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Interventions for Weight Gain Prevention During the Transition to Young Adulthood: A review of the literature

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Abstract

Purpose—To review studies examining weight gain prevention interventions among young adults.

Methods—A snowball strategy was used to identify relevant studies, beginning with systematic PubMed, MEDLINE, PsychInfo, ERIC, and CINAHL searches. Included studies: (a) were published from 1985–2011, (b) were completed in the US or Canada, (a) focused on weight gain prevention among young adults ages 18–35 years, assessing weight, body mass index (BMI), body composition, diet or physical activity as an outcome, and (d) included pre- and post-intervention assessments.

Results—Thirty-seven interventions were identified. Ten interventions assessed weight, BMI, or body composition; twenty-seven addressed other relevant outcomes (e.g., diet, physical activity). Of the studies examining weight or body composition, six evaluated university courses or seminar-based interventions. Overall, many studies focused on individual-level intervention delivery and changes in weight-related knowledge and/or skills, though some incorporated relatively unique aspects (e.g., focusing on eating disorders and obesity simultaneously, using online technology, providing personalized feedback on weight change). Most showed promising results as small-scale pilot studies but lacked data from fully-powered randomized trials.

Conclusions—There is an urgent need to develop effective young adult-focused weight gain prevention strategies. This review identified promising areas for future work, though much additional research is needed.

Keywords

Obesity prevention; primary prevention; behavioral interventions; young adults; emerging adults dietary intake; physical activity

Introduction

Obesity and poor dietary intake are major public health concerns.^{1,2} The transition from adolescence into young adulthood (e.g., 18–35 years of age) is recognized as an influential period for excess weight gain.³ This transition period represents a critical juncture when

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many young people move out of family's homes, relocate to new environments and establish independent lifestyles. However, little scholarly work to date has examined effective obesity prevention strategies for this age group.³

Although increased resources are now being invested in youth obesity prevention strategies, there is little attention on weight gain prevention once individuals transition out of adolescence and into young adulthood. There are virtually no clinical guidelines or effective health promotion programs specifically in place for this age group,⁴ and research has shown that physicians routinely fail to document and/or address excess weight gain among young adults.⁵ Given that nearly 5.5 million Americans are now obese by the time they reach their early 30s and the prevalence of obesity doubles as individuals progress from their 20s to their 30s,⁶ there is an urgent need to develop obesity prevention strategies for the transition from adolescence to adulthood. Furthermore, although young adults have historically had the lowest rates of health insurance coverage of any age group in the US,⁷ the 2010 passage of federal healthcare reform has allowed millions of young people to remain on Medicaid or their parents' coverage well into young adulthood, through age 26.^{8,9} The widespread implications of such large-scale policy action underscore the need for effective interventions for this age group that can be disseminated in clinical settings, as well as other community, academic and worksite venues.

Given the importance of these obesity prevention efforts, the purpose of this review was to systematically summarize the scientific literature, via peer-reviewed published studies, that has examined weight gain prevention intervention strategies specifically among young adults.

Methods

A snowball strategy was used to identify relevant peer-reviewed, intervention research studies completed in the U.S. and Canada and published between 1985 and July 2011. Searches were completed in PubMed, MEDLINE, PsychInfo, ERIC, and CINAHL using various combinations of keywords: weight, weight gain, obesity, college, young adult, prevention, intervention, fruit and vegetables, physical activity, sugar-sweetened beverages, fast food consumption, and dieting. Relevant citations from articles indexed in these search engines were also reviewed. To be included in the review, interventions had to focus on weight gain prevention among young adults (primarily 18-35 years of age) and include either weight, body mass index (BMI), or body composition change as an outcome or address changes in dietary intake and/or physical activity as potential determinants of weight gain prevention. Included studies also needed to provide data on pre- and post-intervention assessment measures. Studies were excluded if the intervention was primarily designed to address other outcomes (i.e., smoking cessation, eating disorders, mental health, sports nutrition, obesity treatment and/or weight loss).¹⁰⁻¹⁵

Overall, this search strategy identified 37 relevant intervention studies, summarized in 40 publications. Although there is a modest degree of overlap between this review and a 2006 meta-analysis of obesity prevention programs for children and adolescents (up to age 22),¹⁶ there are also substantial differences between these two reviews with regard to inclusion and exclusion criteria (e.g., age range, outcomes of interest, publications dates) and databases searched.

Results

Overview of findings

Ten studies assessed weight, BMI, and/or body composition as a primary outcome. These studies are discussed below in detail. Of these, five included process evaluation measures of adherence to or acceptability of the intervention, two measured dieting behavior and body image, two measured changes in dietary intake and physical activity, two measured changes in diet (but not activity), three measured changes in physical activity (but not diet), and two measured other mediators of change (e.g., nutrition knowledge, self-efficacy).

An additional 27 interventions were identified that did not evaluate changes in weight status or body composition, but addressed other highly relevant outcomes, such as dietary intake and/or physical activity. Since diet and activity are major contributors to excess weight gain, these studies may help identify promising strategies for weight gain prevention. Although the full range of these studies cannot be described in detail, a brief overview is provided to highlight potentially promising strategies in need of further research. Of these interventions, 19 specifically targeted changes in dietary intake or diet-related factors only, 7 targeted changes in physical activity only, and one targeted changes in both diet and activity.

Studies addressing weight or body composition as a primary outcome

Among the 10 studies assessing weight, BMI, and/or body composition as a primary outcome, 6 evaluated weight gain prevention interventions in the form of university-based courses or other intervention designs that were similar in scope (for example, non-credit seminars or internet-based university courses). Four additional studies, discussed separately, examined other intervention strategies for young adult weight gain prevention.

University courses—Stice and colleagues¹⁷ evaluated the impact of a 15-week undergraduate obesity and eating disorder seminar, addressing weight gain issues as well as dieting, body dissatisfaction, and eating disorder symptoms among 25 undergraduate women compared to 70 controls from other university psychology seminars, matched on eating disorder symptomology (mean participant age=21.3 years). This study built upon preliminary findings from a similarly-designed pilot study.¹⁸ The course met twice weekly for 1.5 hours and included didactic presentations and class discussions. Intervention process measures, such as adherence and participation, were not discussed. Overall, intervention participants maintained their self-reported BMI at post-test and 6-month follow-up while control participants experienced an increase in BMI ($p<0.025$). Intervention participants also exhibited significant decreases in body dissatisfaction, dieting, and eating disorder symptoms at 6-month follow-up ($p<0.025$).

Matvienko and colleagues¹⁹ evaluated the impact of a 4-month university nutrition course on weight change, dietary intake, and nutrition knowledge among female undergraduate students. Students ages 18-26 were recruited through campus advertisements. Participants were randomized to an intervention ($n=21$) or control group ($n=19$) and completed assessments at baseline, post-test, and 1-year follow-up. The course consisted of science-based lectures and laboratory exercises on nutrition, energy metabolism, and energy balance. Details were not provided regarding the activities of the control condition or intervention process measures. At the end of the study, neither group experienced significant changes in body weight or BMI, but the intervention group reported greater reductions in total calorie ($p=0.013$) and carbohydrate intake ($p=0.004$) compared to controls. At 1-year follow-up, post hoc analyses indicated that intervention participants with baseline BMIs >24 kg/m² ($n=11$) had lost an average of 1.4 kg while controls with baseline BMIs >24 kg/m² ($n=6$) gained an average of 9.2 kg ($p=0.025$).

Gow and colleagues²⁰ evaluated the impact of a 6-week internet intervention course on first-year university students' BMI and weight-related behaviors. Healthy students aged 22 years or younger were recruited from introductory psychology courses and randomized to the internet intervention arm (n=40), feedback intervention arm (n=39), combined intervention arm (n=40), or control group (n=40). Participants in the internet intervention completed six educational modules grounded in Social Cognitive Theory and focused on nutrition, physical activity, and other weight-related issues. Educational strategies included the use of downloadable materials, group discussion boards, self-assessments, experiential activities and homework assignments. Details describing these activities in more depth were not provided. These modules were offered online through an academic course software system (Blackboard©). Participants in the feedback intervention weighed themselves weekly and sent results to study staff; feedback was provided in the form of graphs showing individualized weekly change. The combined intervention arm received both the feedback and internet interventions, and the control group received no intervention. Adherence differed significantly across intervention conditions, with 90% of the feedback group participating in >4 weeks of the intervention, compared to 82% for the combined group and 66% for the internet group. Compared to controls, the combined intervention group had a lower mean BMI at post-intervention, after controlling for baseline BMI ($p<0.05$). Post-intervention BMI did not differ significantly between the other three arms of the study. Measures of diet and physical activity did not differ between the groups.

Hivert and colleagues²¹ evaluated the impact of a 2-year seminar-based intervention on weight, BMI, and other related measures among non-obese first- and second-year undergraduates students attending a large Canadian university. A convenience sample of students was recruited and randomized to intervention (n=58) or control conditions (n=57). The intervention group participated in 45-minute small-group seminars every 2 weeks for the first 2 months and monthly thereafter, excluding summers, focused on increasing knowledge on weight gain, dietary recommendations, exercise, and behavioral modification strategies. Overall, intervention adherence dropped sharply in the second year, with 53% of participants attending 60% of the seminars in the first year (n=31) and 26% doing so in the second year (n=15). By the end of the intervention, the control group gained a small amount of weight on average (0.7 ± 0.6 kg) while the intervention group showed a small mean decrease in weight (-0.6 ± 0.5 kg). The difference over time between groups was significant ($p=0.04$). Plasma triglycerides and alcohol consumption also increased in the controls and decreased in the intervention group ($p=0.04$), but there were no significant differences at the 2-year follow-up for other weight-related measures.

DeVahl and colleagues²² evaluated the impact of academic incentives on the effectiveness of and adherence to a 12-week low-intensity aerobic program among 181 healthy physical therapy students enrolled in a cardiopulmonary patient management course. Students were assigned to receive either a single bonus point on an exam (n=92) or the more attractive incentive of a bonus point on their overall course grade (n= 89). Compared to students in the single exam bonus group, those in the course grade bonus group were more likely to complete the program (55% versus 73% completion rates, respectively; $p<0.05$), and participants in the course grade bonus group exhibited greater reductions in percent body fat after 12 weeks than those in the single exam bonus group (3.3% vs. 1.4%, $p<0.005$).

Finally, Boyle and colleagues²³ evaluated the impact of a semester-long physical activity intervention on percent body fat, waist-to-hip ratio, self-reported physical activity, and physical fitness among 178 undergraduate students enrolled in a required personal health course. Students chose whether to attempt to increase their physical activity level with the help of an upper-level exercise physiology student acting as a peer educator (intervention) or on their own (control). Because more students chose the peer educator condition than could

be accommodated, some students were randomly reassigned to the control group. All participants set individualized goals, plans and rewards for behavior change, completed a weekly journal, and wrote a final report on their achievements as a course requirement. The intervention group additionally received weekly feedback from peer educators. Ninety-one percent of students completed the study, with attrition due mainly to reported lack of time and course withdrawal. Women in the intervention group who were active at baseline (exercising 3 times/week) decreased their waist-to-hip ratio by 0.02 while baseline active women in the control group increased their waist-to-hip ratio by 0.02 ($p<0.05$ for treatment*time interaction). Women in the intervention group who were inactive at baseline increased their physical activity and energy expenditure while baseline inactive women in the control group decreased their physical activity and energy expenditure ($p<0.05$ for treatment*time interaction). There were no significant intervention effects for men.

In summary, many of these university course-based interventions resulted in some positive findings. Weight status, BMI and/or body composition among intervention versus control groups yielded statistically significant differences for five of these six studies, though in many cases effect sizes were small. Several studies lacked process measures and/or detailed descriptions of intervention components. Although most studies used a randomized design, the extent to which these study samples represent either university students and/or young adults overall is not clear.

Other intervention strategies—Four additional studies that assessed weight, BMI, and/or body composition as a primary outcome examined alternative intervention strategies for weight gain prevention.

Levitsky and colleagues²⁴ evaluated the impact of two 10-week trials of weight self-monitoring on weight change in first-year college women. For both trials, participants randomized to the intervention weighed themselves daily and e-mailed their weight to study staff. Intervention participants enrolled in the first trial ($n=11$) were sent a daily e-mail with the slope of their weight change over the prior 7 days; intervention participants enrolled in the second trial ($n=16$) were sent a daily e-mail with the number of calories they would have to increase or decrease in order to hold their weight constant. Intervention process measures were not discussed. Differences in 10-week weight changes between intervention and control groups were statistically significant ($p<0.01$) for both trials. Control participants in the first and second trials gained weight (3.1 ± 0.5 kg and 2.0 ± 0.6 kg, respectively, $p<0.01$); intervention participants did not (0.1 ± 1.0 kg and -0.8 ± 0.6 kg, respectively, $p>0.05$).

Gokee-LaRose and colleagues²⁵ also compared the impact of two self-regulation approaches to weight gain prevention among a community-based sample aged 18-35. All participants attended eight weekly meetings, followed by two monthly meetings at which they were taught principles of self-regulation—daily self-weighing and adjustment of diet and physical activity within the context of their assigned approach when they were above their goal weight. Participants were randomly assigned to an approach focused on making small changes every day throughout the year or an approach focused on making large changes periodically for eight weeks per year. Those assigned to the small changes approach ($n=21$) were taught to make changes in energy balance equal to approximately 200 calories/day, including one small daily dietary modification and increasing daily steps. Participants assigned to the large changes approach ($n=23$) were taught to cut 500-1000 calories/day and to exercise at least 250 minutes/week for 8 weeks/year. Participants completed an average of 8.4 (of 10) intervention sessions. All lost weight by the 8-week and 16-week follow-up assessments; however, those assigned to the large changes approach lost more weight than participants assigned to small changes (3.5 ± 3.1 kg versus 1.5 ± 1.8 kg at week 16, $p<0.001$).

In addition, Klem and colleagues²⁶ evaluated the efficacy of two intervention formats for a 10-week weight gain prevention program among women ages 25-34. Participants were randomized to one of two intervention formats or the control condition. Intervention participants learned behavioral weight control skills (e.g., self-monitoring) at weekly group meetings (n=14) or by completing weekly mailed lessons and assignments (n=27). The control group (n=24) read a brochure about healthy lifestyle choices, but were not contacted by research staff during the intervention. Participants' weight was measured at baseline, post-intervention and 6-month follow-up. Overall, participants in the group condition attended 46% of meetings, and those in the correspondence condition completed 53% of homework assignments. At post-intervention, the average weight change among participants in the group intervention (-1.9 ± 1.8 kg) was significantly greater than that of controls (-0.2 ± 1.3 kg). Participants in the correspondence intervention also lost weight, but average weight change did not differ from that of controls (-1.1 ± 2.1 kg). There were no significant group differences at follow-up.

Finally, Cholewa and Irvin²⁷ evaluated the impact of a nine-week pilot physical activity intervention on self-reported BMI and physical activity level among Canadian university students. Seventy-two percent (n=51 out of 71) completed the study. Participants selected an arm of the study: buddy system (two same-sex participants working together to increase physical activity), online record-keeping device (weekly logbook of physical activity), or both. Details on participant recruitment and study conditions were not provided. There were no significant changes in BMI between intervention arms or over time. Physical activity increased significantly in the record-keeping device and combination groups.

In summary, these studies also resulted in promising findings. Findings indicated significant effects on weight gain prevention for at least one of the intervention arms for three of the four studies. These studies all utilized interventions that were centered upon principles of self-regulation, particularly utilizing self-monitoring as an intervention tool. Despite their relatively small sample sizes, these studies represent promising pilot work for future large-scale intervention studies.

Additional studies addressing weight-related behaviors

Dietary intake—Nineteen interventions (summarized in 21 publications) specifically focused on intervention effects on dietary intake or dietary-related factors. Of these, five interventions were academic nutrition courses,²⁸⁻³⁴ six examined point-of-purchase nutrition labeling in college/university cafeterias,³⁵⁻⁴⁰ four evaluated tailored nutrition messaging interventions (which in some cases included additional components, such as phone calls or motivational interviewing),⁴¹⁻⁴⁴ one evaluated nutrition-centered class-based lessons,⁴⁵ one evaluated the impact of a social marketing campaign,⁴⁶ one examined the impact of cooking videos for college students,⁴⁷ and one evaluated college cooking classes.⁴⁸ Overall, a vast majority of these interventions occurred on traditional, four-year college/university campuses, though one occurred on two-year community college campuses⁴⁶ and one was conducted with a convenience sample of low-income young adults.⁴¹ Several interventions targeted specific dietary components, such as fruits/vegetables,^{41-43,46,47} fiber,⁴⁴ whole grains,³⁴ dietary fat,⁴⁵ or dairy.³²

Overall, the findings from a majority of these studies suggested some positive impact on diet,^{28-30,33,34,38,40-42,44-46} while others indicated positive effects on diet-related correlates (e.g., knowledge, purchasing, attitudes).^{31,32,35-37,47,48} Given the diversity in study designs and assessment methods, however, it is difficult to summarize across studies and/or identify specific types of strategies that were most likely to produce positive effects.

Physical activity—Seven additional interventions (summarized in 8 publications) evaluated interventions that targeted physical activity, but not dietary intake, including moderate- and vigorous-intensity activity, as well as muscle strengthening and flexibility.⁴⁹⁻⁵⁶ Four of the seven interventions included a single-semester college/university academic course for students. In one of these four studies, the academic course was augmented with additional components, including follow-up written material and telephone counseling following the course.⁴⁹ The remaining three physical activity interventions were conducted in college/university settings but were not part of a semester-long academic course.⁵⁴⁻⁵⁶ Two of these studies were delivered online or via email,^{54,55} and two compared results from intervention arms that presented tailored or positively/negatively framed messages.^{55,56} Overall, these physical activity interventions yielded inconsistent effects on activity, with three studies reporting positive effects,⁵³⁻⁵⁵ and others reporting mixed and/or null results.⁴⁹⁻⁵²

Multiple behaviors—One study was identified that targeted multiple weight-related behaviors (e.g., physical activity, diet), as well as other behaviors (sleep, stress, alcohol, tobacco and drug use), but did not assess weight status as an outcome.⁵⁷ This intervention included a multiple health behavior contract/goal-setting and one-on-one tailored health counseling. It took place on a large university campus. Findings indicated some positive influence of the intervention on diet- and physical activity-related behaviors, such as frequency of moderate-intensity physical activity.

Discussion

In this systematic review of young adult weight gain prevention intervention studies, we identified 10 studies that assessed change in weight, BMI, and/or body composition, as well as an additional 27 interventions that addressed other outcomes directly relevant to weight gain, such as dietary intake and physical activity. Of the interventions that examined weight, BMI, or body composition, more than half (6/10) were in the form of university courses or seminars. Although some of these interventions incorporated relatively unique aspects (e.g., focus on eating disorders as well as obesity, use of online course technology, provision of personalized feedback on weight change), many targeted changing knowledge around weight, nutrition, physiology and/or energy balance. Though these are important goals, weight-related interventions focusing primarily on health education and/or knowledge acquisition have come under scrutiny over the past decade for their limited potential to change behavior on their own, particularly when implemented without attention to the contexts in which individuals engage in weight-related behaviors.⁵⁸ The university course-based interventions reviewed here showed some successes in weight gain prevention in convenience samples of traditional post-secondary students (i.e., those attending large, four-year universities), though it is unclear how generalizable these findings are to other potentially higher-risk populations of young adults, such as part-time students, students attending two-year community and technical colleges, and non-students.^{59,60}

In addition, other intervention studies explored alternative strategies for weight gain prevention beyond university courses, though many of these were still highly focused on individual-level intervention delivery. Strategies included self-weighing with routine feedback on weight change and small group-based behavioral weight control classes. These strategies have shown promising results in small-scale pilot studies (e.g., with sample sizes ranging from 11-27 participants in each study arm), but further evaluation of efficacy in fully-powered randomized trials is needed. In addition, given the individualistic nature of some of these intervention approaches, mechanisms for large-scale dissemination and/or institutionalization should be explored. Other promising approaches for addressing weight gain prevention may include strategies such as tailored messaging, point-of-purchase food

labeling in university food service venues, cooking-related skill-building, peer leadership training, social marketing campaigns and use of social media; however, as of yet these strategies have only shown promising influences on mediators of young adult weight change (e.g., dietary intake^{28-30,33,38,40-42,44-46}, physical activity^{55,56}) and have not been directly evaluated within the context of weight change.

Overall, there is an urgent need to develop and evaluate young adult-focused weight gain prevention strategies, particularly in that it is likely that interventions developed for other age groups are not directly transferrable to young adults. This has been the case for behavioral obesity treatment strategies; for example, research with large NIH-funded trials for adult weight loss has shown that not only are young adults substantially underrepresented, but in these trials young adult participants also attended fewer treatment sessions, had higher drop-out rates, and had significantly poorer health outcomes compared to participants of other ages. These findings highlight the fact that the methods employed by existing obesity-related interventions may be unsuitable and ineffective for young adults.

In recent years, there has been a broad array of research focusing on overall population-wide obesity prevention, as well as numerous literature reviews on the topic.^{16,62-67} Although obesity prevention research during young adulthood has been limited, there are important insights that may be drawn from work among other age groups. Promising avenues for future research include obesity prevention interventions that capitalize on the important influence of social networks and peer influences among young adults, as well as other environmental influences, such as those in the home, school and/or workplace settings.³ The integration of technology may be a particularly important strategy among young adults; a recent review of research in this area has highlighted numerous components of internet-delivered health behavior change interventions that have been shown to be generally effective, such as combining tailored communication and the use of reminders and incentives, as well as a number of important research needs for the future.⁶⁸ Furthermore, large-scale, population-wide environmental approaches that target away-from-home food consumption (e.g., nutrition menu labeling in chain restaurants required under the Affordable Care Act) and sugar-sweetened beverage consumption (e.g., proposed increases in sugar-sweetened beverage taxation) may be particularly relevant to the young adult age group, given that individuals of this age are among the highest consumers of fast food and sweetened beverages and these factors yield strong associations with weight gain.³

In designing new intervention strategies, a specific focus on the unique challenges faced by young adults is particularly important. These challenges include the many changes experienced by young adults, such as rapidly shifting life circumstances related to home, work, family and other relationships; difficulties in juggling an array of responsibilities for the first time in one's life;³ continuing cognitive development through the mid-twenties (particularly related to impulsivity and emotional control);^{69,70} and learning the skills needed to manage basic adult responsibilities, such as home food preparation and meal planning.^{71,72} In addition, there are numerous challenges that need to be addressed related to designing intervention strategies to reach young adults who are non-traditional post-secondary students and those not attending a college/university – particularly young adult males and minorities, who have traditionally been underrepresented in weight-related research.^{3,73} It is critical that the public health community develops strategies to effectively reach large populations of young adults both within and outside of traditional university settings. Primary care clinics may be important settings for intervention development, particularly in light of recent health care reform that has granted a wide range of young adults enhanced health care coverage well into their 20s. Health care offered through the US Department of Veterans Affairs may also provide valuable opportunities for the delivery of

preventive services to the estimated 2.2 million veterans who have recently returned to the US after serving in on-going conflict areas overseas, many of whom are young adults.^{74,75}

To our knowledge, this is the first review to address obesity prevention intervention research among young adults. This summary of the literature highlights the scant evidence available on this topic. Although numerous studies have identified promising strategies for young adult obesity prevention, much additional research is needed to explore these issues in more depth. Similarly, a recent review of weight loss (rather than weight gain prevention) interventions among 18-25 year olds yielded parallel findings; the 14 studies reviewed by Poobalan and colleagues identified promising strategies for weight loss, but were limited by a wide array of study design challenges (e.g., small sample sizes, short-term interventions, recruitment difficulties and gender biases in participation rates).⁷³

Overall, a growing body of evidence indicates that the transition from adolescence into the young adult years (e.g., 18-35) is a vulnerable period for excess weight gain. Scant attention has focused on developing and evaluating effective obesity prevention strategies for this age group that can be widely disseminated. Notably, the National Heart, Lung and Blood Institute and the *Eunice Kennedy Shriver* National Institute of Child Health and Human Development recently funded several intervention trials related to young adult weight control;⁷⁶ however, a majority of these on-going trials target weight loss, rather than weight gain prevention. Given the significant needs for research in this area, it may be appropriate for federal funding agencies to appropriate additional funds for a university-based research center to support and continue leading efforts in this area.

Furthermore, although a wide array of national health objectives exist for younger ages, such as Healthy People 2020 adolescent objectives, virtually no objectives exist for young adults. In addition, there is little consensus in the scientific and/or clinical communities as to when “adolescence” ends and “emerging adulthood” or “young adulthood” begins. For example, while some adolescent health organizations, such as the National Incentive to Improve Adolescent Health, define their target age group to include individuals through their mid-20s (10-24 years of age) (<http://www.cdc.gov/HealthyYouth/AdolescentHealth/NationalInitiative/index.htm>), many adolescent efforts define their target populations as individuals up to age 18, 19 and/or 20. The fact that there are such discrepancies in the definition of the “young adult” age group only adds to the challenges in addressing major public health issues of this population. Overall, more attention and research needs to be dedicated to understanding and improving major health issues for this age group, particularly those related to the prevention of excess weight gain.

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References

1. Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999-2008. *JAMA*. Jan 20; 2010 303(3):235–241. [PubMed: 20071471]
2. Ogden CL, Carroll MD, Curtin LR, Lamb MM, Flegal KM. Prevalence of high body mass index in US children and adolescents, 2007-2008. *JAMA*. Jan 20; 303(3):242–249. [PubMed: 20071470]

3. Nelson M, Story M, Larson N, Neumark-Sztainer D, Lytle L. Emerging adulthood and college-aged youth: An overlooked age for weight-related behavior change. *Obesity*. 2008; 16(10):2205–2211. [PubMed: 18719665]
4. Irwin CE Jr. Young adults are worse off than adolescents. *J Adolesc Health*. May; 46(5):405–406. [PubMed: 20413074]
5. Tang JW, Kushner RF, Thompson J, Baker DW. Physician counseling of young adults with rapid weight gain: a retrospective cohort study. *BMC Fam Pract*. 2010; 11:31. [PubMed: 20433703]
6. Gordon-Larsen P, The NS, Adair LS. Longitudinal trends in obesity in the United States from adolescence to the third decade of life. *Obesity (Silver Spring)*. Sep; 18(9):1801–1804. [PubMed: 20035278]
7. DeNavas-Walt, C.; Proctor, B.; Smith, J. *Income, Poverty, and Health Insurance Status in the United States: 2009*. U.S. Government Printing Office; Washington, DC: 2010.
8. Monheit AC, Cantor JC, DeLia D, Belloff D. How have state policies to expand dependent coverage affected the health insurance status of young adults? *Health Serv Res*. Feb; 2011 46(1 Pt 2):251–267. [PubMed: 21054376]
9. Callahan ST, Cooper WO. Uninsurance and health care access among young adults in the United States. *Pediatrics*. Jul; 2005 116(1):88–95. [PubMed: 15995037]
10. Stice E, Chase A, Stormer S, Appel A. A randomized trial of a dissonance-based eating disorder prevention program. *Int J Eat Disord*. 2001; 29(3):247–262. [PubMed: 11262503]
11. Hawks S, Madanat H, Smith T, De La Cruz N. Classroom approach for managing dietary restraint, negative eating styles, and body image concerns among college women. *J Am Coll Health*. 2007; 56:359–366. [PubMed: 18316278]
12. Ames S, Ames G, Stevens S, Patten C, Werch C, Schroeder D. Effect of Expressive Writing as a Treatment Adjust for Reducing Smoking Cessation Related Weight Gain in Young Adult Smokers. *Subst Use Misuse*. 2008; 43:1315–1325. [PubMed: 18696370]
13. Mailey EL, Wojcicki TR, Motl RW, et al. Internet-delivered physical activity intervention for college students with mental health disorders: a randomized pilot trial. *Psychol Health Med*. Dec; 2010 15(6):646–659. [PubMed: 21154018]
14. Bartlett ML, Zizzi SJ. A mixed-method evaluation of a college student fitness program using the RE-AIM framework. *Californian Journal of Health Promotion*. 2010; 8(1):46–59.
15. Abood DA, Black DR, Birnbaum RD. Nutrition education intervention for college female athletes. *J Nutr Educ Behav*. May-Jun;2004 36(3):135–137. [PubMed: 15202989]
16. Stice E, Shaw H, Marti CN. A meta-analytic review of obesity prevention programs for children and adolescents: the skinny on interventions that work. *Psychol Bull*. Sep; 2006 132(5):667–691. [PubMed: 16910747]
17. Stice E, Orjada K, Tristan J. Trial of Psychoeducational Eating Disturbance Intervention for College Women: A Replication and Extension. *Int J Eat Disord*. 2006; 39:233–239. [PubMed: 16498589]
18. Stice E, Ragan J. A preliminary controlled evaluation of an eating disturbance psychoeducational intervention for college students. *Int J Eat Disord*. Mar; 2002 31(2):159–171. [PubMed: 11920977]
19. Matvienko O, Lewis DS, Schafer E. A college nutrition science course as an intervention to prevent weight gain in female college freshmen. *J Nutr Educ*. Mar-Apr;2001 33(2):95–101. [PubMed: 12031189]
20. Gow R, Trace S, SE M. Preventing Weight Gain in First Year College Students: An Online Intervention to Prevent the “Freshman Fifteen”. *Eat Behav*. 2010; 11:33–39. [PubMed: 19962118]
21. Hivert M-F, Langlois M-F, Berard P, Cuerrier J-P, Carpentier A. Prevention of Weight Gain in Young Adults Through a Seminar-Based Intervention Program. *Int J Obes*. 2007; 31:1262–1269.
22. DeVahl J, King R, Williamson J. Academic Incentives for Students Can Increase Participation in and Effectiveness of a Physical Activity Program. *J Am Coll Health*. 2005; 53:295–298. [PubMed: 15900994]
23. Boyle J, Mattern CO, Lassiter JW, Ritzler JA. Peer 2 peer: efficacy of a course-based peer education intervention to increase physical activity among college students. *J Am Coll Health*. Jun; 2011 59(6):519–529. [PubMed: 21660807]

24. Levitsky D, Garay J, Nausbaum M, Neighbors L, DellaValle D. Monitoring Weight Daily Blocks the Freshman Weight Gain: A Model for Combating The Epidemic of Obesity. *Int J Obes*. 2006; 30:1003–1010.
25. Gokee-LaRose J, Tate D, Gorin A, Wing RR. Preventing Weight Gain in Young Adults: A Randomized Controlled Pilot Study. *Am J Prev Med*. 2010; 39(1):63–68. [PubMed: 20537843]
26. Klem M, Wing RR. Primary Prevention of Weight Gain for Women Aged 25-34: The Acceptability of Treatment Formats. *Int J Obes*. 2000; 24:219–225.
27. Cholewa S, Irwin JD. Project IMPACT: brief report on a pilot programme promoting physical activity among university students. *J Health Psychol*. Nov; 2008 13(8):1207–1212. [PubMed: 18987094]
28. Ha E, Caine-Bish N. Effect of nutrition intervention using a general nutrition course for promoting fruit and vegetable consumption among college students. *J Nutr Educ Behav*. 2009; 41:103–109. [PubMed: 19304255]
29. Ha E, Caine-Bish N, Holloman C, Lowry-Gordon K. Evaluation of effectiveness of class-based nutrition intervention on changes in soft drink and milk consumption among young adults. *Nutr J*. 2009; 8:50. [PubMed: 19857266]
30. Hekler EB, Gardner CD, Robinson TN. Effects of a college course about food and society on students' eating behaviors. *Am J Prev Med*. May; 38(5):543–547. [PubMed: 20227847]
31. Mitchell S. Changes after taking a college basic nutrition course. *J Am Diet Assoc*. 1990; 90:955–961. [PubMed: 2365937]
32. Poddar KH, Hosig KW, Anderson ES, Nickols-Richardson SM, Duncan SE. Web-based nutrition education intervention improves self-efficacy and self-regulation related to increased dairy intake in college students. *J Am Diet Assoc*. 2010; 110(11):1723–1727. [PubMed: 21034887]
33. Skinner JD. Change in students' dietary behavior during a college nutrition course. *J Nutr Educ*. 1991; 23:72–75.
34. Ha EJ, Caine-Bish N. Interactive introductory nutrition course focusing on disease prevention increased whole-grain consumption by college students. *J Nutr Educ Behav*. Jul-Aug;2011 43(4): 263–267. [PubMed: 21419709]
35. Buscher L, Martin K, Crocker S. Point-of-purchase messages framed in terms of cost, convenience, taste and energy improve healthful snack selection in college food service settings. *J Am Diet Assoc*. 2001; 101:909–913. [PubMed: 11501865]
36. Chu YH, Frongillo EA, Jones SJ, Kaye GL. Improving patrons' meal selections through the use of point-of-selection nutrition labels. *Am J Public Health*. Nov; 2009 99(11):2001–2005. [PubMed: 19762664]
37. Davis-Chervin D, Rogers T, Clark M. Influencing food selection with point-of-choice nutrition information. *J Nutr Educ*. 1985; 17:18–22.
38. Evans A, Sawyer-Morse M. The right bite program: a theory-based nutrition intervention at a minority college campus. *J Am Diet Assoc*. 2002; 102(3 Suppl):S89–93. [PubMed: 11902398]
39. Freedman M, Connors R. Point-of-Purchase nutrition information influences foodpurchasing behaviors of college students: a pilot study. *J Am Diet Assoc*. 2010; 110(8):1222–1226. [PubMed: 20656098]
40. Peterson S, Duncan DP, Null DB, Roth SL, Gill L. Positive changes in perceptions and selections of healthful foods by college students after a short-term point-of-selection intervention at a dining hall. *J Am Coll Health*. 2010; 58(5):425–431. [PubMed: 20304754]
41. Nitzke S, Kritsch K, Boeckner L, et al. A stage-tailored multi-modal intervention increases fruit and vegetable intakes of low-income young adults. *Am J Health Promot*. 2007; 22:6–14. [PubMed: 17894257]
42. Richards A, Kattelman KK, Ren C. Motivating 18-to 24-year olds to increasing their fruit and vegetable consumption. *J Am Diet Assoc*. 2006; 106(9):1405–1411. [PubMed: 16963345]
43. Park A, Nitzke S, Kritsch K, et al. Internet-based interventions have potential to affect short-term mediators and indicators of dietary behavior of young adults. *J Nutr Educ Behav*. 2008; 40(5): 288–297. [PubMed: 18725147]
44. Brinberg D, Axelson M, Prince S. Changing food knowledge, food choice, and dietary fiber consumption by using tailored messages. *Appetite*. 2000; 35:35–43. [PubMed: 10896759]

45. Finckenor M, Byrd-Bredbenner C. Nutrition intervention group program based on preaction-stage-oriented change processes of the Transtheoretical Model promotes long-term reduction in dietary fat intake. *J Am Diet Assoc.* 2000; 100(3):355–342.
46. Shive SE, Morris MN. Evaluation of the Energize Your Life! social marketing campaign pilot study to increase fruit intake among community college students. *J Am Coll Health.* 2006; 55:33–39. [PubMed: 16889313]
47. Clifford D, Anderson J, Auld G, Champ J. Good Grubbin': impact of a TV cooking show for college students living off campus. *J Nutr Educ Behav.* May-Jun;2009 41(3):194–200. [PubMed: 19411053]
48. Levy J, Auld G. Cooking classes outperform cooking demonstrations for college sophomores. *J Nutr Educ Behav.* Jul-Aug;2004 36(4):197–203. [PubMed: 15544728]
49. Calfas K, Sallis J, Nichols J, et al. Project GRAD: Two-Year Outcomes of a Randomized Controlled Physical Activity Intervention Among Young Adults. *Am J Prev Med.* 2000; 18:28–37. [PubMed: 10808980]
50. Sallis J, Calfas K, Nochols J, Sarkin J, et al. Evaluation of a University Course to Promote Physical Activity: Project GRAD. *Res Q Exerc Sport.* 1999; 70:1–10. [PubMed: 10100330]
51. Cardinal B, Jacques K, Levy S. Evaluation of a university course aimed at promoting exercise behavior. *J Sports Med Phys Fitness.* 2002; 42(1):113–119. [PubMed: 11832885]
52. Claxton D, Wells G. The effect of physical activity among college students. *J Phys Act Health.* 2009; 6(2):203–210. [PubMed: 19420398]
53. Jackson EM, Howton A. Increasing walking in college students using a pedometer intervention: differences according to body mass index. *J Am Coll Health.* 2008; 57:159–164. [PubMed: 18809532]
54. Ornes L, Ransdell LB. Web-based physical activity intervention for college-aged women. *International Electronic Journal of Health Education.* 2007; 10:126–137.
55. Parrott M, Tennant L, Olejnik S, Poudevigne. Theory of Planned Behavior: Implications for an email-based physical activity intervention. *Psychology of Sport and Exercise.* 2008; 9:511–526.
56. Jung T, Heald GR. The effects of discriminate message interventions on behavioral intentions to engage in physical activities. *J Am Coll Health.* Mar-Apr;2009 57(5):527–535. [PubMed: 19254894]
57. Werch C, Blan H, Moore M, Ames S, DiClemente C, Weller R. Brief multiple behavior interventions in a college student health care clinic. *J Adol Health.* 2007; 41:577–585.
58. Jeffery RW. Public health strategies for obesity treatment and prevention. *Am J Health Behav.* May-Jun;2001 25(3):252–259. [PubMed: 11322624]
59. Nelson MC, Larson NI, Barr-Anderson D, Neumark-Sztainer D, Story M. Disparities in Dietary Intake, Meal Patterning, and Home Food Environments Among Young Adult Nonstudents and 2- and 4-Year College Students. *Am J Public Health.* May 14.2009
60. Laska MN, Pasch K, Lust K, Story M, Ehlinger E. The differential prevalence of obesity and related behaviors in two-versus four-year colleges. *Obesity.* Oct.2010 21 2010, Advanced Online Publication.
61. Gokee-Larose J, Gorin AA, Raynor HA, et al. Are standard behavioral weight loss programs effective for young adults? *Int J Obes (Lond).* Sep 29.2009
62. Lombard CB, Deeks AA, Teede HJ. A systematic review of interventions aimed at the prevention of weight gain in adults. *Public Health Nutr.* Nov; 2009 12(11):2236–2246. [PubMed: 19650959]
63. Lemmens VE, Oenema A, Klepp KI, Henriksen HB, Brug J. A systematic review of the evidence regarding efficacy of obesity prevention interventions among adults. *Obes Rev.* Sep; 2008 9(5): 446–455. [PubMed: 18298429]
64. Brown T, Avenell A, Edmunds LD, et al. Systematic review of long-term lifestyle interventions to prevent weight gain and morbidity in adults. *Obes Rev.* Nov; 2009 10(6):627–638. [PubMed: 19754634]
65. Hardeman W, Griffin S, Johnston M, Kinmonth AL, Wareham NJ. Interventions to prevent weight gain: a systematic review of psychological models and behaviour change methods. *Int J Obes Relat Metab Disord.* Feb; 2000 24(2):131–143. [PubMed: 10702762]

66. Kremers S, Reubsæet A, Martens M, et al. Systematic prevention of overweight and obesity in adults: a qualitative and quantitative literature analysis. *Obes Rev.* May; 2010 11(5):371–379. [PubMed: 19538441]
67. Mayer K. Childhood obesity prevention: focusing on the community food environment. *Fam Community Health.* Jul-Sep;2009 32(3):257–270. [PubMed: 19525707]
68. Crutzen R, de Nooijer J, Brouwer W, Oenema A, Brug J, de Vries NK. Strategies to facilitate exposure to internet-delivered health behavior change interventions aimed at adolescents or young adults: a systematic review. *Health Educ Behav.* Feb; 2011 38(1):49–62. [PubMed: 21189422]
69. Giedd JN. Structural magnetic resonance imaging of the adolescent brain. *Ann N Y Acad Sci.* Jun. 2004; 1021:77–85.
70. Cunningham MG, Bhattacharyya S, Benes FM. Amygdalo-cortical sprouting continues into early adulthood: implications for the development of normal and abnormal function during adolescence. *J Comp Neurol.* Nov 11; 2002 453(2):116–130. [PubMed: 12373778]
71. Larson NI, Perry CL, Story M, Neumark-Sztainer D. Food preparation by young adults is associated with better diet quality. *J Am Diet Assoc.* Dec; 2006 106(12):2001–2007. [PubMed: 17126631]
72. Laska MN, Graham D, Moe S, Lytle L, Fulkerson J. Situational characteristics of young adult eating occasions: A real-time data collection using Personal Digital Assistants. *Public Health Nutr.* Dec 8.2010 :1–8. [Epub]. [PubMed: 21138611]
73. Poobalan AS, Aucott LS, Precious E, Crombie IK, Smith WC. Weight loss interventions in young people (18 to 25 year olds): a systematic review. *Obes Rev.* Aug; 2010 11(8):580–592. [PubMed: 19874531]
74. VA Office of Public Health and Environmental Hazards. Analysis of VA Health Care Utilization among Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF) Veterans. Apr. 2011
75. Widome R, Littman AJ, Laska MN, Fu SS. Preventing chronic illness in young veterans by promoting healthful behaviors. *Prev Chronic Dis.* Jan.2012 9:E19. [PubMed: 22172186]
76. Loria CM, Signore C, Arteaga SS. The need for targeted weight-control approaches in young women and men. *Am J Prev Med.* Feb; 2010 38(2):233–235. [PubMed: 20117581]

Implications and contributions

This is the first systematic review of its kind to address obesity prevention intervention research studies among young adults, aged 18-35. This summary of the literature highlights the limited evidence available on this topic, and the urgent need to develop and evaluate young adult-focused weight gain prevention strategies.

Reference	Sample Study	Design	Description of Intervention	Primary outcomes of interest	Summary of primary weight-related findings
	<p>Internet intervention group: n=40; feedback intervention: n=39; combined intervention: n=40; controls: n=40</p> <p>Age 22y (mean=18.1y), 74.2% female, 46.6% non-white</p> <p>Baseline BMI (mean±SD)=25.0±5.4 in Internet intervention; 24.7±4.9 in feedback; 23.6±5.2 in combined; 24.1±4.7 in control</p>		<p>delivered in 6 weekly, intensive (45 min) sessions, covering topics on obesity and weight-related behaviors consisting of online facilitated discussions, homework assignments, and additional materials posted on the website, (b) feedback only intervention, which included weekly self-weighting and weekly feedback in the form of individualized change graphs, (c) combined internet and feedback intervention, and (d) no treatment control group.</p>	<p>and BMI post-intervention, after controlling for baseline weight and/or BMI.</p>	<p>group had a significantly lower mean BMI than the control group (p<0.05), after adjusting for baseline BMI.</p> <p>Mean BMIs of the feedback only and intervention only groups did not differ significantly from that of controls.</p>
Hivert et al, 2007	<p>First- and second-year students at a 4-year, Canadian university</p>	<p>2-year RCT.</p>	<p>Small-group seminar (45 min) every 2 weeks for first 2 months, then every month for the remainder of the study period, excluding summers. The aims of the seminar were to increase knowledge around weight gain, diet, exercise, health maintenance, and behavioral modification methods.</p>	<p>Mean change in measured weight and BMI at 12- and 24-month follow-up</p>	<p>The control group gained 1.2±0.5kg and 0.7±0.6kg by 12 and 24 months, respectively. The intervention group lost 0.2±0.4kg and 0.6±0.5kg, respectively. Trends between the groups was significant (p=.04).</p>

Reference	Sample Study	Design	Description of Intervention	Primary outcomes of interest	Summary of primary weight-related findings
	<p>Intervention: n=58, mean age=19.9y, 81% female, 7% non-white</p> <p>Control: n=57, mean age=19.5y, 82% female, 7% non-white</p> <p>Baseline BMI (mean±SE)=22.4±0.4 in Intervention; 22.4±0.3 in Control</p>				<p>The control group increased BMI by 0.4±0.2 and 0.2±0.2 by 12 and 24 months, respectively. The intervention group decreased BMI by 0.1±0.1 and 0.3±0.2. Trends between groups was significant (p=.01).</p>
DeVahl et al, 2005	Physical therapy students enrolled in cardiopulmonary patient management course	12-week intervention	<p>Participation in a low-intensity aerobic exercise program during the course of the semester. Course bonus points awarded for students who reduced their percent body fat. Those in intervention group 1 (single exam bonus) received 1 bonus point on an exam. Those in intervention group 2 (grade bonus) received the same number of bonus points on their overall grade, i.e., a more attractive incentive.</p>	<p>Mean change in percent body fat, assessed via 4 skinfold measurements administered by peer participants in the intervention</p>	<p>Group assignment significantly predicted percent body fat loss, with those in the course grade group losing a greater percent body fat. The course grade bonus group reduced their body fat by 3.3±1.7 percent, whereas the single exam bonus group reduced body fat by only 1.4±1.2 percent (p<.005).</p>
Boyle et al, 2011	Undergraduate students	4-month trial with		<p>Intervention group 1 (single exam bonus): n=92, 69.6% female, mean age=26.8y</p> <p>Intervention group 2 (course grade bonus): n=89, 67.4% female, mean age=28.1y</p> <p>Baseline percent body fat (%), SD)=24.9±4.9 in group 1; 23.8±5.2 in group 2</p>	<p>One-semester course</p> <p>Between-group</p> <p>Women in the</p>

Reference	Sample Study	Design	Description of Intervention	Primary outcomes of interest	Summary of primary weight-related findings
	enrolled in a required personal health course at a public, 4-year college	assignment to students' preferred arm of the study and some random reassignment to control condition	requiring students to set individualized goals, plans and rewards for behavior change, complete a weekly journal on adherence to their plan, and write a final report on their achievements. Intervention participants additionally received weekly feedback from individually-assigned peer educators, upper-level students who assisted in the design of an appropriate exercise plan, modified the plan in response to participant adherence, and provided timely exercise advice and positive reinforcement.	changes in percent body fat, assessed via 3 skinfold measurements administered by trained study technicians, and measured waist-to-hip ratio	intervention group who were active at baseline decreased their waist-to-hip ratio by 0.02 while baseline active women in the control group increased their waist-to-hip ratio by 0.02 ($p < 0.05$ for treatment*time interaction). There were no significant intervention effects for men.
	Intervention group (assigned peer educator to assist with behavior change): n=86 Control group (no outside help for behavior change): n=92 Mean age 21y, 74% female, 9% non-white				

Other intervention strategies

Levitsky et al, 2006	Female freshman students at Cornell University Trial 1: intervention n=11, control n=15, 18-21 years Trial 2: intervention n=16, control n=16, 18+ years	Two independent, 10-week RCTs	Participants measured their own weight daily and reported the value by e-mail to research staff. For Trial 1, participants were sent daily e-mails with the slope of their weight change over the past week. For Trial 2, participants were sent daily e-mails with the number of calories they would have to increase/decrease in order to hold their body	Measured mean change in weight over 10 weeks	Control group participants in each trial gained weight (3.1 ± 0.51 kg and 2.0 ± 0.65 kg, $p < .01$ for both trials). Intervention group participants did not report significant changes in weight (0.1 ± 0.99 kg and -0.82 ± 0.56 kg).
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Reference	Sample Study	Design	Description of Intervention	Primary outcomes of interest	Summary of primary weight-related findings
Gokee-LaRose et al, 2010	Baseline weight in kg (mean±SD)=62.5±10.2 in Trial 1; 62.0±8.6 in Trial 2 Young adults (98% female) ages 18-35 years who were living in Providence, RI or Chapel Hill, NC	16-week randomized trial	Participants attended 8 weekly meetings, then 2 monthly meetings at which they were taught behavioral weight control skills and self-regulation principles. All participants were told to weigh themselves daily and, if they were above their goal weight, to make changes within the context of the small or large changes approach. The small changes approach focused on discrete changes that could be made on a daily basis throughout the year. The large changes approach encouraged adherence to a specific calorie goal and 50 minutes/day of structured activity for eight weeks/year.	Measured mean change in weight at eight weeks and at 16 weeks	At eight weeks, participants in the small changes intervention had lost 0.68 ± 1.5 kg and those assigned to the large changes intervention had lost 3.2 ± 2.5 kg (between group comparison p<0.001).
	Small changes intervention: n=21 Large changes intervention: n=23				At 16 weeks, participants in the small changes intervention had lost 1.5 ± 1.8 kg and those assigned to the large changes intervention had lost 3.5 ± 3.1 kg (between group comparison p=0.006).
Klem et al, 2000	Baseline BMI (mean±SD) for both groups= 26.7±2.4 Women ages 25-34 years who were living in Pittsburgh, PA	10-week RCT	Both intervention formats were based on the premise that normal-weight individuals can reduce their risk of future weight gain by learning	Measured mean change in weight over 10 weeks and at 6-month follow-up, proportion of	At post-treatment (10 weeks), participants in the group intervention had lost significantly more weight than those in the control condition (-1.9 ± 1.8 kg

Reference	Sample Study	Design	Description of Intervention	Primary outcomes of interest	Summary of primary weight-related findings
	<p>Group intervention: n=14</p> <p>Correspondence intervention: n=27</p> <p>Control: n=24</p> <p>Baseline BMI (mean±SD)=22.4±1.0 in Group; 22.6±1.0 in Control</p> <p>Correspondence; 22.4±0.8</p>		<p>how to use behavioral weight control skills (e.g., self-monitoring, stimulus control, problem-solving). All participants were given dietary and exercise goals and asked to set a healthy weight range determined by their baseline weight. Participants in the group intervention attended weekly group meetings where they received training in behavioral weight control skills. Participants in the correspondence intervention were mailed one lesson per week and completed brief homework assignments.</p>	<p>women who remained at or below their baseline weight</p>	<p>versus -0.2 ± 1.3 kg, $p<0.05$). Participants in the intervention did not lose significantly more weight than those in the control condition.</p> <p>There were no significant group differences in mean weight change at 6-month follow-up. There were no differences in the proportion of women in each group who were at or below their baseline weight at 10 weeks or at 6 months.</p>
Cholewa and Irvin, 2008	<p>Full-time students from five academic disciplines at the University of Western Ontario.</p> <p>n=51, 82.4% female,</p>	<p>9-week trial with assignment to students' preferred arm of study</p>	<p>Participants were paired with a same-sex individual to work together increasing physical activity (buddy system), tracked their physical activity using a record-keeping device, or both for the duration of the intervention.</p>	<p>Measured mean change in BMI calculated from self-reported height and weight between baseline and weeks 5, 8 and 9.</p>	<p>There were no significant changes in BMI over time.</p>

Reference	Sample Study	Design	Description of Intervention	Primary outcomes of interest	Summary of primary weight-related findings
	76.5% baseline BMI < 25				