to derive the AWP variable which captures all possible categories of concordance or discordance between self-perceived weight and actual weight status. First, to measure self-perceived weight, respondents were asked if they considered themselves to be “overweight”, “underweight”, or “just about right”. Second, respondents’ BMI scores were derived from their self-reported assessments of weight and height. In accordance with the body weight classification system recommended by the World Health Organization (15), those with BMI<18.50 were classified as “underweight”, those with $18.50 \leq \text{BMI} \leq 24.99$

were classified as "normal weight", and those with BMI ≥ 25.00 were classified as "overweight/obese". To measure life satisfaction, respondents were asked to rate how they felt about their life as a whole on a scale from 0 ("very dissatisfied") to 10 ("very satisfied"). This single-item life satisfaction scale has been validated to accurately reflect respondents' level of subjective well-being (16).

Potential confounders selected for our study included age, cultural/racial background, income, and marital status. These variables were chosen as they have been previously associated with AWP and life satisfaction (2, 3). Age was grouped into 5-year intervals and treated as a continuous variable. Responses to survey questions about respondents' cultural/racial background were grouped into two categories: white and non-white, the latter of which included Aboriginal respondents. The CCHS asked respondents to report the best estimate of their total household income from all sources, before taxes and deductions. Statistics Canada then computed income deciles by adjusting total household income to the low-income cut-off based on household and community size. Finally, marital status was captured by a binary variable indicating whether respondents were in a relationship (married or common-law) or not (widowed/divorced/separated or single).

Statistical analysis

Kappa statistics (k) were computed to assess concordance between actual weight status and self-perceived weight for the entire sample, by sex, and by the presence of anxiety and/or mood disorders. Univariate (unadjusted) generalized linear models (GLM) using the Gaussian distribution were computed for the whole sample, as well as separately for males and females. Three multivariate GLMs using Gaussian distribution were computed, separately for males and females: the first model for the whole sample, the second for those with anxiety and/or mood disorders, and the third for those without anxiety and/or mood disorders; age and income decile (both grand-centered and modelled as quadratic), as well as cultural/racial background, and marital status were included as covariates in the multivariate models. Individuals who accurately perceived themselves as having normal weight (i.e., perceived themselves to be "just about right") and had normal weight status served as the reference groups. Respondents with the "don't know", "refusal", or "not stated" response categories for any variables of interest were removed from the analysis. It was decided *a priori* that all AWP categories would be included in the multivariate models, regardless of their statistical significance observed in the univariable

analysis, in order to best capture the difference between those with and without anxiety and/or mood disorders in males and females.

All statistical analyses were conducted using Stata v17.0. To account for the complex sampling methodology of the CCHS, we applied adjusted sampling weights (13). Two-sided tests were conducted at a significance level of 0.05.

Results

Our sample included 88,814 (45%) males and 106,717 (55%) females; 9,123 (10%) of males and 18,639 (17%) of females had anxiety and/or mood disorders. The mean (SD) for life satisfaction was 8.05 (1.72) in females and 7.98 (1.69) in males. The majority of the respondents was overweight based on their BMI score (52% of females and 65% of males) and the majority perceived their weight as "just about right" (53% of females and 57% of males). Additional sample characteristics can be found in Table 1.

Association between accuracy of weight perception and life satisfaction in the total population

In the total female sample, 77% of body weight perceptions were concordant with their weight status (k=0.57). In unadjusted analyses, females who perceived their weight as underweight or overweight had lower life satisfaction than the reference group, except for those who perceived themselves as overweight but were underweight (see Table 2). In adjusted analyses, females who perceived themselves as "just about right" but were overweight had life satisfaction scores 0.07 units higher than females accurately perceiving their weight as "just about right" (95%CI: 0.01, 0.12). All females who perceived themselves as underweight, regardless of their actual weight status, had lower life satisfaction scores compared to the reference group; those who were of normal weight or underweight had a nearly one-unit lower life satisfaction score, whereas those who were overweight had a 0.58-unit lower life satisfaction score. Among females who perceived themselves as overweight, those with normal weight status had a life satisfaction score 0.36 units lower than the reference group (95%CI: -0.43, -0.28), and those who were overweight had a life satisfaction score 0.34 units lower, when compared to the reference group.

In the total male sample, 66% had concordance between their body weight perceptions and their actual weight status (k=0.39). In unadjusted analyses, males who perceived themselves as "just about right" but were overweight had higher life satisfaction than those who accurately

perceived their weight as "just about right". All males, regardless of their actual weight status, who perceived themselves as underweight had lower life satisfaction scores than the reference group (see Table 2). All males who perceived themselves as overweight also had lower life satisfaction scores than the reference group, except those who were underweight. In multivariable analysis, males who perceived themselves as "just about right" but who were overweight had a life satisfaction score 0.11 units higher than those accurately perceiving their weight as "just about right" (95%CI: 0.06, 0.15). Those who perceived themselves as underweight had lower life satisfaction scores than the reference group across all actual weight status categories, particularly for those who were overweight (β: -0.72; 95%CI: -1.40, -0.03). Finally, males who perceived themselves as overweight and had overweight or normal weight status had lower life satisfaction scores than males accurately perceiving themselves as "just about right", with life satisfaction scores 0.30 and 0.43 units lower, respectively.

Association between accuracy of weight perception and life satisfaction with presence of anxiety and/or mood disorders

Females with and without anxiety and/or mood disorders had similar concordance between weight perception and actual weight status (k=0.60 and k= 0.56, respectively). Those who perceived themselves as underweight when they were normal weight or underweight had lower life satisfaction scores than the reference group (see Table 3). This association was more pronounced in females with anxiety and/or mood disorders compared to females without anxiety and/or mood disorders. Females with anxiety and/or mood disorders who perceived themselves as underweight with normal weight status had a life satisfaction score 1.28 units lower than the reference group (95%CI: -1.85, -0.72); in females without anxiety and/or mood disorders from this AWP category, the corresponding life satisfaction score was only 0.66 units lower than the reference group (95%CI: -0.84, -0.47). Females with anxiety and/or mood disorders who accurately perceived themselves as underweight had a 0.91-unit lower life satisfaction score than the reference group (95%CI: -1.36, -0.46), whereas in females without anxiety and/or mood disorders, the associated life satisfaction score was only 0.76 units lower than the reference group (95%CI: -1.01, -0.51). The effect of perceiving oneself as overweight varied by weight status, when comparing females with and without anxiety and/or mood disorders. The life satisfaction score associated with females who accurately perceived themselves as overweight did not differ by the presence of anxiety and/or mood disorders. Perceiving one's weight as

overweight when actually having normal weight status was associated with lower life satisfaction in females with anxiety and/or mood disorders (β: -0.46; 95%CI: -0.64, -0.28) than in females without these disorders (β: -0.28; 95%CI: -0.35, -0.20).

In males, concordance of weight perceptions and actual weight status were similar in males with anxiety and/or mood disorders and males without these disorders (k=0.42 vs 0.38, respectively). As presented in Table 4, males with anxiety and/or mood disorders who perceived themselves as "just about right" when they were underweight had a 0.83-unit higher life satisfaction score than the reference group (95%CI: 0.19, 1.47), whereas in males without anxiety and/or mood disorders in this AWP category, life satisfaction score was not significantly different from the reference group. Lower life satisfaction scores for males who perceived themselves to be underweight when they were of normal weight were found in those with anxiety and/or mood disorders (β: -0.75; 95%CI: -1.08, -0.42) than in those without these disorders (β: -0.42; 95%CI: -0.53, -0.30). Similarly, lower life satisfaction scores were found in those who accurately perceived themselves as underweight and had anxiety and/or mood disorders (β: -1.49; 95%CI: -2.18, -0.79), compared to those without (β: -0.34; 95%CI: -0.65, -0.02). In males with anxiety and/or mood disorders who perceived themselves as overweight but had normal weight status, life satisfaction score was 0.95 units lower than in the reference group (95%CI: -1.55, -0.34), whereas it was only 0.35 units lower in males without anxiety and/or mood disorders (95%CI: -0.50, -0.20). Among males who accurately perceived themselves as overweight, those with anxiety and/or mood disorders had a 0.41-unit lower life satisfaction score than the reference group (95%CI: -0.58, -0.24), compared with a 0.25-unit lower score in males without anxiety and/or mood disorders (95%CI: -0.30, -0.21).

Missing data

For males, 91% had complete data for all variables. Approximately 6% of males eligible for our study were missing only the cultural/racial background variable; this was the most common missing data pattern. Males missing this information tended to be in lower income deciles and were more likely to be married. More males with missing data were also of overweight status. For females, 87% had complete data for all considered variables. The most common missing data patterns were missing either the cultural/racial background variable (6%) or AWP (5%). Females missing only information on cultural/racial background tended to have lower age, lower income, and were more likely to be married; they were also more likely to be

overweight and more likely to perceive themselves as overweight. Among females missing only information on AWP, their age tended to be lower, and a higher proportion were married.

Discussion

Main findings of this study

The objective of the current study was to explore the association between AWP and life satisfaction among Canadian adults with and without anxiety and/or mood disorders. We found that females in the general population who perceived their weight as overweight or underweight had lower life satisfaction, regardless of their actual weight status. The same relationship was found in males who were underweight but perceived themselves as overweight; however, the sample size of this group was too small to detect a statistically significant difference. Conversely, in both males and females, misperceiving yourself as "just about right" had either no association or a positive association with life satisfaction. In individuals with anxiety and/or mood disorders, compared to those without, there were more pronounced negative associations with life satisfaction in females and males who perceived themselves as underweight (when they were normal or underweight), in females and males who perceived themselves as overweight (when they were normal weight), and in males who accurately perceived themselves as overweight. The only increase in life satisfaction was found among males with anxiety and/or mood disorders who perceived themselves as "just about right" when they were actually underweight and among females without anxiety and/or mood disorders who perceived themselves as "just about right" when they were actually overweight.

What is already known on this topic

Previously, Herman and colleagues investigated the relationship of concordance and discordance between actual weight status and perceived weight with self-rated health and life satisfaction in Canadian adults (11). Results of their study showed that misperception of weight status, as well as accurately perceiving oneself as underweight and overweight were associated with higher odds of having suboptimal life satisfaction. Though the study utilized older data from the 2005 cycle of the CCHS, their results generally mirrored our results which are based on much larger and more recent data. Consistent with Herman et al. (11), we also found that weight perception, rather than actual weight status, had a greater impact on life satisfaction. McCreary and Sadava found that weight perception had a similar association with life satisfaction in a

study conducted among Canadian adults aged 18 to 39 (17). The authors noted that a normal weight perception was associated with greater life satisfaction, while an overweight perception was associated with lower life satisfaction. An Australian study looking at the relationship between weight misperception and quality of life (QoL) found that overestimating weight status was associated with higher QoL in those who were underweight but lower QoL in those who were normal weight or overweight (18). This finding was similar to the associations we found in our general population. Comparable to our sample of individuals who were overweight but perceived themselves as "just about right", Heard et al. (18) found that underestimating BMI was associated with higher overall QoL among those who were overweight or obese. Park et al. examined weight perception as a moderator in the relationship between BMI and health-related QoL in a sample of Korean adults (19). They found that both the underestimation and overestimation of weight status were associated with lower QoL compared with accurate weight perception. This association was particularly pronounced among those with normal and overweight BMI (19). While the results of Park et al. (19) were consistent with the results from our general population, we also found that those who correctly perceived themselves as underweight tended to have lower life satisfaction than the reference group.

What this study adds

Taken together, the extant literature and our findings emphasize the importance of weight perception, in addition to actual weight status, as an important correlate of life satisfaction. Regardless of actual weight status, individuals may experience lower life satisfaction if they perceive themselves as underweight or overweight. From a public health perspective, while there are population-level initiatives aimed at achieving healthier weight and improving health-related behaviours, there is little emphasis on improving body imagery and weight perception (20). Body dissatisfaction has been considered an "overlooked public health concern", and several public health initiatives have been suggested to address this problem (21). Results of our study suggest that hybrid interventions, focusing both on healthy weight and healthy body weight perception, may be most effective at improving life satisfaction in the general population and among adults with anxiety and/or mood disorders.

When healthcare providers are treating patients with intention to improve their life satisfaction, especially adults with anxiety and/or mood disorders, to increase effectiveness, they should also target their weight perception. A meta-analysis of 48 studies identified several

successful interventions aiming at improving body image, with interventions targeting such areas as cognitive restructuring, body language, and guided imagery (22). Physical activity may also be effective at improving body perception (23). Longitudinal studies, however, are needed to determine whether such interventions result in improved life satisfaction.

Finally, the stronger association between AWP and life satisfaction seen in individuals with anxiety and/or mood disorders suggests that there may be some psychological processes unique to this subpopulation that accentuate this association. For instance, the potential mediating effects of physical self-esteem, self-efficacy, self-criticism, self-stigma should be further explored as these factors may explain the nature of this association (24-26).

Limitations of this study

There were some limitations to our study. First, small sample sizes for certain groups after stratification by sex and presence of anxiety and/or mood disorders may have reduced the power to detect significant associations. Second, self-reporting of measures such as height and weight render our BMI variable vulnerable to recall or misclassification bias (27, 28). Furthermore, BMI does not always accurately reflect actual weight status and body composition, as those with high proportion of muscle mass may be inaccurately categorized as overweight or obese (29). Third, there was a lack of available granular data in the CCHS surrounding self-perceived weight as respondents were only asked to assess their weight but were not asked directly whether that perception was linked with any negative connotations, a construct known as internalized weight bias (30). Thus, our ability to explore psychological mediating pathways was limited. Lastly, the cross-sectional nature of this study did not allow for temporality to be accounted for. It is unclear whether weight misperceptions resulted in lower life satisfaction or if weight misperception was a consequence of lower life satisfaction.

Conclusions

The results of this study indicate that perceived weight is associated with life satisfaction, regardless of actual weight status. For males and females who perceived themselves as overweight or underweight, life satisfaction scores were lower compared with those who accurately perceived themselves to have normal weight. Furthermore, these associations were generally more pronounced in those with anxiety and/or mood disorders. Future studies should explore potential psychological processes that may mediate the relationship between AWP and

life satisfaction such as self-esteem and self-efficacy. Interventions aiming to improve life satisfaction in both the general adult population and those with anxiety and/or mood disorders should aim to target weight perception as well as health-related behaviours.

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