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Short Report

Do the holidays impact weight and self-weighing behaviour among adults engaged in a behavioural weight loss intervention?

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ABSTRACT

We examined the U.S. holiday period impact on weight gain, self-weighing, and treatment success among adults in a weight loss intervention (N = 171). Using electronic scales, body weight and self-weighing frequency were compared by time period [i.e., pre-holiday, holiday (November 15–January 1), post-holiday]. Self-weighing was less frequent during holiday period ($p < .01$), and longer intervention engagement was associated with weight gain ($p < .0001$) during this time. Enrollment during holiday period was associated with 2.3% 12-month weight loss. Holiday period enrollment might be beneficial for preventing holiday weight gain and facilitating successful intervention outcomes.

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Adults in the United States (U.S.) typically gain weight [0.4–0.9 kilograms (kg)], during the holiday period (i.e., mid-November–January) [1–5]. This weight gain is often maintained throughout the year [3,5], perhaps, contributing to the rising prevalence of overweight [body mass index (BMI) ≥25.0 kg/m^2] and obesity (≥30.0 kg/m^2) [6]. Weight gain is attributed to changes in weight-related behaviours (e.g., self-weighing) [3,7], which may be due to less physical activity in colder temperatures and holiday-based eating.

Previous weight maintenance interventions (i.e., conjugated linoleic acid supplementation, group support, cognitive-behavioural treatment focused on self-monitoring) were successful in preventing weight gain during the holiday period [1,7,8], although one self-monitoring-focused intervention found that only participants with the greatest adherence did not gain weight during this time [9]. However, it is unknown how the holidays influence weight change in a weight loss seeking population, self-weighing frequency, and as well as how timing of this period within an intervention impacts long-term success [1,7–9].

To our knowledge, only one study used electronic scales (e-scales) to facilitate more frequent measurements [10,11] and only in the general population [10,11], not in a weight loss seeking population. The current study aims to use e-scale measurements to examine changes in weight and self-weighing frequency over the holiday period among military personnel enrolled in a weight loss intervention. This study will also examine the influence of enrollment and completion during the holiday period on treatment outcomes. This sample may have increased motivation to manage their weight due to military fitness and appearance standards [12].

Methods

Sample

Active duty military personnel [≥18 years of age, BMI > 25.9 kg/m^2)] who expected to be stationed at least one year at Joint Base San Antonio, TX were enrolled. There was an equal distribution of gender and BMI category, and diversity with race (19.9% African American, 14.0% Other races) and ethnicity (18.7% Hispanic/Latino). Participant characteristics and main outcomes are reported elsewhere [13].

Design

Protocol was approved by the IRB of the 59th Medical Wing in San Antonio, TX and acknowledged by IRB at the University of Tennessee Health Science Center. After obtaining informed consent, one-week of self-monitoring (i.e., diet, physical activity), and healthcare provider approval, participants were randomised to a counselor-initiated (CI) or self-paced (SP) weight loss inter-

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vention (based on the Look AHEAD intensive lifestyle intervention) [14]. Personalised weight loss, calorie, and exercise goals were the same between conditions. At baseline visit, participants were given BodyTrace™ e-scale and encouraged to self-weigh daily. Weight was uploaded to personalised webpages using automatic cellular transmission, accessible by participants and counselors. Conditions differed in amount of initiation needed for receiving intervention components. In the CI condition, counselors provided 16 weekly, then 8 every other week, and then 4 monthly email feedback messages focused on self-monitoring and weight loss progress. The SP condition could request the same number of feedback messages [15].

Measures

Participants reported demographics and height was collected using a wall-mounted stadiometer at baseline by study staff. At baseline and 12-months, participants were weighed in kg on a calibrated scale (Tanita BWB-800S). BMI was calculated from baseline height and weight. Body weights were collected from e-scale measurements. For the 12-month follow-up, if in-clinic weight was missing, e-scale weight closest (±30 days) to 12-months was used [16,17]. Missing weights ($n = 42$) were then imputed as baseline weight carried forward.

Analysis

Mean (%) weight change, rate of weekly weight change, and mean number of times participants self-weighed, were compared from pre-holiday (October 1st–November 14th), to the holiday (November 15th–January 1st), and post-holiday (January 2nd–February 14th) periods overall and by participant demographics, condition, and days from randomisation (≤90, 91–180, 181–270, and >270 days)] using Wilcoxon–Mann Whitney and Kruskal–Wallis tests. Dates were consistent with previous studies [3,5]. Annual quarterly time periods were used to compare time from randomisation. To be included in rate of weight change analyses, individuals need to self-weigh more than two times at least 14 days apart in each period.

Logistic regressions examined the relationship between enrollment during holiday (versus other times) and 12-month weight change (i.e., 2.3% and 5%). Logistic regressions examined difference between completing final study visit during holiday (versus other times) in relationship to 12-month weight change. Criteria were based on standard definitions (i.e., <2.3% maintenance, 5% loss) [18].

Results

Most self-weighed at least weekly during the pre-holiday, holiday, and post-holiday periods (i.e., 89.57%, 81.82%, 83.63%, respectively). From the pre-holiday to the holiday period, there was not significant weight change overall (i.e., M = +0.18 (+2.16) kg, $p = 0.30$; +0.22%, $p = 0.30$) (Table 1), but this differed by days from randomisation ($p < 0.0001$). Those enrolled within 90 days of the holidays (i.e., mid-August–mid-November) lost on average −0.98% (−0.86 kg). Those enrolled >90 days before holiday (i.e., before mid-August) gained weight (M = +0.25% to +0.93%). Rate of weekly weight change differed from the pre-holiday to the holiday period overall [M = +0.17 (0.45) kg; $p = 0.001$] and differed by race ($p = 0.04$) and days from randomisation ($p = 0.026$) (Table 1).

Participants self-weighed less frequently (M = −1.09, $p = 0.01$) during the holiday than the pre-holiday period (Table 1), which differed by days from randomisation ($p = 0.006$). Those enrolled within 90 days of the holidays self-weighed, on average, 5.18 times *more* frequently during the holidays than the pre-holiday period.

Table 1
Pre-holiday to holiday period comparisons by participant characteristics.

	Weight change (%)	
	N	M (SD)
Overall	163	0.18 (2.16)
Days from randomisation		
≤90 (*mid-August to mid-November*)	44	−0.98 (1.75)***
91–180 (*mid-May* to *mid-August*)	43	0.25 (1.89)***
181–270 (*mid-February* to *mid-May*)	54	0.90 (3.27)***
>270 (*Before mid-February*)	22	0.93 (1.65)***
	Rate of weekly weight change	
Overall	71	0.17 (0.45)**
Race		
African American	16	0.38 (0.47)*
Other	13	0.28 (0.39)*
Caucasian	42	0.06 (0.43)*
Days from randomisation		
≤90 (*mid-August to mid-November*)	14	0.45 (0.33)*
91–180 (*mid-May* to *mid-August*)	21	0.18 (0.52)*
181–270 (*mid-February* to *mid-May*)	24	0.03 (0.06)*
>270 (*Before mid-February*)	12	0.07 (0.05)*
	Self-weighing frequency	
Overall	163	−1.09 (11.31)**
Days from randomisation		
≤90 (*mid-August to mid-November*)	44	5.18 (14.70)**
91–180 (*mid-May* to *mid-August*)	43	−4.70 (9.55)**
181–270 (*mid-February* to *mid-May*)	54	−1.72 (7.85)**
>270 (*Before mid-February*)	22	−5.00 (8.95)**

*** $p < 0.001$.
** $p < 0.01$.
* $p < 0.05$.

Table 2
Holiday to post-holiday period comparisons by participant characteristics.

	Weight change (%)	
	N	M (SD)
Overall	171	0.12 (2.21)
Days from randomisation		
≤90 (*Mid-November to Mid-February*)	43	−0.85 (2.10)***
91–180 (*Mid-August to Mid-November*)	48	0.60 (2.10)***
181–270 (*Mid-May to Mid-August*)	39	0.35 (2.59)***
>270 (*Before Mid-May*)	41	0.36 (1.80)***
	Rate of weekly weight change	
Overall	152	−0.11 (0.41)**
Race		
African American	31	−0.32 (0.47)**
Other	22	−0.09 (0.29)**
Caucasian	99	−0.04 (0.40)**
Gender		
Male	73	−0.17 (0.39)*
Female	79	−0.05 (0.43)*
	Self-weighing frequency	
Overall	171	−0.46 (10.66)
Days from randomisation		
< 90 (*Mid-November to Mid-February*)	43	3.74 (13.62)
91–180 (*Mid-August to Mid-November*)	48	−2.48 (8.07)
181–270 (*Mid-May to Mid-August*)	39	−1.74 (10.82)
>270 (*Before Mid-May*)	41	−1.29 (8.59)

*** $p < 0.001$.
** $p < 0.01$.
* $p < 0.05$.

Participants enrolled >90 days before the holidays (i.e., before mid-August) self-weighed *less* (M = −1.72 to −5.00 times).

From the holiday to the post-holiday periods, there was not significant weight change overall (M = +0.10 (1.95) kg, $p = 0.41$; +0.12%; $p = 0.37$), which differed by days from randomisation ($p < 0.0001$) (Table 2). Those enrolled within 90 days of the post-holiday period lost −0.85% (−0.68 kg) of weight. Those enrolled >90 days before the post-holiday period gained weight (M = +0.35 to +0.60%). Rate of weekly weight change differed from the holiday to post-holiday

periods overall [M = −0.11 (0.41) kg, $p = 0.007$] and differed by race ($p = 0.01$) and gender ($p = 0.04$) (Table 2).

Controlling for condition, those enrolled during the holiday period were more likely to lose 2.3% of baseline weight at 12-months compared to those enrolled during other times (odds ratio: 2.49, 95% confidence interval: 1.03–6.27; $p = 0.04$). There was not a difference in enrollment periods for 5% weight loss at 12-months ($p = 0.55$). Adjusting for condition, there was no difference in achieving 2.3% or 5% weight change between those who completed their final 12-month visit within holiday period versus other times.

Discussion

Participants, on average, did not experience significant percent or total weight change between the pre-holiday, holiday, and post-holiday periods. However, they gained weight more rapidly during the holidays compared to other times. Participants, perhaps due to increased weight loss motivation in this population, gained less weight overall (+0.18 kg) [1], and gained weight *less* rapidly compared to previous samples [7–9]. Despite differences in samples and protocols, results extend previous findings that intervention engagement prevents gains during the holidays [1,8]. Importantly, the longer participants had engaged in the intervention, the more weight they gained and the less frequently they self-weighed during this time. As noted previously [7,9], interventionists might encourage more frequent self-monitoring behaviour during holidays, particularly for those who enroll in August or earlier in the year.

Importantly for future trials, holiday period enrollment did not negatively impact weight loss success and perhaps facilitated improved outcomes. Because early self-monitoring adherence and weight loss is associated with long-term weight maintenance [19], "braving" the holiday period at the beginning of treatment, when participants are the most motivated, may increase self-efficacy. Despite potential time constraints (e.g., scheduling), enrollment during the holidays may increase long-term self-monitoring, or perhaps, participants who enroll during the holidays are most motivated to make behavioural changes. Surprisingly, when self-monitoring adherence is typically lowest [20], completing the intervention within the holiday period did not impact outcomes. Further, researchers should examine both percent weight change and rate of weight changes when observing the holiday impact on weight, to facilitate comparability between studies. Qualitative research also would help to understand how holidays influence weight and self-weighing.

These participants were active duty military personnel, perhaps limiting generalisability due to differences in holiday practices (e.g., stationed away from extended family) or in body composition. However, prevalence of overweight and obesity in the U.S. military is high [21], and this sample was more diverse in gender, race, and ethnicity [1,7–9]. Enrollment period comparisons had small samples and were collected from one site; thus, findings should be replicated.

Conclusion

Using e-scale measurements, this study captured changes in weight and self-weighing behaviour among weight-loss-seeking adults throughout the U.S. holiday period. More recent intervention enrollment promoted more self-weighing behaviour and resulted in better weight management during this time. Results suggest weight loss intervention enrollment prior to and during the holiday period does not negatively impact, and might improve, treatment success.

Ethical approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Conflict of interest

Margaret C. Fahey declared no conflicts of interest. Robert C. Klesges declared no conflicts of interest. Mehmet Kocak declared no conflict of interests. Jiajing Wang declared no conflicts of interest. Gerald W. Talcott declared no conflicts of interest. Rebecca A. Krukowski declared no conflicts of interest.

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