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Weight management interventions targeting young women: a systematic review

Abstract

Young women are at high risk of weight gain. The aim of this systematic review was to evaluate randomized controlled trials (RCTs) of weight management interventions specifically targeting young women. Nine databases were searched from 1980 to December 2011 for RCTs that recruited females aged 18 to 35 years, evaluated a weight management intervention and reported weight as the primary outcome. Eight studies, of moderate to poor quality, met the inclusion criteria. Three interventions were specifically designed for young women and compared behavioral weight gain prevention interventions, to control groups. Four of the five remaining studies evaluated weight gain prevention interventions, including daily weighing with feedback (n=2), a science course (n=1), and exercise programs (n=1). The one weight loss intervention, lowered the energy-density of the diet (n=1). Intervention lengths ranged from four weeks to one year, and only three studies followed-up participants post-intervention. Retention rates ranged from 54% to 100% at post-intervention, with half of the studies' retention rates less than 80%. Five studies reported significant differences in weight change in the intervention group (+0.1 to -1.9kg) compared to controls (-0.2 to +3.1kg) post-intervention. The available evidence suggests weight management interventions targeting young women are limited in number and quality, and are highly heterogeneous. Therefore their overall effectiveness cannot be established at this time. High quality RCTs evaluating interventions that are tailored to the unique needs of young women, and that can be disseminated broadly are urgently needed to address the unmet needs of this high-risk group.

Introduction

Early adulthood is a vulnerable life stage for weight gain amongst women.¹ Large cohort studies, in Australia and the US, report an average weight gain of 6.3kg to 11.7kg amongst females during the transition from their twenties to thirties.^{1,2} Furthermore, the number of women entering early adulthood already overweight or obese is also increasing. For example, from 1995 to 2011 combined rates of overweight and obesity (Body Mass Index (BMI) ≥ 25) rose from 26% to 35% among 18 to 24 year old Australian women.³

Weight gain during early adulthood increases the risk of developing a number of chronic health conditions. The Nurses' Health study demonstrated that, after 18 years of age, women were 1.9 times more likely to develop Type 2 diabetes if they gained 5kg to 8kg and 2.7 times more likely if they gained 8kg to 11kg.^{4,5} Additionally, the risk of coronary heart disease increased by 3.1% for every 1kg gained after 18 years of age.^{4,5} Furthermore, progression to obesity during young adulthood also increases a woman's risk of depression, polycystic ovarian syndrome, infertility and adverse pregnancy outcomes in the short-term.^{6,7}

Therefore, interventions capable of reversing this weight gain trajectory, or preventing young women's progression to obesity, have the potential to have a considerable impact on improving health and well-being at a population level. However, traditional behavioral weight management interventions may not meet the needs of many young adults, as evidenced by lower recruitment and retention rates, inferior attendance and compliance, and poorer weight loss outcomes, in comparison to older adult participants.⁸ Three recent systematic reviews have assessed the effectiveness of weight management interventions for young adults.⁹⁻¹¹ Their findings were inconclusive due to the small number of available studies,⁹ small sample sizes,^{9,11} heterogeneity of intervention design,^{9,10} differences in participant characteristics,⁹ and short

intervention durations.^{9,11} However, the effectiveness of weight management interventions in young adult females alone has not been assessed. Therefore, the primary aim of this systematic review was to evaluate the efficacy of weight management interventions that target young women, aged 18 to 35 years, in improving weight-related and behavioral outcomes.

Methods

Inclusion criteria

Randomized controlled trials (RCTs) that recruited young women, aged 18-35 years, with a primary aim of achieving weight management in at least one intervention study arm were included. Weight management incorporated weight loss, maintenance of lost weight, prevention of weight gain, and weight maintenance. To be included in the review studies must have measured and reported weight-related outcomes (e.g. weight, body mass index (BMI), percentage body fat) as the primary outcome. The review specifically focused on lifestyle interventions that promoted changes to dietary behaviors, physical activity behaviors, or other behavioral skills associated with weight management (e.g. self-monitoring). Surgical interventions and drug trials were excluded. Other studies excluded were those that recruited pregnant or postpartum women or participants who had a recent history of major health conditions such as coronary heart disease, diabetes, mental disorders or eating disorders.

Search strategy

The search strategy identified studies published in the English language from 1980 to December 7, 2012. The search commenced from 1980 as the prevalence of overweight and obesity increased rapidly from this time.¹² Keywords were determined from an initial search in

MEDLINE, which were used to search the following databases: CINAHL, The Cochrane Library, Dissertations & Theses, EMBASE, MEDLINE/PREMEDLINE, PsycINFO, PubMed, Scopus, and Web of Science. Key terms used in the search were: randomized controlled trial, clinical trial, intervention studies, evaluation studies, intervention, trial, obesity, overweight, weight gain prevention, weight loss, weight maintenance, weight reduction, weight control, weight intervention, behavior intervention, lifestyle intervention, diet intervention, physical activity intervention, and exercise intervention. The reference lists of all included studies and relevant review articles identified from the initial search were also reviewed to identify additional studies for inclusion.

Study selection

The titles and abstracts of all studies were evaluated against the inclusion criteria. The full articles of all studies that met the inclusion criteria or where it was unclear whether they met the inclusion criteria were retrieved. All full text articles were screened for inclusion or exclusion. Authors of articles were contacted when it was unclear whether studies met the inclusion criteria for participant age (i.e. only mean age of participants reported, not range).

Risk of bias

Methodological validity was assessed using a standardized critical appraisal instrument from the Joanna Briggs Institute (JBI) Meta-Analysis of Statistics Assessment and Review Instrument.

Data extraction and synthesis

Data extraction was completed using a standardized data extraction form developed by the researchers. Data in relation to methodology, intervention effect on weight, dietary intake and physical activity were extracted, and described in a narrative synthesis.

Results

Characteristics of included studies

Of the 3800 articles identified, 445 full text articles were retrieved. Eight articles met the inclusion criteria. One article described two studies,¹³ and two articles described the same study.^{14,15} Therefore eight separate studies were included in the review (Table 1).¹³⁻²⁰

The total number of participants across all studies was 452 (mean n=57, range 23-129). Intervention length ranged from four weeks¹⁹ to one year.¹⁶ Only three studies conducted post-intervention follow-up measurements. Retention rates varied from 54 to 100% at the post-intervention time point, with three studies retaining greater than 80% of participants.¹⁸⁻²⁰ Five studies were conducted in the US,^{13,15,17,18} with the others conducted in Sweden,¹⁶ Korea¹⁹ and Australia.²⁰

Most interventions (n=7) focused on weight gain prevention,^{13,15-19} with one aimed at weight loss.²⁰ Half of the studies did not specify a BMI inclusion criterion for participants, while two specifically recruited overweight/obese participants,^{15,19} one recruited healthy weight individuals,¹⁷ and one study excluded only individuals who were underweight.¹⁶ Three studies compared behavioral weight gain prevention interventions to a no intervention waiting list control group¹⁶ or a usual care control group.^{15,17} The behavioral interventions were delivered using different mediums (DVD with teleconferences;¹⁵ telephone and email with minimal face-to-face contact;¹⁶ and face-to-face group meetings with correspondence via mail¹⁷). The

remaining five studies were diverse and compared daily weighing with feedback to no intervention;¹³ science education delivered via a college course to no intervention;¹⁸ a low energy density diet to a higher energy density diet;¹⁹ and a high intensity intermittent exercise program to a steady state exercise program and a usual exercise control group.²⁰ Notably, only three interventions were specifically designed for young women.^{14,16,17} Other studies (n=2) recruited young women because they were more likely to volunteer than men¹³ and one included only females because no males responded to recruitment.¹⁸

Risk of bias

None of the included studies met all 10 requirements to be considered a high quality study (Table 2). Four studies met six of the requirements.^{9,15,19,20} Although all studies were described as RCTs, none specified the method of randomization or whether allocation of participants to a treatment group was concealed from the allocator. Only one study reported that research personnel assessing the outcomes were blinded to treatment allocation¹⁵ and only one reported the participants were blinded to treatment allocation.¹⁹ Only four studies conducted an intention-to-treat analysis,^{15,16,19,20} however two of these studies reported no drop-outs.^{19,20} For half of the studies the control and treatment groups were similar at baseline,^{15,16,18,20} while this was not reported in the other four studies. All studies treated the intervention and control groups identically and measured the outcomes in the same way for all groups. Most studies used appropriate statistical analysis, except one study which did not specify how the analysis was undertaken.¹³ Five studies measured outcomes using a reliable method,¹⁶⁻²⁰ while the other three did not specify how outcomes were measured.

Effectiveness of weight management interventions for young women

Change in weight-related outcomes

Table 3 reports the weight-related outcomes of included studies. Five studies reported statistically significant differences in weight or weight change in the intervention group compared to the control group,^{13,16,17,20} and were therefore deemed effective.

Two of the three behavioral weight gain prevention interventions were effective. Eiben et al. demonstrated that a telephone and email intervention, with minimal face-to-face contact achieved significantly greater weight loss after one year compared to a wait-list control group (-1.9kg versus +2.6kg, $p=0.041$ ITT).¹⁶ Klem et al. showed face-to-face group meetings for 10 weeks resulted in significantly greater weight loss compared to the control group (-1.9kg versus -0.2kg, $p=0.03$), but not compared to those who received the intervention via mail correspondence (-1.1kg). Furthermore, the significant differences were not maintained at six months post-intervention.¹⁷ A 10 week behavioral weight gain prevention program delivered via DVD and telephone produced similar changes in weight to a usual care control group after eight months.¹⁵

Of the remaining five interventions, three were effective. Levitskey et al. showed in two studies that a minimal intervention, where young women weighed themselves daily for 10 weeks and were provided with feedback on energy needs for weight maintenance, resulted in weight stability compared to controls who gained weight (1: +0.1kg versus +3.1kg, 2: -0.8kg versus +2.0kg, $p<0.01$).¹³ Young women who participated in a high intensity intermittent exercise program for 15 weeks lost weight, compared to the control group who gained weight (-1.5kg versus +1.4kg, $p<0.01$). In comparison young women who participated in the steady state exercise program remained weight stable (-0.1kg).²⁰ No significant differences in weight change were found post-intervention or one year post intervention between women randomized to a four

month nutrition science college course compared to the control group.¹⁸ Likewise, there was no difference in weight between women randomized to a four week low energy density diet to a high energy density diet.¹⁹

Changes in dietary intake

Three studies assessed dietary intake (Table 4).^{15,16,18} Two studies reported energy and macronutrient intake, measured using a semi-quantitative food frequency questionnaire^{16,18} and the other study reported fat, fruit and vegetable intake measured using two dietary screeners.¹⁵ Females significantly reduced energy, protein and carbohydrate intake following a four month college science course compared controls, but these differences were not sustained one year post-intervention. However, the intervention produced significantly lower fat intake after one year compared to the control group.¹⁸ The other studies found no significant changes in dietary intake between groups post-intervention.^{15,16}

Changes in physical activity

Three studies assessed physical activity (Table 4).^{15,16,20} Two studies used self-report questionnaires to estimate time spent in moderate physical activity,^{15,16} while one measured fitness level using VO₂-max testing¹⁶ and one assessed heart rate and peak aerobic power.²⁰ Eiben et al. demonstrated individuals randomized to a one year behavioral weight gain prevention intervention, delivered predominantly via telephone and email, achieved significantly higher physical activity levels, but not fitness levels post-intervention compared to the control group.¹⁶ Trapp et al. demonstrated an increased peak absolute oxygen uptake after 15 weeks in the high intensity intermittent exercise and steady state exercise groups compared to the control

group.²⁰ Chang et al. found no significant differences in physical activity levels between groups post-intervention.¹⁵

Discussion

Given the growing incidence of weight gain amongst women during early adulthood,^{1,2} identifying appropriate weight management interventions for young women has the potential to significantly improve their health and wellbeing. This is the first systematic review to specifically evaluate weight management interventions targeting young women. Only eight eligible RCTs published in a period spanning more than 30 years were identified. Of these only three were specifically designed for young women. Overall, the majority (n=5) of interventions achieved statistically significant improvements to participants weight status when compared to no intervention control groups or usual care, and were therefore deemed effective. However, the heterogeneity of intervention types, components and duration, the small sample sizes and the moderate to poor quality ratings of the included studies make it difficult to ascertain the overall effectiveness of weight management interventions targeting young women.

Two of the five effective interventions were weight gain prevention programs that targeted diet, exercise and behavior change using different modes of delivery. Eiben et al. used initial face-to-face contact followed by ongoing regular telephone and e-mail contact for one year,¹⁶ while Klem et al. utilized weekly group meetings for 10 weeks. Conversely, Levitsky et al. demonstrated in two studies that a low intensity intervention, where young women weighed themselves daily and received feedback on energy needs for weight maintenance, resulted in weight stabilization over 10 weeks, compared to the control group who gained weight.¹⁷ Finally, an intervention that included 45 high intensity intermittent exercise sessions over 15 weeks

achieved significant weight loss compared to a no intervention control group.²⁰ Therefore, there are a small number of weight management interventions specifically targeting young women that have shown limited success in the short term. Of note, only three of the included studies followed-up participants upon completion of the intervention,^{14,17,18} none of which were effective in the long-term. Dietary intake and physical activity were only evaluated as secondary outcomes in three studies,^{14,16,18,20} and the reported measurement and outcomes differed across studies, making it difficult to compare studies. Therefore, the short and long-term effectiveness of weight management interventions targeting young women, and the impact on diet and physical activity behavior change remains unclear.

The poor methodological quality of most included studies further weakens the current evidence base. Most included studies were preliminary pilot studies with small sample sizes and not large-scale efficacy RCTs. Generally studies did not adequately describe the methods of the trial (e.g. randomization method, allocation concealment, assessor blinding). If these elements of the trial were not of high methodological quality (e.g. use of non-randomized methods for treatment allocation), the risk of bias is likely to be high thereby threatening the internal validity of the study. Furthermore, half of the studies did not conduct intention-to-treat analyses. Three of these studies showed significant differences between treatment and controls groups, which may not have been evident if all participants who commenced the trial were included in the analysis. Overall, to improve the methodological quality of future RCTs studies should be designed and reported as per the Consolidated Standards of Reporting Trials Statement.²¹

This systematic review had a number of methodological strengths and limitations that should be considered when interpreting the results. Strengths include the use of a comprehensive search strategy, along with standardized data extraction and critical appraisal tools. Furthermore,

the review was designed and reported as per the Transparent Reporting of Systematic Reviews and Meta-Analysis Statement.²² However, only studies that were published in English and that reported weight as a primary outcome were included. This may have reduced the number of included studies, but ensured the review was explicitly focused on weight management interventions with a primary aim to achieve weight change.

Overall, research assessing the effectiveness of weight management interventions specifically targeting young women is only in its infancy, with research conducted to date appearing uncoordinated. This is potentially due to perceived difficulties in reaching and engaging this target group due to the life transitions that occur during early adulthood (e.g. work, study, marriage, pregnancy), or because weight gain is a relatively new priority health problem in this age group. Most of the studies included in this systematic review did not evaluate weight management interventions specifically designed with the unique needs of young women in mind. Instead studies recruited young women to ensure a homogenous sample or for convenience. Therefore, most are limited in their capacity to be translated at the population level to prevent unhealthy weight gain during this important life stage. Furthermore, three of the five weight management interventions that were deemed effective were intensive in terms of the commitment required by participants and intervention providers. This further limits the external validity of the findings as they are impractical to implement on a large scale. However, studies that evaluated similar interventions using less intensive modes of delivery (e.g. mail and DVD) were not effective in achieving significant weight change when compared to usual care. Therefore, a strategic and comprehensive approach to research in this area is required. High quality RCTs, with adequate sample sizes, study designs and follow-up periods that extend beyond the intervention period are essential. More specifically, interventions that can be

translated at the population level and that also appeal to young women (e.g. online, mobile phones) should be a priority.

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