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Qualitative analysis of the role of self-weighing as a strategy of weight control for weight-loss maintainers in comparison with a normal, stable weight group

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Abstract

Self-weighing seems to have a primary role in weight-loss maintenance. The use of this strategy may help correct even slight weight regain and contribute to long-term weight stability. However, self-weighing has also been associated with negative psychological health consequences in specific subgroups. This study aimed to explore the use and the behavioral and psychological consequences of self-weighing in a group of weight-loss maintainers (WLoMs). We chose a qualitative design to conduct this investigation. Eighteen WLoMs were interviewed and compared to a matched comparison group of 18 participants with a lifelong normal stable weight (NSW). Analyses showed that most WLoMs needed regular self-weighing to be aware of their weight. The weight displayed on the scale helped WLoMs sustain the continuous efforts needed to maintain weight loss and also at times triggered corrective actions that were sometimes drastic. Weight changes generated both negative and positive affect among WLoMs, who could experience anxiety because of self-weighing or have their self-esteem impaired in the case of weight gain. In comparison, the NSW group rarely used self-weighing. They relied on a conscious way of living to control their weight and needed fewer strategies. NSW participants simply went back to their routine when they felt a slight increase in their weight, without experiencing consequences on their mood or self-esteem. Regular self-weighing as a component of weight-loss maintenance should be encouraged to help WLoMs regulate their food and physical activity, provided that potential consequences on psychological well-being, including self-esteem, are screened and addressed when needed.

Keywords: weight-loss maintenance; self-weighing; psychological well-being; body weight; behavioral strategies

1. Introduction

Weight-loss maintenance is a major issue in the treatment of obesity. Behavioral interventions involving diet and physical activity have been reported to be only moderately effective in slowing weight regain after weight loss (Dombrowski, Knittle, Avenell, Araujo-Soares, & Sniehotta, 2014), and research is needed to design effective interventions (MacLean et al., 2015). A way of improving our knowledge on weight-loss maintenance is to observe successful individuals. In the community, it has been reported that, among previously overweight or obese persons who lost at least 10% of their weight, around 20% succeeded in maintaining the loss for at least one year (de Zwaan et al., 2008; McGuire, Wing, & Hill, 1999). This number might increase if we could transfer the know-how of those who succeeded to those who tend to regain weight.

After long being criticized as being responsible for the increase in disordered eating, self-weighing has attracted the interest of researchers as a weight-control strategy (Pacanowski, Bertz, & Levitsky, 2014). Weight monitoring belongs to the strategies of weight-loss maintenance identified by the National Weight Control Registry (NWCR), which has been enrolling successful weight-loss maintainers for twenty years. This study identified the core weight-loss maintenance strategies as being the consumption of a low-calorie low-fat diet, the maintenance of high levels of physical activity and the consistent self-monitoring of weight (Butryn, Phelan, Hill, & Wing, 2007; Thomas, Bond, Phelan, Hill, & Wing, 2014). A reduction in the use of any of these strategies, including self-weighing, turned out to be predictive of weight regain several years later (Thomas et al., 2014). Using semi-structured interviews, qualitative studies carried out with individuals successful with weight-loss maintenance also underlined the importance of self-weighing, together with a healthy, balanced eating approach including regular meals, increased levels of physical activity and social support (Hindle & Carpenter, 2011). Self-monitoring of weight and behavior was also a theme that distinguished those who maintained weight loss from those who had regained weight, combined with adopting a long-term approach, setting realistic weight goals, having a routine and being organized, avoiding food deprivation and coping with lapses (McKee, Ntoumanis, & Smith, 2013).

Regular self-weighing has been examined in literature reviews and is associated with greater weight loss or prevention of weight regain (Pacanowski et al., 2014; Vanwormer, French, Pereira, & Welsh, 2008; Zheng et al., 2015). A higher weighing frequency was also associated with greater weight loss or less weight gain at 24-month follow-up in two large trials conducted in the community (Linde, Jeffery, French, Pronk, & Boyle, 2005). Interventions based on self-weighing and feedback were successfully evaluated for weight-gain prevention of college students (Bertz, Pacanowski, & Levitsky, 2015; Levitsky, Garay, Nausbaum, Neighbors, & Dellavalle, 2006), leading to the postulate that self-weighing might prevent age-related weight gain.

In spite of these studies, self-weighing use is still in debate because the consequences of frequent self-weighing on psychological health have been questioned (Dionne & Yeudall, 2005). Positive correlations have been found between self-weighing and disordered eating, body dissatisfaction or depressive symptoms, and weight gain among adolescents and young adults (Neumark-Sztainer, van den Berg, Hannan, & Story, 2006; Pacanowski, Loth, Hannan, Linde, & Neumark-Sztainer, 2015; Quick, Larson, Eisenberg, Hannan, & Neumark-Sztainer, 2012). A review of 20 studies that examined psychological effects of self-weighing showed that many of the studies reported a negative relationship between self-weighing and affect (4/10), self-esteem (3/4), body evaluation (4/10) and eating behaviors or cognitions (6/13), particularly for certain subgroups, such as women or young adults (Pacanowski, Linde, & Neumark-Sztainer, 2015). A recent meta-analysis also highlighted that the effect of self-weighing might be adverse for particular individuals, such as younger samples or normal-weight individuals, or in certain situations, such as when self-weighing was not part of an intervention (Benn, Webb, Chang, & Harkin, 2016). The benefits and the potential adverse effects of self-weighing have to be described more thoroughly to help health care professionals give correct and relevant advice.

The importance of self-monitoring to adjust one's behavior is based on the theory of self-regulation (Bandura, 1998). Recording one's behavior and then comparing the actual state with the desired state would prompt self-corrective adjustments to achieve one's goal through a discrepancy-reducing feedback loop (Carver & Scheier, 1982). Self-monitoring is one of the "ingredients" identified in the corpus of techniques used in behavior-change interventions (Abraham & Michie, 2008) that target healthy eating and physical activity,

smoking cessation (Michie, Hyder, Walia, & West, 2011) or control of alcohol consumption (Michie et al., 2012).

Regarding weight management, keeping track of one's weight would enable the adjustment of the behaviors involved in its control, food consumption and physical activity (Boutelle, 2006). The complementarity of other weight-management components was confirmed by studies that searched to determine the unique effect of self-weighing (Madigan, Jolly, Lewis, Aveyard, & Daley, 2014; Mahoney, 1974). They concluded that there was a lack of evidence to recommend self-weighing as an intervention without any other behavioral component.

The first randomized controlled study showing that daily self-weighing was an effective tool for the prevention of weight regain was conducted with participants who had lost at least 10% of their body weight during the prior 2 years (Wing, Tate, Gorin, Raynor, & Fava, 2006). The study, which was aimed specifically at weight-loss maintenance, also provided the participants with feedback and intervention aiming at self-regulation. A softer procedure designed to encourage and facilitate weekly self-weighing as a maintenance intervention after a weight-loss program that proposed recording weight on a card, together with two telephone calls without specific advice on weight management, also showed promising results (Madigan, Aveyard, et al., 2014).

These studies have highlighted the key role of self-weighing in weight-loss maintenance in the presence of additional tools, such as weight record-keeping, reinforcement, feedback or counseling, but they have provided no information about how weight-loss maintainers converted self-weighing into a successful strategy. A better understanding of the processes that underpin the successful effect of self-weighing on weight in observational studies could help optimize its use in interventions. The goal of the present study was to explore the use and the consequences of self-weighing in weight-loss maintenance. In order to identify the specificities related to weight-loss maintenance, we compared two groups, one composed of participants successful at maintaining weight loss and one composed of participants who had always had a normal, stable weight. We wanted to address three questions:

- Was self-weighing used as a weight maintenance strategy?
- What were the behavioral consequences of self-weighing?
- What were the psychological consequences of self-weighing?

In order to collect data on processes, we conducted face-to-face interviews of weight-loss maintainers (WLoMs) and of individuals with a lifelong normal stable weight (NSW), and we proceeded to descriptive qualitative analyses. We referred to the consolidated criteria for reporting qualitative research (COREQ) to report our study (Tong, Sainsbury, & Craig, 2007).

2. Material and methods

2.1 Population

We recruited two groups of 18 participants in the community, from June 2013 to January 2014, through snowball sampling. The sample size of 18 participants per group was defined a priori for the exploratory study. The first WLoM participants were recruited through the professional and personal networks of the investigators. After each interview, participants were asked whether they could think of someone in their environment who could be a comparison participant and whether they knew other people who had also lost and maintained weight loss. Both samples were recruited this way.

The inclusion criteria used for the WLoM group were those of the NWCR (Wing & Hill, 2001), with intentional weight loss of at least 10% and maintenance for at least one year. Participants were required to have been overweight (BMI≥25) for a minimum of one year before the loss, excluding pregnancy. Women who had given birth and who had breast fed should have stopped for at least one year. Exclusion criteria were bariatric surgery or severe somatic or psychiatric conditions. Self-weighing was not an inclusion criterion.

The inclusion criterion to be involved in the NSW comparison group was to have had a normal weight (18.5 ≤BMI≤24.9) during adulthood, which was stable within a range of 5 kilos. Exclusion criteria were severe somatic or psychiatric conditions.

Groups were paired on gender, age and socio-economic status. The data used in this study were part of an exploratory study on weight-loss maintenance. Results on dietary intake will be published elsewhere (in preparation).

2.2 Procedure

After first contact by phone to check the main inclusion and exclusion criteria, an appointment was arranged with an interviewer. During this appointment, participants

received complete information on the study and signed an informed consent prior to proceeding with the interview. It was explained to participants of both groups that we were interested in individuals successful at weight-loss maintenance so that those who regain weight could be better supported. The inclusion of a normal stable group was explained by saying that we wanted to understand which processes were specific to weight-loss maintenance in comparison with normal weight control. The weight loss of WLoMs was attested by pictures before and after the loss, as done in the NWCR (Klem, Wing, McGuire, Seagle, & Hill, 1997). Interviews were audio-recorded, and no field notes were taken. Participants were seen once for one to two hours. The meeting took place either at the participant's home or at our office; we made sure that the place was quiet. Only the interviewer and the participant were present during the interview. At the end of the interview, the participants received paper questionnaires that they had to mail back with a pre-stamped envelope. In the present paper, only data from the socio-demographic questionnaire were used. The participants received by mail a general report on the study results at the end of the trial, together with a gift voucher of 20 Swiss francs. We did not ask them to correct the transcripts. The protocol was approved by the Cantonal Ethics Committee on Research (Geneva, Switzerland).

2.3 Measures

Interviews: Semi-structured interviews were conducted by one of three female interviewers, two dietitians and one psychologist (including the two authors IC and MK). One of the dietitians and the psychologist (the authors) were experienced, with a Master's in Public Health for the dietitian, a PhD in Psychology for the psychologist and more than 10 years of clinical and research experience in the field of obesity and disordered eating for both of them. The second dietitian had more recently graduated, had experience in treating patients who were overweight or obese, and worked under the authors' supervision. A grid with the main questions helped the interviewers address all the topics to cover. This grid was slightly adjusted after the first interviews, in accordance with unplanned items that had emerged. The data collected concerned weight history, including weight loss and weight regain episodes if any, reasons for weight gain or weight stability. The data on participants' current weight, weight loss and weight-loss maintenance duration were retrieved from this part of the interviews. WLoMs were questioned on the methods used the last time they lost weight.

All participants were asked about strategies, rules or habits that, according to them, had ensured weight management either after weight loss (for WLoMs) or during their whole life (for the NSW group). In addition to open questions on strategies, specific questions were focused on self-weighing frequency ("How frequently do you weigh yourself?", "Why?" "And before losing weight how frequently did you weigh yourself?" and "At what frequency will you continue?") and perceived consequences ("What happens when the weight displayed on the scale increases/decreases?").

Self-weighing frequency: Participants' answers were classified according to the following categories used in previous studies (LaRose et al., 2014; Wing et al., 2006): 0: never weigh myself; 1: less than once/month; 2: less than once/week; 3: one time/week; 4: several times/week; 5: one time/day; 6: several times/day.

Socio-demographic questionnaire: Data on participants' age, gender, origin, marital status, education level, profession and income level were collected with this questionnaire.

2.4 Analysis

The interviews of the 36 participants were anonymized and integrally transcribed verbatim. In order to describe the processes as reported by the participants with the least interpretation, we based our analysis on qualitative description as characterized by Sandelowski, which entails "low-inference" interpretation (Sandelowski, 2000). Sandelowski explained that qualitative description does not require a conceptual interpretation of data. The output of the analysis should be "a comprehensive summary of an event in the everyday terms of those events […], an accurate accounting of events that most people (including researchers and participants) observing the same event would agree is accurate" (p. 336).

The quantitative analyses were conducted with SPSS (version 22). They included descriptive analyses of participants' characteristics and differences between groups. Comparisons between groups were calculated with chi-square for nominal variables and t-tests for quantitative variables. Calculations involving self-weighing frequency were cross-checked with non-parametric analyses that gave similar results.

The interviews were coded by IC and MK with MaxQDA (version 11). To ensure standardization of the codes, two interviews were first coded by both of them together.

Then, the two authors coded half of the interviews separately according to a list of codes. Several a priori codes were defined similarly for both groups. They were descriptive, mainly determined from the strategies for weight management mentioned in the literature (e.g. planning, weight self-monitoring). The list was then enriched with codes that emerged during the process of coding and that were more specifically related to the three research questions on the use of self-weighing and self-weighing's behavioral and psychological consequences. A logbook described the list of codes and what they included or not, together with rules of coding. Each modification was discussed and when a new code was introduced, all interviews were re-examined. Each coder reviewed the interviews coded by the other; several iterations were needed. No new codes emerged in the last interviews, indicating that we had reached data saturation.

3. Results

3.1 Sample characteristics

The WLoM group's mean age was 39.3 ± 8.2 years old, and that of the NSW group was 39.4 ± 10.1. Each group comprised 11 women (61.1%) and 7 men (38.9%). The WLoM group's mean BMI was significantly higher than the NSW group's BMI (25.8 ± 3.0 vs 21.3 ± 2.1, $t_{(34)}$=-5.2, p<.001).

Most participants came from Switzerland (n = 26, 72.2%), with no difference in nationality between WLoMs and NSW participants (χ^2 = 0.6, p=0.711). No differences emerged regarding marital status of the two groups ($\chi^2_{(3)}$ = 5.9, p=0.117) or education level ($\chi^2_{(5)}$ = 3.3, p=0.647). The majority of participants were professionally active (n=17 WLoMs (94.4%), and n=16 NSW participants (88.9%)) and income categories were similar between the two groups ($\chi^2_{(7)}$ = 5.7, p=0.580).

WLoMs had lost a mean of 25.2 ± 11.1 kg and had maintained the loss for a mean of 3.9 ± 3.6 years. To lose weight, most WLoMs had resorted to popular weight-loss programs that they had applied by themselves or customized. These weight-loss programs favored proteins, a balanced diet or were a home-made mix. A few participants used the help of a dietitian or a health care professional who gave various prescriptions regarding self-weighing during the weight-loss phase, from "weigh yourself each day" to "once a month when we

meet." Two WLoMs were seeing a health care professional for their weight maintenance but had received no prescription regarding self-weighing for weight-loss maintenance.

3.2 Frequency of self-weighing

WLoMs' mean frequency of self-weighing was 3.3 ± 1.5 on the scale that ranged from 0 "never" to 6 "several times a day". This result represents a frequency of self-weighing between once a week and several times a week. NSW group's median frequency was 1.2 ± 1.4, which represents self-weighing less than once a month. No participants reported self-weighing several times per day. Proportions of each group's participants by frequency of self-weighing are displayed in Figure 1.

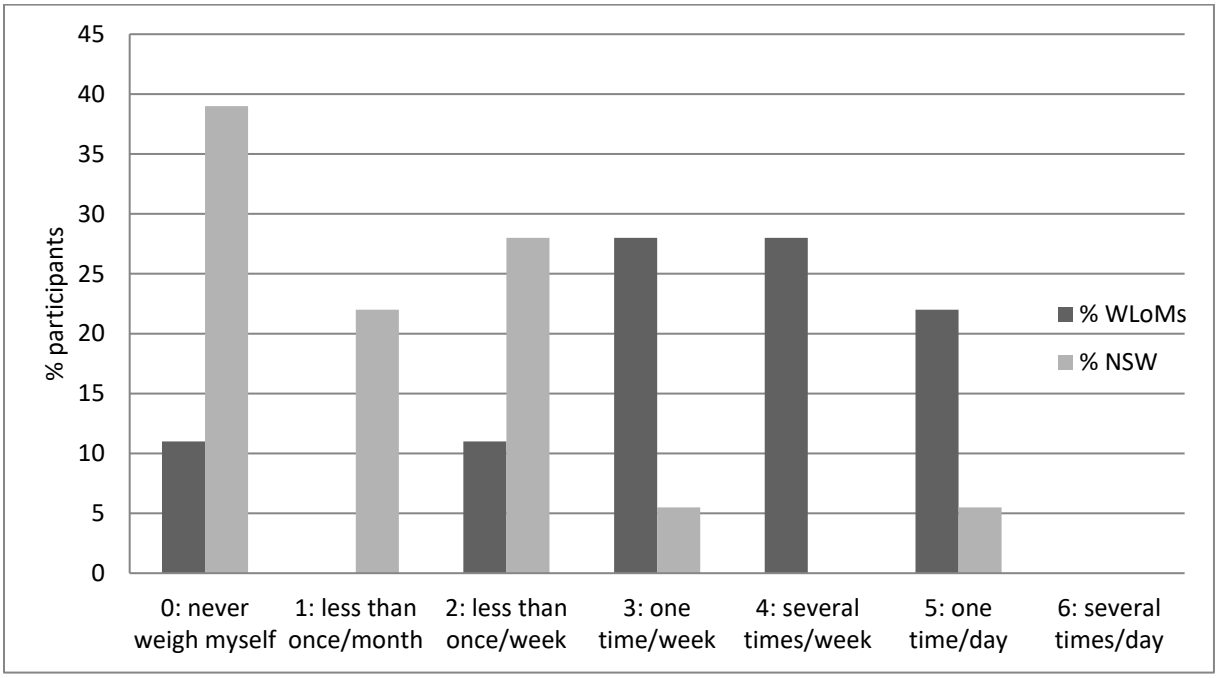

Fig.1 Percentages of WLoMs and NSW participants in each category of self-weighing frequency (WLoMs: Weight-loss maintainers group; NSW: Normal, stable weight comparison group).

The difference of self-weighing frequency between the groups was statistically significant ($t_{(34)}$=-4.3, p<.001), meaning that the WLoMs used self-weighing more frequently than NSW participants.

3.3 Qualitative description

Data description is structured according to the three questions explored in this study.

- Was self-weighing used as a weight maintenance strategy?
- What were the behavioral consequences of self-weighing?
- What were the psychological consequences of self-weighing?

Regarding **the use of self-weighing as a weight maintenance strategy**, self-weighing was not spontaneously mentioned as a strategy, but when we came on the topic during the interview, "stepping on the scale" was considered as a safety measure by the group of WLoMs. Two WLoMs mentioned that they were relying on their clothes and one of them on his performance when biking. Whereas most WLoMs said self-weighing was helping them to monitor their weight, most NSW participants said they never used a scale or very rarely did so.

When WLoMs were asked if they used to weigh themselves before weight loss, most of them answered negatively, ("definitely not"), meaning that at that time they did not want to know how much they weighed. They got into the habit of self-weighing during weight loss. Without the scale as a reference, they had no idea of their weight: "*I can gain four to five kilos. I won't know it. I only see it on the scale*" (WLoM, Woman, 47).

WLoMs continued self-weighing during weight maintenance and said that they would go on that way. The result of self-weighing was considered to be either encouraging, when their weight was stable or decreasing, or providing a warning sign, when their weight was increasing. The scale informed them of whether they had properly managed their week/day or not, which was the trigger for action when weight was increasing: "*When I see the scale, either it's encouraging, or I think 'Ouch, I have to pull myself together'*"(WLoM, Woman, 29).

Self-weighing was seen as routine on the part of the WLoMs: "*I weigh myself every other morning; it has really become a habit now*" (WLoM, Man, 52). But for others, self-weighing was painful, and they would have liked to avoid it. Some had tried to, but observed that they had gained weight. One woman noticed that continuous self-weighing during weight-loss maintenance was the difference between this successful weight loss and the previous ones, after which she had regained weight.

Apart from triggering action when their weight had increased, self-weighing also appeared to have a role in itself among WLoMs, contributing to awareness and vigilance, like a

safeguard: "*It helps me to weigh myself once a week. I like to keep track of where I am. It stays here a little [showing her head]. It's a kind of control, for sure*" (WLoM, Woman, 42).

On the contrary, NSW participants could "feel" their weight—some of them even with accuracy close to 500 grams—whereas not one WLoM mentioned such an internal benchmark. NSW participants relied on clothes or on their reflection in the mirror as a reference: "*I don't need to weigh myself to know how much I weigh. I weigh myself once in a while. I know how much I weigh within 500g even if [my weight] has changed*" (NSW participant, Woman, 45).

Then, regarding **the behavioral consequences of self-weighing** or of feeling one's weight, we identified patterns of behaviors intended to manage weight that resulted from weight awareness and classified them into three categories. The first category assembled strategies used when participants were accepting the weight they either felt or saw on the scale and was called "Conscious living." In the second and third categories were collected strategies used when participants wanted to modify their weight; they were called "Drastic compensation" and "Keep calm and go back to your routine."

The category called "Conscious living" concerned patterns used when individuals' weight was perceived as stable. Participants of both groups kept at their usual weight-management strategies, which were mostly about planning and organizing mindfully.

All participants, WLoMs and NSW participants, mentioned being careful not to keep stocks of tempting foods at home, giving away the chocolate they received in excess, planning before buying groceries or organizing themselves to prepare meals in advance so as not to be dependent on take-out. Physical activity required some arrangements with work and family for WLoMs and the NSW group. Overall, both groups anticipated and organized themselves to move and eat in a balanced way.

But besides these similarities in "Conscious living" for WLoMs and NSW participants, differences between groups could also be noticed. Most WLoMs were more stringent: "*It is necessary to put constraints in the diet because you cannot expect success without making an effort. You have to be consistent*" (WLoM, Woman, 47). They had developed an arsenal of proactive strategies in relation to the pitfalls of their environment. They suggested

restaurants if their friends wanted to go to places where nothing suited them or asked the waiter to swap the starches for vegetables; they warned their family that they would not eat anything when invited for birthdays or holidays. Overall, WLoMs were constantly watchful regarding their diet and/or their physical activity, even when their weight was stable.

NSW participants reported fewer controlled strategies. Some of them explained that they were able to know in advance how much to eat in order to have enough until the next meal or to be able to put the right quantity on their plate to have "enough but not too much": "*I don't eat big portions. Generally, I help myself so that there are no leftovers on my plate. If I want more, I can take a second plate*" (NSW participant, Woman, 49). WLoMs never mentioned such knowledge. Finishing one's plate was mentioned as a common habit among the NSW group and WLoMs, but the latter were not able to help themselves the adequate quantities and ended up overeating.

The category "Drastic compensation" assembled extreme strategies used to rectify weight increases. They were used by most WLoMs. When weight increased on the scale, they turned to the method they had used for weight loss and re-applied the principles that had worked previously. These rules were often radical, such as one day of consuming exclusively protein, two-three days of low-fat cottage cheese and bouillon, or eating more vegetables and (almost) no carbohydrates. Some said that constant attention was needed and that they knew it would be the case for the rest of their lives. Others even spoke in terms of punishment. Most WLoMs fluctuated between usual strategies and restrictive phases, during which they went on a strict diet: "*I know that during 2-3 days, I will only eat vegetables and proteins, with some fruits*" (WLoM, Woman, 42); "*I try to be vigilant and to react quickly. One and a half kilo [gained], and I don't feel pretty anymore. I go back to my weight-loss program*" (WLoM, Woman, 45).

Finally, the category "Keep calm and go back to your routine" gathered strategies mainly used by NSW participants when they felt they had gained some weight. They knew that at certain times, such as Christmas or holidays, they would gain a little weight and that they would lose it when they went back to their habits. After they ate calorie-rich foods during a certain time, either they would pay more attention to their diet and do more physical activity for a while or they would feel uncomfortable rather rapidly and would not continue

eating that way. NSW participants seemed to counterbalance in a natural way, without having to plan restrictive days or apply specific control strategies. Processes seemed automated compared to WLoMs who had to instill constant attention to manage their behavior: "*If I eat too much greasy, heavy stuff, naturally I rebalance. But even without an effort, it's spontaneous. I feel it was too much and I … it just rebalances"* (NSW participant, Woman, 43); "*It is a sweet balance during the holidays. We eat one main meal, and for the rest we eat sandwiches. It's a kind of balance*" (NSW participant, Man, 35).

When it comes to **psychological consequences of self-weighing**, first, WLoMs judged negatively their "dependency" on self-weighing. Weighing too frequently left them worried that it would become overwhelming and "drive them crazy": "*I don't want to weigh myself every day, but I know it helps me*" (WLoM, Woman, 45). Frequent self-weighing was also discouraged by health care providers: "*During the first three years, I got on the scale twice a day, in the morning and in the evening, to be sure. And then my dietitian slapped me on the wrist, so I continued only in the morning*" (WLoM, Woman, 44). WLoMs felt worried about giving too much attention to their weight, but on the other hand they also reported that missing the "self-weighing session" could be associated with anxiety: "*Every morning I get on my scale. Every morning. I am worse than a girl. The day I leave my house and I realize that I have forgotten, I panic all day*" (WLoM, Man, 37).

Secondly, among WLoMs, the weight displayed on the scale was more than just information on how they had dealt with food and physical activity during the previous days. It provoked consequences for their mood, their body image, and for some of them, on their self-esteem. Weight loss was related to happiness and weight gain with anxiety, guilt, sadness, anger and self-blaming among WLoMs: "*The lighter I am on the scale, the better I feel. If my weight goes up, I spend the whole day thinking about it*" (WLoM, Woman, 44). They were sensitive to the variations of the scale that could switch on an internal alarm as if regaining a little was similar to gaining back all the lost kilos: "*I am very attached to my body image, which affects my mood a lot, I mean. If my weight increases, it makes me sad. I don't want to go out anymore. It's a bit as if gaining 2-3kg meant I regained all my weight! As soon as it's going up, I say oh no, that's dreadful! I'm not tolerant at all with myself over that. And when it [the weight] goes down, it has a slight euphoric effect! I go back to my weight-loss program when it goes up*" (WLoM, Woman, 30). Insecurity regarding their success and anxiety of regaining

weight was revealed through their interaction with the scale. No participants reported what happened to their mood when their weight was stable.

Paradoxical effects were also mentioned, such as thoughts of eating more when the weight was lower than expected: "*I am happy when my weight goes down and unhappy when it goes up. When it goes down I think, 'Cool, you can take two more macaroons," but I shouldn't think that way because it will stop going down*" (WLoM, Woman, 28).

In comparison, the NSW participants who weighed themselves reported no implications of the result of self-weighing on their mood. They were not surprised by the results that appeared on the scale. Their emotions and their self-esteem were independent of the result shown on the scale. NSW participants were satisfied with their weight but would not have liked gaining weight. They reported that they would feel unsatisfied if they gained 5 to 10 kilos and would react to avoid more weight gain: "*I don't know how I would feel if I gained weight, but I am sure that I would react*" (NSW participant, Man, 47).

Discussion

In this paper, we analyzed interviews of individuals who had maintained weight loss and others who had always kept a normal stable weight in order to explore and compare how self-weighing was used as a strategy of weight maintenance as well as the behavioral and psychological consequences of self-weighing.

Most participants in the WLoM group used self-weighing more frequently than the NSW participants. The strategy of self-weighing was part of WLoMs' life as it helped them to keep the course and adjust their dietary intake and physical activity. Without the help of the scale, they were unable to identify any weight gain, even, for some of them, after several years of weight-loss maintenance. This is in accordance with data from the NWCR showing that discontinuing self-monitoring of weight was associated with weight regain (Thomas et al., 2014). WLoMs had acquired this strategy during weight loss and were still relying on it, whether it was a trouble-free routine or a painful moment. In comparison, individuals who had had a lifelong normal stable weight seemed to rely on internal points of reference. They knew rather precisely the variations of their weight without needing a scale.

The behavioral consequences of self-weighing—or of feeling one's weight for participants who did not rely on self-weighing—entailed adapted strategies according to weight change. Even though participants of both groups went on as usual when their weight remained stable, the "usual" differed between the WLoMs and the NSW group. All participants reported that they needed planning and organization. However, WLoMs had developed more tactics, needed constant attention and resorted to more stringent behaviors than NSW participants who relied on internal knowledge. Also, when their weight increased, WLoMs could resort to quite extreme behaviors to return to their weight, whereas NSW participants went back to their routine. Weight management differed between WLoMs and people with a lifelong normal stable weight in terms of vigilance and energy devoted to it, even after several years of weight-loss maintenance.

The WLoMs did not rely on self-weighing as a single measure as it was interrelated with behavioral strategies, but it was a necessary condition to guide one's behaviors. This observation is consistent with studies that found an effect of self-weighing when used in a self-regulatory program (Wing et al., 2006). However, WLoMs were capable of giving themselves feedback and adjusting their behavior without needing professional advice. Self-weighing seems a necessary step allowing the behavioral components of personal health strategies to work. It instills the drive to react or the motivation to go on with the strategies, as illustrated by the WLoMs who expressed a "dependency" to self-weighing and acknowledged that stopping the use of the scale had led to weight regain. This constant use of strategies was also reported by the quantitative studies on the NWCR data (Butryn et al., 2007; Thomas et al., 2014) and in qualitative studies (Hindle & Carpenter, 2011).

The consequences of self-weighing on mood were also different across groups. For most WLoMs, weight increase triggered negative emotions such as anger and guilt. In the present case, it seems that these emotions of anger or guilt were helping WLoMs to initiate corrective actions. If we refer to the model of self-regulation proposed by Carver and Scheier (1982; 2011), negative affect can be seen as the "error signal" that results from the comparison between the current and desired states. This error signal indicates a discrepancy between the observed and expected weight, leading the persons to make more efforts to reach their goal. Furthermore, the increase in positive affect is a sign that weight is less than planned and that the person outperformed, leading the individuals to decrease their efforts.

That can be paralleled to what we observed among the WLoMs of our study, who were alternating between usual and drastic corrective strategies. In comparison, the process of self-regulation of NSW participants was much smoother and seemed mostly automatic, requiring less attention. It implied neither self-weighing nor strong corrective actions, and it was not causing notable variations in their emotional state.

However, some WLoMs also reported anxiety towards self-weighing or that their self-esteem was negatively affected when their weight increased on the scale. This negative impact of self-weighing on psychological well-being corroborates results observed in adolescents and young adults (Benn et al., 2016; Pacanowski, Linde, et al., 2015; Pacanowski, Loth, et al., 2015; Quick et al., 2012) and shows that despite the number on the scale certainly ensuring that actions will be taken in case of weight regain, some WLoMs had difficulties keeping a healthy concern for weight maintenance without adverse effect.

The negative effect that self-weighing can cause on certain WLoMs' self-esteem should be examined in a longitudinal study, as it may impact the person's sense of self-efficacy or add a supplementary cost to the constant vigilance already needed for weight-loss maintenance. WLoMs may be then discouraged to continue using this strategy, thus precipitating weight regain. Moreover, the overvaluation of shape and weight for self-esteem is a core feature of eating disorders (Fairburn, 2008). Before recommending self-weighing as a strategy for weight-loss maintenance, disordered eating should be checked in persons experiencing this association between weight and self-esteem.

These findings underline that weight-loss maintenance can be attained through behaviors that are disseminated along a continuum of healthy and extreme strategies. Drastic behaviors can suit certain WLoMs and enable them to achieve weight-loss maintenance. Even though they are not usually recommended, they can be tolerated, as long as adverse effects on psychological health are screened and taken care of.

This study shows that self-weighing is used by many individuals as a successful strategy for weight-loss maintenance. Even if self-weighing has been most of the time described as a necessary strategy for weight-loss maintenance in the literature (Butryn et al., 2007), a qualitative study also described WLoMs that did not rely on this strategy (Metzgar, Preston, Miller, & Nickols-Richardson, 2015). Instead they reported that social support that helped

them to stay motivated, planning ahead, being mindful and aware of one's food choices, learning about nutrition and portion control, and being physically active were facilitators of weight loss and weight-loss maintenance. This shows that other pathways can be taken to reach weight-loss maintenance, which could be recommended for those who experience adverse effects from self-weighing.

The inclusion of a heterogeneous sample composed of men and women that had used different weight-loss methods provided rich data and can be seen as a strength. These results cannot be generalized on a statistical basis; instead, they can only be generalized only on a theoretical basis. One has to keep in mind the specificities of the sample, as most of the individuals interviewed in this study had chosen to lose and maintain weight on their own, with no or little help from professionals. They had used various weight-loss methods and relied on strategies of weight-loss maintenance that they had developed by themselves. Self-weighing was suitable for most of them to help them maintain their weight loss. The literature has shown that this strategy was privileged for many persons from the community, similar to our sample, but also that there were other options, such as relying on internal cues that could be learned during a weight-loss program. Two WLoMs in our study also mentioned relying on their clothes, similarly to several participants of the control group. Identifying the determinants predicting who can benefit the most from which strategy would be valuable for the design of a tailored weight-loss maintenance program.

Finally, it must be noted that the comparison group enrolled in this study was hard to recruit. We demanded a lifetime stable weight within a range of 5 kg, whereas the normal population seems to gain weight during its lifespan (Droyvold et al., 2006). We probably included participants who had particular abilities to monitor their weight with internal cues and who had acquired good knowledge of their functioning. A recent study showed that the importance of the environment can be more or less "obesogenic" and potentiate or neutralize unhealthy eating habits (Lindvall et al., 2015). If the context continues favoring weight gain increasingly, more people might have to resort to strategies to preserve a stable weight—and self-weighing may be one way.

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