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The effect of holiday weight gain on body weight ☆

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HIGHLIGHTS

- Weight gain between the Nov. to Jan. holiday season is common in Western societies.
- Holiday weight gain is highly variable and averages less than 1 kg.
- Behavior modifications have been successful at preventing holiday weight gain.

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ABSTRACT

The topic of holiday weight gain has been a frequent subject of the lay media, however, scientific interest has only been recent. Multiple studies in Western societies have reported average weight gains among adults during the period between mid-November and mid-January that were about 0.5 kg. The range in individual weight changes was large, however, and the already overweight and obese gain more weight than those who are healthy weight. When the average gain across the year was also measured, the holiday weight was the major contributor to annual excess weight gain. Efforts patterned to increase awareness to energy balance and body weight have been shown to be successful at reducing such gain. An exception to holiday weight gain being a major contributor to annual excess gain has been children, in whom summer weight gains have been observed to be the major contributor to average excess weight gain.

Holiday weight gain has long been a topic in the lay press, but it was not until Yanovski et al. [1] clearly demonstrated a seasonal increase in weight between mid-November and mid-January, that holiday weight gain attracted significant scientific attention. This study measured the body weight of a convenience sample of 195 racially mixed adults four to six times over the course of more than a year. They documented an average holiday weight gain of 0.4 ± 1.5 kg (mean ± SD), which tended to be greater than 0.1 ± 1.5 kg observed during the three months prior to mid-Nov. and was not compensated for by the loss of 0.1 ± 1.1 kg during the three month period following mid-Jan. It was noted that the holiday weight gain was much smaller than the 2 to 5 kg holiday weight gain often cited by the lay press as the typical weight gain expected by the US public [1], but it should be noted that the gain was similar to the average annual weight gain of 0.3 kg that has fueled obesity epidemic beginning in 1960 [1]. In this regard, the authors reported an average annual weight gain of 0.5 kg among this cohort. Moreover, two-thirds of this annual average weight gain occurred between mid-Nov. and mid-Jan. and thus not a weight change that should be discounted. (See Table 1.)

It is important to note that the reported individual weight gains during the holiday period were quite variable (range −7 to 4.1 kg) [2]. Some of this variation could be accounted for by baseline weight status. Although the average holiday weight gain was not reported by weight status, it was reported that the relative incidence of a large weight gain (>2.3 kg) increased from 5% in those who were healthy weight (body mass index <25 kg/m^2), to 11% in those who were overweight (BMI ≥ 25 and <30), and to 17% in those who were obese (BMI ≥ 30). In an attempt to understand the alteration in energy balance leading to the holiday weight gain, a survey of change in physical activity and hunger was administered along with the quarterly weight measures. Results, unfortunately, indicated that either energy intake or expenditure could explain the weight change. Specifically, self-report questionnaires indicated that holiday weight gain was greatest in those that reported a decrease in physical activity during the holiday period, and also in those reporting the greatest hunger during the holiday period.

While weight change averaged across several hundred individuals over a three month period is usually an indication of gain of fat, there often is variability in the fraction of weight change that is fat mass [3]. To test whether holiday weight gain did reflect gain in fat mass, a follow-up study by Hull et al. [4] included a measure of body composition as assessed by repeated DXA measures. The study was performed in a younger cohort (23 ± 5 years) of 82 college students, who were mostly (66%) healthy weight and racially mixed. Unlike the findings of

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Table 1
Summary of holiday weight gain studies.

Reference	Subjects	Weight gain	Comments
Shahar et al. (1999)	n = 94 BMI = 26 ± 4 kg/m^2	ca. 1.5 kg Summer to winter	% of reported energy intake from fat increased in winter.
Yanovski et al. (2000)	n = 195, 19–82 years BMI = 26 ± 5, kg/m^2	0.4 ± 1.5 kg Mid Nov. to Jan.	Gain tended to incr. with BMI. Gain tended to incr. with reported energy intake and sedentary behavior.
Hull et al. (2006)	n = 82, 23 ± 5 years BMI: 34% > 25 kg/m^2	N.S. weight change Mid Nov. to early Jan.	%fat increased, %fat tended to increase with increasing BMI.
Ma et al. (2006)	n = 593, 20–70 years BMI = 27 ± 5 kg/m^2	0.5 kg greater in early Feb.	Peak reported energy increase in Nov. Peak physical activity in June.
Watras et al. (2007)	n = 20, 18–44 years BMI: 25 to 30 kg/m^2	Weight tended to increase Sept. to Jan./Mar.	Weight increase was significant compared to a group treated with CLA for weight loss.
Branscum et al. (2010)	n = 90, 3rd–5th grade BMI %ile = 74 ± 26	No increase Early Dec. to mid Jan	BMI %ile increased. Relative weight tended to increase with increasing BMI.
Cook et al. (2012)	n = 443, 40–69 years BMI: 61% > 25 kg/m^2	0.7 ± 1.4 kg Sept./Oct. to Jan./Feb.	Low energy expenditure did not predict weight gain.
Stevenson et al. (2013)	n = 148, 18–65 years BMI = 25 ± 5 kg/m^2	0.8 ± 1.3 kg Mid Nov. to early Jan.	Weight gain increased with BMI. %fat increased.

Uncertainties are expressed as one standard deviation.

Yanovski et al. [1], weight change between mid-Nov. and mid-Jan. averaged −0.1 kg, and reflected the greater prevalence of healthy weight individuals in the Hull study. Similar to the findings of Yanovski et al., however, Hull et al. reported that subjects who were overweight or obese were much for likely to gain 2 kg or more (8 of 28) and holiday weight gain in that group averaged 0.8 kg compared to an average weight change (loss) of −0.4 kg in those of healthy weight. Of note however, both the BMI classes of healthy weight and excess weight gained fat mass (0.5 and 1.3 kg, respectively) over the holiday period indicating positive energy balance in both weight status groups. Thus, the DXA measures indicated that the gain in fat mass in both groups was fully or partially masked by a decrease in fat-free mass mostly due to fat-free mass loss in the legs. It is possible that this pattern of change in body composition is more likely among college students, given the large amount of walking performed by college students during the on campus (non-holiday) portion of the semester. In both weight status groups, weight change was highly correlated with change in fat mass (r = 0.76), and thus, while the loss of fat-free mass masked the gain in fat mass among those with healthy weight, greater weight gain was indeed due to greater gain in fat mass and thus would raise concern about the health consequences of holiday weight gain over time as suggested by Yanovski et al. [1].

In a study by Stevenson et al. [5] that was also performed in a group of 148 mostly college students, it was confirmed that increases in body weight were indeed largely due to increases in fat mass, although body composition change in this study was measured by bioelectrical impedance, which is less precise than DXA. In this cohort of slightly older (33 ± 11 years) subjects recruited on college campus, average holiday weight gain was 0.8 ± 1.1 kg. This cohort was largely Caucasian, two-thirds female, and 56% healthy weight, with 26% overweight and 18% obese. More similar to Yanovski, however, all groups by weight status gained weight; however, as reported by Hull et al. [4], both groups gained fat and the gain in body fat was greater among the obese than among those of healthy weight (increase in percent body fat of 1.6 vs 0.2 percentage points), with overweight being intermediate (+0.5 percentage points), although not different from either of the other weight status groups. Participants who reported more than 150 min/wk of moderate exercise were less likely to gain fat mass, but this difference disappeared after controlling for baseline body weight suggesting that weight status was also a predictor of exercise time. Thus the primary predictor of holiday gain was weight status and that those with excess weight tended to be less likely to be exercises.

With a similar aim of investigating the role of habitual energy expenditure in the amount of holiday weight gain, Cook et al. [6] analyzed the three month weight gain across the holiday period in the participants of the OPEN study [7]. This study was performed in 443 adults between 40 and 69 years old who were most Caucasian and roughly equally distributed between healthy weight, overweight, and obese. These subjects were an average 15 years older than those of Yanovski et al. [1], but of similar weight characteristics and locale (Bethesda, MD). The average weight gain (0.7 ± 1.4 kg) was somewhat larger than that reported by Yanovski et al. [1], Stevenson et al. [5], and Hull et al. [4]. The objective of this study by Cook et al. extended beyond documenting holiday weight gain by testing whether baseline energy expenditure could protect against the gain. Cook et al. [6] used doubly labeled water to measure baseline total expenditure and it was found that neither having a higher total energy expenditure adjusted for fat-free mass nor higher estimated PAL (total energy expenditure/resting metabolic rate) at baseline reduced the average holiday weight gain. Thus, neither a higher typical energy expenditure relative to fat-free mass in the study by Cook et al., nor a high self-reported level of min/wk of moderate exercise reported by Stevenson et al. [5] was protective against subsequent holiday weight gain.

Two epidemiologic studies while not keying on holiday weight gain per se did investigate winter weight gain. These, studies, do not present data in a manner that isolate the holiday period, but they do investigate the seasons of the year in a not dissimilar manner. These studies report higher weights in winter than in summer and provide additional diet and physical activity data, although both are derived from self-report.

Shahar et al. [8] surveyed 94 adult (mean age 43 years, mean BMI 26 kg/m^2) in January and July. Winter BMI values were 0.5 kg/m^2 higher, which was a difference of about 1.5 kg. Energy intake as self-reported was not significantly different between January and July, but tended to be 69 kcal/d higher (p = 0.39). Unfortunately, self-reported energy intake is known to be inaccurate [9] and thus this evidence is weak. Possibly, more insightful was that there were significant increases in fat intake at the expense of carbohydrate, with both saturated and monounsaturated fat intake increasing. These differences did predict an increase in plasma lipids that was in the same direction of the change in intake. Of note, this study was performed in Israel and thus closer to the equator than most of the other studies reported herein, reducing the likelihood that the weight increases reported above were not driven by season effect disorder.

A second epidemiologic study of winter weight change was conducted by Ma et al. [10] among subjects from Central Massachusetts. Subjects were seen quarterly. Also in this study, subjects with seasonal effect disorder were excluded, leaving 593 subjects of which 47% were female. Average age was 48 years and average BMI was 27 kg/m^2. Winter (Dec 21–Jan 20) weight was 0.5 kg higher than summer, which is very consistent with reported holiday weight gains, but it was not possible to isolate the holiday season weight data as presented. Winter energy intake was higher by self-report and physical activity was lower by