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ORIGINAL ARTICLE

Characteristics of individuals who report present and past weight loss behaviours: results from a Canadian university community

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Abstract

Purpose To characterise individuals who reported present and past weight loss behaviours on psycho-behavioural factors known to influence body weight, e.g. overeating, dietary restriction.

Methods An online questionnaire was distributed to a university community. Questions pertaining to present weight loss, previous weight loss, eating behaviour tendencies, perceived stress and sleep quality were answered by 3,069 individuals. Body weight and height were self-reported.

Results Present and past weight loss behaviours were prevalent in the sample, with 33.3 % of the participants who reported trying to lose weight, 33.1 % who reported having previously lost weight (>10 lbs), and 18.8 % who reported repeated weight loss behaviour (i.e. present and past weight loss behaviours). Trying to lose weight and

previous weight loss were both independently associated with increased risk for psycho-behavioural characteristics known to be associated with obesity, e.g. overeating tendencies, perceived stress, short sleep duration. This risk was particularly elevated among the underweight/normal-weight individuals who reported repeated weight loss behaviours. Indeed, adjusted odds ratios for reporting restrictive and overeating tendencies, perceived stress and short sleep for these individuals were significantly higher compared to their underweight/normal-weight peers who did not report repeated weight loss behaviours (adjusted odds ratios 4.7, 2.7, 1.8, and 1.8, respectively, $p < 0.01$ to < 0.0001).

Conclusions Normal-weight individuals reporting weight loss behaviours are characterised by a psycho-behaviour profile which may further increase their risk of weight gain.

Keywords Weight loss behaviours · Weight control · Restraint · Overeating · Stress · Sleep

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Introduction

Concurrent with the high prevalence of obesity is the high percentage of individuals trying to lose weight [1], encouraged by the parallel influences of the societal emphasis on weight control for health [2] and the cultural ideal of thinness/muscularity propagated through the mass media [3, 4]. Although moderate weight loss has shown to improve health in overweight/obese individuals [5], weight loss may also be accompanied by some negative effects. Accordingly, it can contribute to the development of unfavourable eating behaviour traits, such as higher rigid control over eating [6], an increase in hunger sensations [7], depressive symptoms [6], psychological and biological

stress [8], and preoccupations about food and eating and may even trigger repeated cycles of weight loss and regain [9–12]. Most concerning is that restriction and dieting have been associated with weight gain [13–15]. Therefore, for some, weight loss efforts may be counter-productive, and may even present a health risk.

Weight control behaviours are not limited to overweight and obese individuals. Indeed, a large percentage of healthy weight individuals report trying to lose weight [16–18]. These individuals, which are often young women, are of particular interest because voluntary actions to lose weight are no longer considered healthy [9, 19]. In line with this, Johnson and colleagues [20] recently reported that the association between chronic dieting (dietary restraint) and body weight is often moderated by weight status. This association is usually positive among normal-weight women whereas it is negative in overweight and obese populations [20]. Taken together, these results emphasise the importance of examining weight control behaviours in the context of body weight status and gender.

Currently, there are few observational data on Canadian populations regarding weight control. We have recently observed a high prevalence of dieting in a Canadian university community [21], which has prompted further examination of this topic. Considering the literature stated above, it would be expected that weight loss behaviours are prevalent in normal-weight individuals and associated with increased risk of behaviours related to obesity, e.g. restriction, stress. The aim of this study was to report on the prevalence of non-specific weight loss behaviours among men and women from a large Canadian university sample and to characterise individuals who reported present, past and repeated weight loss behaviours according to psycho-behavioural factors known to influence body weight.

Methods

Participant recruitment

An online survey was emailed to the Laval University community in Québec city in November, 2008. The email stated the purpose of the survey: to acquire knowledge on the lifestyle behaviours (eating/nutrition, physical activity and general health behaviours) of the university community. Prospective respondents were informed that if they participated, they would then be entered to win one of 3 scholarships of \$150 (students) or one of 10 gift-cards valued at 50\$. The questionnaire was completed by 3,260 individuals, of which 3,143 gave written consent to participate in the study. The estimated participation rate was 7.3 % with an estimated measurement error of ± 3.3 % and a 95 % confidence interval. Individuals who responded

(yes or no) to the question: “Are you currently trying to lose weight?” were analysed ($n = 3,069$). The study was approved by the ethics committee of Laval University.

Questionnaire

The questionnaire was adapted from two questionnaires used in Canadian surveys: the Canadian Collective Health Survey Cycle 2.2 and the 1998 Québec Health and Social Survey [22, 23]. The numbers of question were limited to favour survey participation rate. Questions covered personal characteristics such as sex, socioeconomic status (annual income), member status (student vs. staff). Participants were asked to report their height and weight, and BMI was calculated from these data (kg/m^2) and categorised into two weight groups: $\text{BMI} < 25 \text{ kg/m}^2$ and $\text{BMI} \geq 25 \text{ kg/m}^2$. For the purpose of this study, the former is termed underweight/normal-weight and the later overweight/obese. Individuals who answered “yes” to the following questions: “Are you currently trying to lose weight?” or “Have you ever deliberately lost weight (>10 lbs)?” were identified as currently trying to lose weight (TLW) or as having previously lost weight (PWL), respectively. This could include any type of behaviours that aimed to reduce body weight, e.g. dieting, exercise, supplements. However, specific types of weight loss behaviours were not assessed in the current study. Individuals who indicated a positive response to both questions were classified as reporting repeated weight loss behaviours (RWL).

The survey also included questions pertaining to eating behaviours, stress, and sleep. Restrictive and overeating tendencies were determined by positive responses to the following questions: “Do you voluntarily stop eating before you have emptied your plate to restrain your caloric intake?” and “Do you have trouble to stop eating before you have emptied your plate, even if you are no longer hungry?”, respectively. These questions were taken from the Three-Factor Eating Questionnaire [24]. Perceived stress was identified by the following question: “In general, are you a stressed person?” and sleep duration was identified by the following question: “How many hours of sleep do you usually get per night?” For restraint, overeating and stress, individuals who responded often/always were compared with individuals who reported never/rarely. An individual was categorised as a short sleeper if he or she reported < 7 h of sleep per night, which was based on research showing an increased risk for obesity associated with this cut-off [25].

Statistical analysis

Data were analysed using JMP (version 8.0.1, SAS Institute, Cary, NC). Statistical significance was set at a

p value of ≤ 0.05 . The Shapiro–Wilk test was used to verify normality for all continuous variables. Descriptive statistics (mean \pm SD) were calculated; independent *t* tests, Fisher’s exact test and adjusted odds ratios from logistic regression analyses were used to test for significant differences in reported behaviours between groups. Odds ratios were adjusted for sex, age, and body weight status. In addition, to isolate the effects associated with TWL and PWL, the odds ratios were adjusted for each other. Student/staff status was not included in the models because it was highly correlated with age.

Results

Prevalence and characteristics of individuals who reported weight loss behaviours

Participant characteristics and the prevalence of TWL, PWL and RWL are found in Table 1. A large percent of individuals who reported TLW also reported PWL (56.6 %). A greater percent of women than men reported TWL, PWL, and RWL behaviours, despite having a lower mean BMI (Table 1). A greater percent of overweight/obese than underweight/normal-weight individuals reported TLW (60.3 vs. 24.0 %), PWL (55.6 vs. 25.4 %) and RWL (39.1 vs. 11.8 %). Staff were significantly older (42.7 ± 10.8 , 24.0 ± 5.3 , $p < 0.0001$) and heavier (24.5 ± 4.4 , 22.9 ± 3.8 , $p < 0.0001$) and reported a greater percent of TWL (36 vs. 33 %, $p < 0.05$), PWL (43 vs. 30 %, $p < 0.0001$) and RWL behaviours (25 vs. 17 %, $p < 0.0001$) than students. The overweight/obese women were the subgroup with the

Table 1 Participant characteristics ($n = 3,069$)

	Total ($n = 3069$)	Women ($n = 2296$)	Men ($n = 773$)
Female (%)	74.8	100	0
Age (years)	27.9 (10.2)	27.5 (9.9)	28.9 (10.8)
BMI, kg/m ²	23.2 (4.0)	22.9 (4.0)	24.1 (3.8)
Student (%)	79	81	75
Overweight/obese (%)	25.6	22.7	34.2
Trying to lose weight (%)	33.3	37.3 ^a	21.3
Previous weight loss (>10 lbs) (%)	33.1	35.2 ^a	26.9
Repeated weight loss behaviours ^b (%)	18.8	20.6 ^a	13.3

Mean (SD)

^a Significantly different from men, $p < 0.0001$

^b Individuals who reported both trying to lose weight and previous weight loss

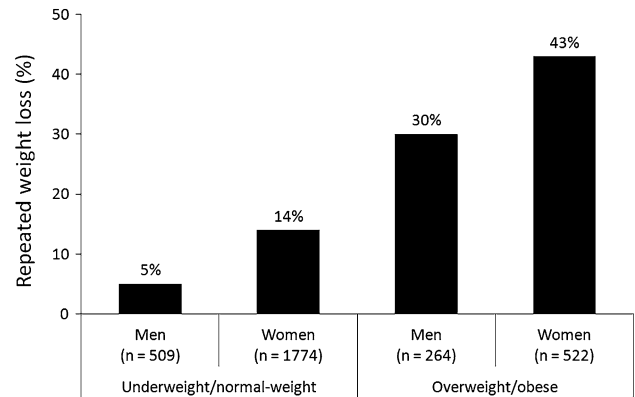


Fig. 1 Percent (%) of individuals who reported repeated weight loss behaviours (reported both currently trying to lose weight and previous weight loss > 10 lbs), stratified by sex and weight status ($n = 3,069$). Sex ($\chi^2 = 50.3$) and weight status ($\chi^2 = 253.9$) were significant independent predictors of prevalence (%) of repeated weight loss behaviours, $p < 0.0001$, after adjusting for age

greatest prevalence of individuals who reported RWL (43 %, $p < 0.0001$, Fig. 1). Mean reported BMI was greater for individuals with RWL behaviours compared to all other individuals in both underweight/normal-weight (22.9 vs. 21.6 kg/m², $p < 0.0001$) and overweight/obese groups (29.5 vs. 27.8 kg/m², $p < 0.0001$), adjusted for sex and age. Moreover, mean BMI of women who reported RWL behaviours was significantly lower than the mean BMI of men who reported RWL behaviours (adjusted for age, 25.8 vs. 27.8 kg/m², $p = 0.0007$).

Psycho-behavioural profiles of individuals who reported weight loss behaviours

Individuals who reported TLW had increased odds of reporting restrained and overeating tendencies and perceived stress, compared to individuals who did not report TWL. Individuals who reported PWL had increased odds of reporting restrained and overeating tendencies, particularly the former, and of being a short sleeper, compared to individuals who did not report PWL. Individuals who reported RWL behaviours had an additive increased risk of reporting all psycho-behavioural measures compared to all other individuals (only TLW, only PWL or no weight loss behaviours) (Table 2).

Current weight status moderated most relationships between psycho-behavioural measures and RWL behaviours, except for overeating tendencies (Fig. 2); the adjusted odds of reporting restrictive eating tendencies, perceived stress and short sleep were significantly elevated only among under-weight/normal-weight individuals who reported RWL behaviours. These results persisted even after the exclusion of the underweight respondents from the analyses.

Table 2 Adjusted odds ratios (OR, 95 % confidence intervals) for reporting psycho-behavioural characteristics associated with weight loss behaviours

	<i>n</i>	Adjusted OR (95 % CI)			
		Restrictive tendencies	Overeating tendencies	Perceived stress	Short sleeper [†]
Not trying to lose weight	2,047	Ref	Ref	Ref	Ref
Trying to lose weight	1,022	1.45 (1.0–2.0) ^a	2.27 (1.8–2.8) ^d	1.57 (1.2–2.0) ^c	1.16 (0.92–1.5)
No previous weight loss	2,053	Ref	Ref	Ref	Ref
Previous weight loss (>10 lbs)	1,016	2.33 (1.7–3.2) ^d	1.44 (1.2–1.8) ^c	1.02 (0.80–1.3)	1.30 (1.0–1.6) ^a
No repeated weight loss behaviours	2,492	Ref	Ref	Ref	Ref
Repeated weight loss behaviours [‡]	577	2.83 (2.0–4.0) ^d	2.48 (1.9–3.2) ^d	1.36 (1.02–1.8) ^a	1.39 (1.1–1.8) ^a

Adjusted for age, sex, weight status (< or ≥25 kg/m²), and trying to lose weight is adjusted for previous weight loss and vice versa

OR odds ratios, CI confidence intervals, ref reference

^a $p < 0.05$; ^b $p < 0.01$; ^c $p < 0.001$; ^d $p \leq 0.0001$

[†] Short sleeper <7 h per night

[‡] Individuals who reported both trying to lose weight and previous weight loss

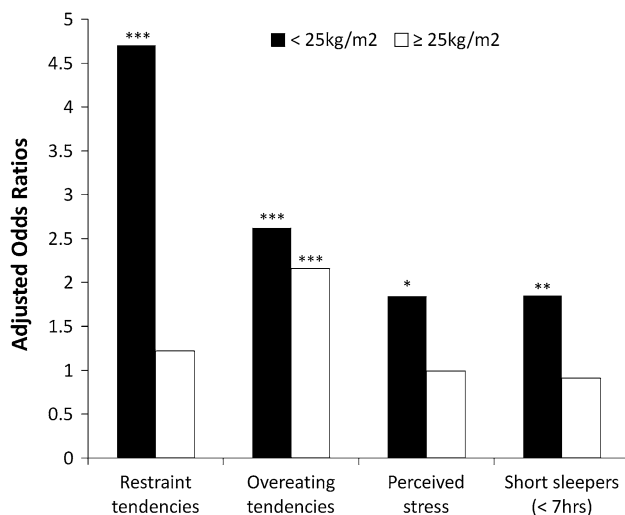


Fig. 2 Sex- and age-adjusted odds ratio of reporting psycho-behavioural factors among individuals who reported repeated weight loss behaviours (reported both currently trying to lose weight and previous weight loss >10 lbs) for underweight/normal-weight (black bars) and overweight/obese (white bars) individuals. Significantly different from reference group (no repeated weight loss behaviours from the same weight group) at * $p < 0.01$, ** $p < 0.001$, and *** $p < 0.0001$

Discussion

The aim of this study was to report on the prevalence of weight loss behaviours and to characterise it according to weight-related psycho-behavioural factors in a large Canadian university sample. Weight loss behaviours were prevalent and highest among overweight women, but were also prevalent in normal weight women. Currently trying to lose weight and previous weight loss were associated with restrained and overeating tendencies, perceived stress and short sleep. Reporting repeated weight loss behaviours was

associated with an additive increase risk for reporting psycho-behavioural factors, compared to reporting either behaviour alone. Weight status moderated most relationships with repeated weight loss behaviours in that the risk of reporting these psycho-behavioural factors among this weight control group was only elevated among underweight/normal-weight individuals.

The results of this study are in accordance with the literature where weight loss behaviours are prevalent, especially among overweight/obese individuals and women [1, 16, 17, 26, 27]. As seen in other populations [16, 18], weight loss behaviours were also common among individuals with no current weight problem—24 % of normal-weight individuals in the present study reported trying to lose weight. Moreover, the mean BMI of weight-preoccupied women was lower than that of weight-preoccupied men, which is in accordance with other work reporting that normal-weight women believed to have a weight problem at relatively lower body weights than men [28]. The consistent finding that more women than men are trying to lose weight, and at relatively lower body weights, illustrates the increased societal pressure to be thin among women. However, the higher prevalence of weight loss behaviours among women may be because the questions pertaining to weight loss were targeted more to women than men. Moreover, there were no questions that were tailored specifically to the male respondents, e.g. trying to gain weight, muscularity, leanness. Accordingly, some researchers indicate that there is an increased pressure placed on males to conform to unrealistic body ideals in society today [29] and that these ideals take the form of trimness and muscularity, rather than the thinness ideal found among women [30].

Paradoxically, this study showed that weight loss behaviours are associated with factors that are not always

conducive to successful weight loss. For example, short sleep has been identified as an obstacle to weight loss [31, 32]. Furthermore, disinhibition, a behaviour trait associated with a general tendency to overeat, has been shown to be an obstacle to weight loss and weight loss maintenance [33–35]. And, despite some evidence showing dietary restraint to be associated with successful weight loss and weight loss maintenance [34–37], other evidence has associated it with weight gain in women [15, 38]. More importantly, the two behaviour traits in concert have been shown to be a problematic eating style associated with dieting in adults [39]; dieting and higher body weight in adolescents [40, 41], higher scores on eating disorder scales [39], higher energy intake during a negative affect condition [42] and during a pre-load manipulation [43]. However, the literature is inconsistent in this regard as evidence has also shown that dietary restraint may attenuate the negative effects of disinhibition on body weight [14, 39, 44, 45]. Although the nature of the relationship between disinhibition and restrained eating tendencies, i.e. healthful or unhealthful, is uncertain in the current study, it cannot be forgotten that the increased risk of reporting these eating tendencies was specific to individuals who reported repeated weight loss behaviours but who do not currently have a weight problem. This phenomenon was observed among both the underweight group and also the normal-weight group when analysed separately (data not shown). This latter finding suggests unhealthful underpinnings. This is in line with Johnson et al. [20] who reported that the relationship between dietary restraint and health may depend on the body weight of the individual, in that it may be unhealthful among normal-weight individuals. It could also depend on the type of restraint, i.e. rigid or flexible [46], which was not assessed in the current study.

Reporting repeated weight loss behaviours was also related to a higher prevalence of perceived stress in the current study, and again, was specific to underweight/normal-weight individuals. There are several potential hypotheses that could explain these associations. On the one hand, the mental aspect of dieting and dietary restraint, e.g. preoccupations with food and eating, calorie counting, has been related with increased perceived stress and markers of biological stress (cortisol) [8, 20, 47–49]. In line with this, relatively more individuals with repeated weight loss behaviours also reported restrictive eating tendencies, characterising these individuals as high stress, restrictive eaters. On the other hand, perceived stress, such as stress from a university environment, could also represent an obstacle to weight control through stress-induced and unhealthful eating [50] and, as a result, increase restrictive tendencies toward food intake and promote compensatory weight loss behaviours [51]. Accordingly, restrained individuals may be at higher risk of stress-induced overeating

[52], such as the underweight/normal-weight individuals of the current study. Due to the cross-sectional nature of these data, the directionality of these associations cannot be determined.

Taken together, the literature suggests that individuals who report these psycho-behavioural factors, such as restrictive and overeating tendencies and stress, may represent unsuccessful dieters. Therefore, underweight/normal-weight individuals with a certain level of weight control may be a sub-sample at risk for future weight gain. Along these lines, one study has reported that dieting, past weight loss and weight suppression were related to weight gain in female college students [53], and weight control behaviour during adolescence was related to increased weight gain 5-years later [54].

It is important to underline the main limitations and strengths of this study. The self-reported data, the cross-sectional nature of the analyses and the high percent of female respondents, could create a potential selection bias. In combination with self-reported anthropometric data, which are often underestimated, these limitations could create an over-representation of normal-weight individuals currently trying to lose weight. However, the similarity of these results to other large studies with higher participation rates minimises the impact of this selection bias, and results persisted after controlling for sex. The fact that each behavioural item was measured by one question is an additional limitation. This makes it difficult to elaborate on the connection between stress and restrictive eating tendencies without more information concerning the source of the perceived stress. Moreover, specific types of weight control behaviours were not assessed in this survey and, thus, the extent of weight control among these individuals is unknown. However, restricting the number of questions permitted a broad survey at a low cost. Also, although this study population consists of a large sample of both men and women with a wide age-range and includes students and staff, the main strength of this study, these results may not be representative of the general community.

In conclusion, weight loss behaviours are prevalent in a university community and are associated with increased risk for unhealthy psycho-behavioural factors, namely restricted and overeating eating tendencies, perceived stress and short sleep duration. These findings were marked among underweight/normal-weight individuals who reported repeated weight loss behaviours which indicate they may be at increased risk for future weight gain. There is a need for more education and prevention programs and policy that focus on this issue and that are targeted to this population. Moreover, future research needs to tailor questions relating to weight control to both sexes so as not to systematically under-report important trends among males, a process which could be enforced by specific health policy relating to this

issue. Finally, more efforts are needed to appease the levels of stress in university environments or, at a minimum, ensure adequate nutrition is provided in cafeterias etc. so nutrition choices are easier during times of high stress.

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Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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