Literature Review

Weight Loss Interventions for Adult Obesity: Evidence for Practice

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ABSTRACT

Background: One out of three adults is obese, making obesity the most common presenting chronic medical condition in the primary care setting. Obesity is associated with an increased risk of developing secondary illnesses resulting in a higher rate of morbidity. This chronic condition is a constant challenge facing international health care systems. A need for a systematic approach to treatment is essential to conquering obesity and improving patients' outcomes and quality of lives. Despite the existence of evidence-based guidelines, the proportion of primary care clinicians implementing weight loss counseling is low.

Approach: This article identifies, critiques, and synthesizes the established body of research evidence for weight loss interventions.

Findings: The strategies that have been shown to be effective in the management and treatment of obesity are outlined.

Implications: Finally, the feasibility of applying these findings to practice and the practical implications of these findings are discussed.

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KEYWORDS obesity, weight loss, diet, exercise, randomized controlled trial (RCT)

BACKGROUND

Globally, the epidemic of obesity negatively impacts the health of more than one third of the adult population producing profound implications and challenges for the public health of the world, as well as the health care clinicians that manage and treat this condition (Gallagher 1999; Management of obesity 2004). Obesity has become a leading health concern second only to smoking because this condition is a chronic, complex, multifactorial disease in which a person's weight is 20% or more than the ideal weight for a given height (Fulton 2001). A common measure expressing this weight-to-height relationship is the body mass index (BMI), which defines individuals with a BMI of 25 to 29.9 kg/m^2 as overweight and individuals with a BMI of 30 kg/m^2 or more as obese (NHLBI 1998). The growing trend of these two health conditions is associated with an increased risk of morbidity from hypertension, type 2 diabetes mellitus, dyslipidemia, coronary heart disease, gallbladder disease, stroke, osteoarthritis, sleep apnea (among other respiratory conditions), and different forms of cancer such as endometrial, breast, colon, and prostate (Rippe et al. 1998). The combination of obesity and its associated morbidities compromises the health of obese people by negatively impacting on their quality of life and decreasing their life expectancy (Thompson et al. 1999). This results in a global economical burden in both direct health care costs and indirect costs (Allison et al. 1999; Management of obesity 2004). This article critiques and synthesizes the established body of research evidence about interventions for weight loss. It then considers the feasibility of applying these findings to practice.

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CLINICAL PROBLEM

The negative health consequences of obesity have triggered health care clinicians to search for effective strategies that achieve optimal health outcomes within the financial constraints of a managed care environment (Nonas 1998). Many factors contribute to the imbalance between energy

consumption and energy expenditure in obese individuals (Rippe et al. 1998). As genetics is a key cause of obesity and is an unmodifiable risk factor (Fulton 2001), modifiable lifestyle determinants, such as nutrition and level of physical activity, have become the focus for the increased incidence and growing prevalence of the condition (Rippe et al. 1998). In spite of this, primary care clinicians continue to either withhold weight loss counseling altogether (Rippe et al. 2001) or recommend invalid weight loss programs (Miller et al. 1997) because the therapeutic effectiveness of diet, exercise, or diet plus exercise is debated. Because obesity is one of the most common presenting chronic medical conditions in primary care, health care providers need to be able to determine what strategies are effective in the management and treatment of this condition so that improved patient outcomes are met resulting in decreased morbidity and mortality (Gallagher 1999). The remainder of this article identifies, critiques, and synthesizes the research evidence for effective interventions for adults with obesity.

LITERATURE SEARCH

The literature search was completed in MEDLINE and Cochrane Database of Systematic Reviews using the key words obesity, weight loss, diet-reducing, and exercise. Limits set were meta-analyses or clinical trials, from 1990 to present, in English only, and research analyzing adult men and/or women. This search resulted in five clinical trials and a meta-analysis that included 493 randomized clinical trials (RCTs) on the therapeutic effectiveness of diet, exercise, and diet plus exercise programs in reducing obesity in adults.

CRITIQUE AND SYNTHESIS OF RESEARCH

The studies reviewed included five RCTs examining obese men and premenopausal women aged 19 to 48 years ($N = 65$; Geliebter et al. 1997), overweight men aged 23 to 46 years ($N = 35$; Kraemer et al. 1999), overweight postmenopausal women aged 45 to 54 years ($N = 121$; Svendsen et al. 1993), obese premenopausal women aged 28 to 46 years ($N = 38$; Janssen et al. 2002), and obese women aged 25 to 75 years ($N = 91$; Utter et al. 1998). A meta-analysis (Miller et al. 1997) of 493 randomized clinical studies (N ranged from 3 to 2,869) analyzed studies of obese adults aged 18 to 68 years. All of these studies, except the RCT conducted by Janssen et al. (2002) included strong representation of subjects in good health with no known diseases except for being obese or overweight. Only Utter et al. (1998) reported the race of the sample, which was Caucasian. The meta-analysis reported that 46% of the sample populations were women with only 26% being men and 28% having either both genders or not reporting group gender at all (Miller et al. 1997).

A true experimental design, specifically a pretest-posttest design, was utilized in each of the five RCTs in order to compare the treatment of diet only versus the combination of diet and aerobic exercise on body composition. A measure of body composition was collected a week prior to the implementation of the intervention and following the conclusion of each of the studies (Svendsen et al. 1993; Geliebter et al. 1997; Utter et al. 1998; Kraemer et al. 1999; Janssen et al. 2002). However, the duration in which the studies were conducted varied from 8 weeks (Geliebter et al. 1997), to 12 weeks (Svendsen et al. 1993; Utter et al. 1998; Kraemer et al. 1999), to 16 weeks (Janssen et al. 2002). These five studies found that the addition of aerobic exercise to an energy-restrictive diet produces no additional benefits over dieting alone with regards to changes in body composition or accelerating diet-induced losses in body fat mass in adult men or women. However, numerous psychological and physical benefits were identified about the role exercise plays in promoting functional health and independence, as well as enhancing overall quality of life in obese and overweight adult individuals (Svendsen et al. 1993; Geliebter et al. 1997; Utter et al. 1998; Kraemer et al. 1999; Janssen et al. 2002).

After examining the effects of diet only versus diet and aerobic exercise or diet and resistance exercise on metabolic risk factors and body fat distribution, Janssen et al. (2002) discovered that a relationship existed between visceral fat and metabolic risk factors following weight loss in obese women. Geliebter et al. (1997) found that strength training combined with a moderate diet was associated with a significant reduction in the loss of fat-free mass in obese men and women. Kraemer et al. (1999) detected that endurance exercise combined with a dietary weight loss program increases maximal oxygen consumption, and when combined with heavy resistance training, has a greater impact on improving body composition, maximal strength, and maintaining power production capabilities in overweight men. Exercise training alone or in combination with moderate energy restriction was also found to result in significant improvements in cardiorespiratory fitness in obese women by Utter et al. (1998). Whereas, Svendsen et al. (1993) found that an energy-restrictive diet, with or without exercise, improves serum lipids and lipoproteins, blood pressure, and fat distribution in overweight postmenopausal women.

Although combining aerobic exercise to an energy-restrictive diet produces no additional benefits over dieting alone with regard to changes in body composition or accelerating diet-induced losses in body fat mass in men or women, the findings suggest that exercise, despite the mode, is associated with numerous health

benefits and plays an important role in improving people's health risk (Svendsen et al. 1993; Geliebter et al. 1997; Utter et al. 1998; Kraemer et al. 1999). Regular exercise enhances individuals' psychological mood (Geliebter et al. 1997; Utter et al. 1998); improves blood lipid profile (Utter et al. 1998); and increases cardiopulmonary capacity (Svendsen et al. 1993; Geliebter et al. 1997; Kraemer et al. 1999), physical fitness, and lean tissue mass (Svendsen et al. 1993; Geliebter et al. 1997). Additionally, exercise has been shown to reduce the risk of obesity related diseases such as diabetes, heart disease, and hypertension when combined to a dietary weight loss program (Svendsen et al. 1993; Utter et al. 1998).

The studies conducted by Geliebter et al. (1997) and Svendsen et al. (1993) found that strength training when combined with an energy-restrictive diet preserves lean tissue mass significantly more than that of aerobic exercise or no exercise in obese individuals. However, regardless if exercise is added or not, the implications of these findings reinforce the importance of weight loss in the treatment of dyslipidemia and hyperinsulinemia, as well as the importance of decreasing visceral fat in the reduction of insulin resistance (Janssen et al. 2002).

The meta-analysis of 493 studies of weight loss programs consisting of diet, exercise, and diet plus exercise addressed the outcome of weight loss as determined by body composition or body weight. These results also indicated that both the men and women in the exercise treatment groups were characteristically different from those in the diet or diet plus exercise groups. Additionally, the length of the intervention for the exercise studies was 6–8 weeks longer. Thus, the implications of these findings suggest that weight loss programs that contain only the exercise component are less effective in reducing body weight initially; however, after 1 year, there was no significant difference in the maintenance of weight loss among the diet, exercise, or diet plus exercise treatment groups. On the other hand, the data also illustrate that a 15-week diet or diet plus exercise program initially produced an approximate 11-kg weight loss with a maintained weight loss of 6.6 kg from dieting alone and 8.6 kg from dieting plus exercise after 1 year.

Thus, these findings suggest that the intervention including both diet plus exercise is more effective than diet or exercise alone after a 1-year follow-up because individuals in the diet plus exercise programs maintained 77% of their initial weight loss compared to 56% in the diet only group and 53% in the exercise only group (Miller et al. 1997).

SUMMARY OF FINDINGS

- Addition of aerobic exercise to an energy-restrictive diet produces no additional benefits over dieting alone with regard to changes in body composition or accelerating diet-induced losses in body fat mass in adult men or women.
- Numerous health benefits (e.g., enhanced psychological mood state, improved blood lipid profile, and reduced risk of obesity related diseases such as diabetes, heart disease, and hypertension) are associated with regular exercise despite the type; thus, exercise plays an important role in improving one's overall health.
- Diet plus exercise is more effective than diet or exercise alone after a 1-year follow-up because individuals in the diet plus exercise programs maintained 77% of their initial weight loss compared to 56% in the diet only group and 53% in the exercise group.

EVALUATION OF THE QUALITY OF THE RESEARCH

Strengths

After critiquing these five RCTs and the one meta-analysis, the identifiable strengths of this body of research are the power of the designs and controls, the size of the overall sample, and the consistency of the use of appropriate instruments for data analysis. The type of design employed in all of these 498 studies was an experimental design (Svendsen et al. 1993; Geliebter et al. 1997; Miller et al. 1997; Utter et al. 1998; Kraemer et al. 1999; Janssen et al. 2002). The process of randomization eliminated any systematic bias among the groups with respect to attributes that may affect the dependent variables being studied, insuring that the groups were comparable. As the independent variable was manipulated, subjects were randomly assigned to a treatment group, and one or more constants were introduced into the experimental investigation, the most rigorous type of experiment was created to assess if a causal relationship existed between two variables (LoBiondo-Wood & Haber 2002). The sample size of the 498 studies, which consisted of more than 3,000 men and women who were obese or overweight, substantiates the findings (Svendsen et al. 1993; Geliebter et al. 1997; Miller et al. 1997; Utter et al. 1998; Kraemer et al. 1999; Janssen et al. 2002). However, the generalizability of the findings to minority adults who are obese or overweight is unclear because only Utter et al. (1998) reported the race of the sample, which was Caucasian. The other five studies limited their description of the samples to sex and age characteristics (Svendsen et al. 1993; Geliebter et al. 1997; Miller et al. 1997; Kraemer et al. 1999; Janssen et al. 2002).

Another strength identified in each of the five RCTs was the techniques used to measure the primary dependent variables, body mass, and body composition, which were measured prior to the implementation of the program and

at the conclusion. Body mass was measured with a scale to the nearest 0.1 kg, and consistency in the methods applied to evaluate body mass was demonstrated (Svendsen et al. 1993; Geliebter et al. 1997; Utter et al. 1998; Kraemer et al. 1999; Janssen et al. 2002). The various controls set in the meta-analysis provided an opportunity to combine data from various studies within the past 25 years (1969–1994). This tested for differences in effects of various weight loss programs that included either diet, exercise, or a combination of the two interventions on body composition or body mass in adult individuals who are obese (Miller et al. 1997).

Weaknesses

Identifiable weaknesses associated with this body of research are the absence of discussion about the instruments used to measure body weight or body mass in the meta-analysis, inconsistency in the methods utilized by the five RCTs to determine body composition, and lack of discussion regarding the representation of minorities in the studies' populations. The meta-analysis conducted by Miller et al. (1997) does not indicate how body composition or body weight was measured, and only three of the five RCTs utilized the same method to determine body composition. The studies conducted by Geliebter et al. (1997), Utter et al. (1998), and Kraemer et al. (1999) measured body composition by underwater weighing. Whole-body magnetic resonance imaging was employed by Janssen et al. (2002), and total-body dual-energy X-ray absorptiometry was applied by Svendsen et al. (1993).

Although minor gaps are present, the overall quality of this body of research is good and supports the addition of an exercise component to a dietary weight loss program in order to reduce obesity related diseases and increase obese individuals' quality of life. Additionally, the body of research is consistent with the clinical guidelines from the National Heart, Lung, and Blood Institute (NHLBI 1998).

IMPLICATIONS FOR PRACTICE AND RESEARCH

Based on the strength and the consistency of the evidence, the findings can be appropriately applied in practice to most healthy men and women who are overweight or obese. The results appear valid because the most rigorous research designs were utilized and the strengths of the research studies outweigh the weaknesses (Svendsen et al. 1993; Geliebter et al. 1997; Miller et al. 1997; Utter et al. 1998; Kraemer et al. 1999; Janssen et al. 2002). Threats to internal and external validity, specifically history, maturation, and selection bias, were controlled to some degree by randomly assigning each participant to one of the specific treatment groups (LoBiondo-Wood & Haber 2002). Direct application of these findings in the primary care setting is feasible because educating patients on the benefits of weight loss, exercising, and reducing caloric intake can be reinforced during subsequent visits. Effort put forth by the client and clinician is the only cost. The only risk is that clients may ignore the significant role that exercise has in reducing individual health risks because the addition of exercise to an energy-restrictive diet produces no additional benefits over dieting alone with regards to changes in body composition or accelerating diet-induced losses in body fat mass in adult men or women. The benefits of diet and exercise are:

- Enhanced psychological mood (Geliebter et al. 1997; Utter et al. 1998),
- Improved blood lipid profile (Utter et al. 1998),
- Increased cardiopulmonary capacity (Svendsen et al. 1993; Geliebter et al. 1997; Kraemer et al. 1999),
- Physical fitness and lean tissue mass (Svendsen et al. 1993; Geliebter et al. 1997),
- Reduced risk factors for obesity related diseases (Svendsen et al. 1993; Utter et al. 1998), and
- Maintaining a greater amount of the initial weight loss at 1-year follow-up (Miller et al. 1997).

Clinicians in primary care settings need to embrace these findings and educate obese men and women about the benefits of exercise, as well as encourage these clients at each visit to follow a dietary weight loss program that includes regular aerobic exercise in order to achieve better outcomes and improve their quality of life. However, because the current proportion of primary health providers implementing weight loss counseling is low (Serdula et al. 2003), a change agent utilizing Lewin's Change Theory (LoBiondo-Wood & Haber 2002) may increase clinicians' involvement in helping obese clients adopt healthier lifestyles. The change agent could introduce and communicate the components of the evidence-based protocol for obesity management established by the NHLBI (1998) through varied interventions based on, for example, the Transtheoretical Model (TTM) Stages of Change developed by Prochaska and DiClemente (Jitramontree 2001). Using this research-based protocol for the management and treatment of adult obesity may allow primary care providers to capitalize on their unique position and ability to help individuals change poor lifestyle habits. However, in order to determine the true effectiveness of this evidence-based protocol and the generalizability of the findings, a pilot study implementing this protocol in a primary care setting, as well as further research in various settings including developed and developing countries, is warranted. This work is currently underway by the author and will be reported on in a future article.

Summary of findings and implications for practice

- Strength training combined with diet preserves lean tissue significantly more than that of aerobic exercise or no exercise in obese subjects; however, aerobic training increases cardiorespiratory capacity and exercise fitness.
- The addition of aerobic or resistance exercise to an energy-restrictive diet does not improve metabolic risk factors or increase the amount of weight lost as compared to a diet-induced weight loss program in obese women; however, a relationship between visceral fat and metabolic risk factors exists after weight loss.
- Endurance exercise when combined with a dietary weight loss program does increase maximal oxygen consumption; however, no additional benefits are detectable over dieting alone in regards to changes in total body mass, body composition, resting metabolic rate, serum lipid profile, or muscular strength in overweight men.
- Diet in conjunction with heavy resistance and endurance exercise training not only improves peak oxygen consumption but also has a greater impact on improving body composition and maximal strength and maintaining power production capabilities in overweight men as compared to diet alone or diet with endurance exercise training.
- Numerous health benefits (e.g., enhanced psychological mood state, improved blood lipid profile, and reduced risk of obesity related diseases such as diabetes, heart disease, and hypertension) are associated with regular exercise; thus, exercise plays an important role in improving one's health risk.
- Diet and diet plus exercise programs produced a three-to-five-fold greater change in body composition than exercise programs alone.
- Diet plus exercise is more effective than diet or exercise alone after a 1-year follow-up.
- Clinicians in primary care settings need to embrace these findings and educate obese men and women about the benefits of exercise, as well as encourage these clients at each visit to follow a dietary weight loss program that includes regular aerobic exercise.
- To increase clinicians' involvement in helping obese clients adopt healthier lifestyles, a change agent utilizing Lewin's Change Theory may be helpful.
- A pilot study implementing the evidence-based protocol for obesity management established by the NHLBI in a primary care setting, as well as further research in various settings including developed and developing countries, is warranted in order to determine the true effectiveness of this evidence-based protocol and the generalizability of the findings.
- Therefore, clinicians in practice should encourage clients to follow a regular exercise training program that combines the two different modes.
- However, in order for these findings to make an impact on nursing practice, more randomized controlled research trials involving a larger sample size on this topic need to be completed. Also, replication with consistent results is needed in order to apply these findings to practice.

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