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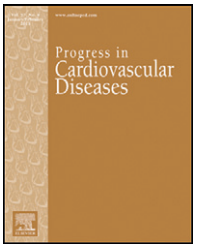

Changing the Endpoints for Determining Effective Obesity Management

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ABSTRACT

Health authorities worldwide recommend weight loss as a primary endpoint for effective obesity management. Despite a growing public awareness of the importance of weight loss and the spending of billions of dollars by Americans in attempts to lose weight, obesity prevalence continues to rise. In this report we argue that effective obesity management in today's environment will require a shift in focus from weight loss as the primary endpoint, to improvements in the causal behaviors; diet and exercise/physical activity (PA). We reason that increases in PA combined with a balanced diet are associated with improvement in many of the intermediate risk factors including cardiorespiratory fitness (CRF) associated with obesity despite minimal or no weight loss. Consistent with this notion, we suggest that a focus on healthy behaviors for the prevention of additional weight gain may be an effective way of managing obesity in the short term.

The prevalence of obesity and associated morbidities among North American adults is already high and increasing. Prevalence estimates for overweight and obesity now exceed 70% in United States (US) adults; and approximately 78 million American adults are now obese.[1] Obesity is associated with a wide range of health outcomes from co-morbidities including type 2 diabetes, cardiovascular disease (CVD) and certain cancers, to psychiatric disorders, such as depression.[2,3] Direct costs attributed to obesity in the US are staggering, with cost estimates now approximating 147 billion dollars annually.[1] These observations are cited by leading health authorities as the basis for recommendations that encourage weight loss as a primary outcome for determining the efficacy of obesity reduction programs.[1,4,5] Public awareness of the importance of weight loss is evident as 33% of American men and 46% of American women report that they have attempted or are currently trying to lose weight,[6] and American consumers now spend over 60 billion dollars each year for weight loss products and services.[7] Growing awareness and participation in weight loss programs have done little to abate the increase in obesity prevalence, in particular abdominal obesity.[8–10]

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Abbreviations and Acronyms

BMI = body mass index

CRF = cardiorespiratory fitness

CV = cardiovascular disease

CVD = cardiovascular disease

MET = metabolic equivalent

PA = physical activity

RCT = randomized controlled trial

US = United States

Despite the fact that there is agreement concerning the urgent need to address the growing obesity crisis, few strategies have been successful on a wide scale basis. Past efforts to achieve and sustain weight loss have not been particularly successful long-term.[11,12] Observations from numerous randomized controlled trials (RCTs) reveal that most adults are not able to sustain the major changes in behavior that are required to maintain even a modest (e.g.,10%) reduction in body weight long term.[13–15] Thus, although it is a relevant objective from a public health standpoint to try and shift the distribution of body mass index (BMI) values to the left, thereby aiming at a reduction in the number of overweight or obese adults, this goal may be largely out of reach in the short term. The question then is what can be done to address the obesity problem now? In this report we argue that more effective obesity management in today's environment will require an approach central to which are two fundamental principles: 1) The focus of obesity management programs shift from weight loss to improvements in the causal behaviors; diet and exercise/physical activity (PA); 2) A reasonable start point in addressing the obesity problem is to develop diet and physical activity/exercise goals for prevention of weight gain.

Changing the targets for determining effective obesity management

In 2013 the American Heart Association in association with both the American College of Cardiology and the Obesity Society published revised practice guidelines for the management of overweight and obesity in adults.[1] The recommendations from this report were thoroughly considered, based on the best available evidence and expert opinion, and provide valuable insight for general practitioners. Consistent with obesity management guidelines from several health authorities worldwide,[4,5,16,17] this report identified weight loss as the primary determinant of treatment efficacy. Specifically, that successful management of obese adults should target a weight loss of at least 10% with a 3%–5% weight loss as the minimal target for clinically meaningful benefit.[18]

It is established that, on a population basis, excessive weight gain results in a greater BMI and consequently increased health risk.[2,19] It makes sense, therefore, that weight loss or a decrease in BMI will reduce health risk, hence the resolution by health authorities that effective obesity treatment *requires* weight loss. Indeed, it is clear that intentional weight loss is associated with improvement in many of the intermediate risk factors and medical complications associated with obesity.[20] Unfortunately, sustaining weight loss for most adults is almost impossible in today's environment, and a failure to lose weight is cited as a primary determinant of withdrawal from obesity reduction programs.[21] A consequence of withdrawal from obesity reduction programs due to a failure to lose body weight is that the individual discontinues adherence to the healthy behaviors that were adopted to lose weight. This is a tragic consequence, as it is clearly established that increasing PA, combined with a healthful diet, is associated with benefit across a wide range of health outcomes, despite minimal or no weight loss.[17,22–24] More importantly, failed weight loss attempts often result in poor self-efficacy and empowerment.[25] Thus a monolithic focus on weight loss as the optimal target for obesity management has not only proven ineffective, it is well argued that it may have negative health effects. As illustrated in Fig 1, with weight loss as the primary determinant of effective obesity management, most adults enter a futile cycle. The 'obesity cycle' described and illustrated in Fig 1 forms the basis for the recommendation that obesity management programs would benefit from a shift in focus from weight loss to the causal behaviors; physical inactivity combined with a low quality, energy dense diet.

Benefits of focusing on causal behaviors for managing obesity

We have long-argued that there is little support for the position that weight loss is mandatory in order to achieve health benefits from lifestyle changes, or that a weight change of 3%–5% is a threshold that must be achieved to reduce obesity-associated health risk.[17,22] On the contrary, mounting evidence underscores the position that weight loss greater than 3% is not a prerequisite for reducing obesity, in particular abdominal obesity, and related cardiometabolic risk (Table 1). This is particularly true for lifestyle-based strategies that include an increase in PA combined with a healthful diet, particularly since improvements in cardiorespiratory fitness (CRF), which come mainly from increased PA, are likely more important than weight loss per se.[26,27] Inspection of Table 1 reveals the findings from several randomized controlled studies indicating benefit for several cardiometabolic risk factors in response to minimal weight loss regardless of gender. We[28] and others[29] have also observed substantial reductions in abdominal obesity in response to positive lifestyle changes despite negligible weight loss.[9] This is a clinically relevant observation because abdominal obesity is the phenotype that conveys the greatest health risk[8] and the prevalence of abdominal obesity is increasing at rates greater than obesity per se.[30] Furthermore, substantial reductions in abdominal subcutaneous and visceral fat are observed in both obese and type 2 diabetic persons despite the absence of change in body weight.[31] Corresponding increases in skeletal muscle mass[32] explain the stability in body weight and hence *underscore the unique benefits of positive lifestyle changes on obesity management despite weight loss well below recommended targets*.

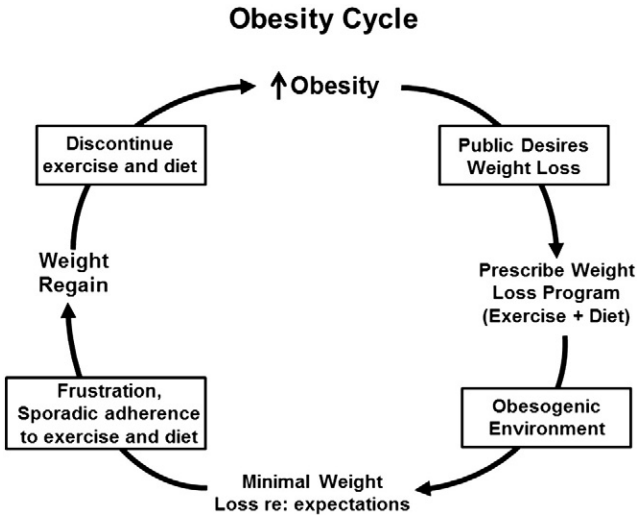

Fig 1 – The Obesity Cycle illustrates the challenge of managing obesity when weight loss is the primary endpoint.

While it is true that for many health outcomes the benefits are associated with weight loss in a dose–response manner,[17,33] these are encouraging observations that suggest dependence on weight change alone to determine the utility of strategies to reduce obesity and related cardiometabolic risk factors is unfounded. It is recommended that all health professionals embrace the immediacy of the myriad of benefits associated with the adoption of healthy behaviors, since knowledge of these benefits may well provide obese persons with motivation to initiate behavior change. Further, it is an excellent starting point for the process of shifting the focus of obesity reduction success from weight loss to the adoption of healthy behaviors.

Focusing on causal behaviors: obesity prevention

For obesity management, it is currently recommended that obese adults increase PA by at least 200 to 300 min/week and that energy intake be reduced by ≈500 to 750 kcal/day.[1] If followed routinely, the majority of overweight and obese persons will reduce body weight and many of the medical complications associated with obesity. However, as previously suggested, most obese adults are unable to sustain the magnitude of behavior change recommended and thus an alternative approach is required. We argue here that when focusing on the causal behaviors of obesity, evidence suggests that practitioners should counsel obese persons to begin by adopting small changes in PA and initially target a few food items that could improve overall nutrition quality. Accordingly, we reason that the prevention of additional weight gain through a focus on healthy behaviors may be an effective way of managing obesity in the short term.

Table 1 – Improvements in cardiometabolic risk factors in randomized, controlled trials reporting weight loss of ≤ 3% [a].

Reference	Subjects (*n*)	Age (yr) [b]	Study Duration (wk)	Baseline Weight (kg)	Weight Δ (kg)	Weight Δ (%)	Improvement in Metabolic Parameters (Δ%) [c]
Ready et al. (1995)[53]	15 F	62	24	77.2	↓1.9	↓2.5	TC (↓4.5), TG (↓6.7)
Binder et al. (1996)[54]	23 F	60–72	44	61.9	↓1.2	↓1.9	DBP (↓3.8), TC (↓6.0), LDL (↓8.2)
Dengel et al. (1996)[55]	10 M	60	40	94.8	↓0.5	↓0.5	IS (↑22.0)
Mourier et al. (1997)[29]	11 M/F	45	8	85.3	↓1.5	↓1.8	IS (↑46.5)
Boudou et al. (2000)[56]	8 M	45	8	N/A	↓1.9	↓2.2	IS (↑51.2), TG (↓30.8)
Poehlman et al. (2000)[57]	14 F	29	24	59	0.0	0.0	IS (↑16.4)
Short et al. (2003)[58]	65 M/F	22–87	16	86.1	↓0.8	↓0.6	IS (↑28.5), TG (↓22.0)
Watkins et al. (2003)[59]	14 M	≥30	24	96.0	↓2.0	↓2.1	F Ins. (↓12.5), 2-h Ins (↓27.4)
Irwin et al. (2003)[60]	87 F	50–75	48	81.6	↓1.3	↓1.6	IS (↑2.0)
Donnelly et al. (2003)[61]	25 F	24	64	77.0	↑0.6	0	FPG (↓6.8)
Slentz et al. (2004)[62]	28 M/F	53	32	88.0	↓1.1	↓1.3	TG (↓26.2), IS (↑65.3)
Stewart et al. (2005)[63]	51 M/F	55–75	24	83.2	↓2.3	↓2.8	DBP (↓4.8), HDL (↑5.3)
O'Donovan et al. (2005)[64]	13 M	41	24	83.6	↓0.5	↓0.6	TC (↓9.0), LDL (↓11.9)
Dansinger et al. (2005)[65]	40 M/F	49	52	97	↓3.0	↓3.0	TC (↓3.7), LDL (↓6.5), HDL (↑7.2)
Sigal et al. (2007)[66]	60 M/F	39–70	22	103.5	↓2.6	↓2.5	HbA1c (↓5.8)
Shojaee-Moradie et al. (2007)[67]	10 M	50	6	87.4	↑0.2	↑0.2	IS (↑16.4)
Gardner et al. (2007)[68]	234	41	52	85	↓2.2	↓2.5	HDL (↑5.5), TG (↓12.3)

Abbreviations: 2-h Ins: 2-hour insulin, DBP: diastolic blood pressure, F: female, F Ins: fasting insulin, FPG: fasting plasma glucose, HbA1c: glycated hemoglobin, HDL: High density lipoprotein cholesterol, IS: Insulin sensitivity, LDL: low density lipoprotein cholesterol, M: male, N/A: not available, SBP: systolic blood pressure, TC: total cholesterol, TG: triglycerides.

[a] Results from 17 randomized controlled trials selected according to the following criteria: weight loss ≤3%, measurement of at least one metabolic risk factor.

[b] Mean age or age range in years.

[c] Changes in intervention group were significantly ($p<0.05$) different from control.

Our reasoning hinges on the position that from an energy balance perspective, it should be easier to prevent weight gain than to lose weight once it is acquired.[23,34] The rationale as described by Hill and colleagues is that the biological compensatory mechanisms defending body weight appear to respond much more strongly to negative energy balance than to the prevention of positive energy balance.[34,35] In other words, the energy balance system is biased toward preserving existing body weight but does not appear to strongly defend against body weight not yet acquired. Indeed, because metabolism declines with loss of body mass[34,35] energy requirements are reduced substantially following intentional weight loss with reductions ranging from ~200 kcal/day in response to a 10% weight loss to ~400 kcal/day for a 20% weight loss.[35] Thus from an energy balance perspective, substantial weight loss and subsequent maintenance require substantial and permanent behavior change. The lack of success in long-term weight loss maintenance[36] suggests that most adults are unable to sustain the degree of behavior change required to maintain substantial weight loss. Thus focusing on preventing further weight gain in the population seems like a reasonable and achievable goal for now.

Compensatory reductions in resting metabolic rate and increases in hunger consequent to caloric restriction and weight loss underscore the biological adaptations that make sustained weight loss extremely difficult for most adults. However, simply preventing weight gain should not produce compensation in energy intake or resting metabolic rate. Therefore, from an energy balance perspective, this would require less behavior change because the degree of positive energy balance producing the gradual weight gain observed for most adults appears to be relatively small. Using population (cross-sectional and longitudinal) data illustrating weight gain over the past 3 decades, Hill et al.[35] and others[37] have calculated that a reduction of ≈100–150 kcal/day would be required to prevent positive energy balance (e.g., weight gain) in 90% of the adult population. These observations support the view that a weight gain prevention strategy that focuses on healthy behaviors need only advocate *small changes* in PA and/or energy intake.

The small change approach[38] is an innovative strategy for the prevention of weight gain in which individuals monitor their usual nutrition and PA patterns and then make modest alterations to these usual patterns. The small change approach encourages individuals to modify their behaviors enough to affect overall energy balance (≈200–300 kcal/day through nutrition and increase daily PA (e.g., step count by ~2000 steps/day)), but does not require making major lifestyle changes that are difficult to maintain thereby promoting the prevention of weight gain, or a gradual, modest weight loss across time. While the small change approach leads to a prevention of weight gain, participants may be more likely to reach the goals they set, experience higher self-efficacy and satisfaction, and lower feelings of deprivation and wanting of foods. Accumulating evidence supports the notion that small changes in behavior (~100 kcal/day) can be achieved and maintained by many adults. For example, Bravata et al. reviewed studies using pedometers to increase daily PA.[39] Providing pedometers and step goals were associated with an increase of ~2500 steps/day (~125 kcal/day); thus, small changes in energy intake also appear to be achievable.[40]

The feasibility of the small change option for managing obesity has been demonstrated in a series of short-term pilot studies. In two separate studies, Rodearmel et al.[41,42] report that the small change approach (increase daily steps by 2000 (~100 kcal) and/or decrease energy intake by 100 kcal) prevented weight gain in a small group of adults and children over 13 weeks. In a second study, the same group reported that both the small change group and controls experienced small, comparable weight losses at 6 months in both obese adults and children.[42] Larose et al.[43] report that the small change approach (2000 steps/day and/or 100 kcal/day reduction) prevented weight gain in overweight and obese young adults over 4 months. Taken together, these series of studies, although small and with methodological limitations, are encouraging and provide consistent and compelling data suggesting that small, positive changes in PA and diet are feasible for participants to implement in their lives and can prevent weight gain or promote modest weight loss.

Preventing additional weight gain has important health implications

Prevention of weight gain through small improvements in diet and exercise/PA has important health benefits. It is well established that weight gain is associated with morbidity and mortality in a dose–response manner,[44] that avoiding weight gain reduces the risk of morbidity independent of age and gender,[44–47] and that weight gain prevention is a strategy that is beneficial to the entire population regardless of current weight status.[44] Large-scale, prospective cohort studies provide support that weight gain is associated with increases in morbidity and mortality in a dose–response manner and that even a very moderate increase in weight is strongly associated with increased morbidity and mortality.[45–47] Relative to overweight adults with stable weight, each kg of weight gained annually over 10 years is associated with a 49% increase in risk of developing type 2 diabetes in the subsequent 10 years.[46] By comparison to men with stable weight, relative risk of coronary death increased by 57% in men who gained as little as 3–7 kg over the 20 year follow-up.[45] These observations are consistent with the repeated demonstration in RCTs that adoption of PA is associated with a marked reduction in obesity and cardiometabolic risk factors in overweight and obese adults who do not lose weight.[17,28,48] The importance of preventing weight gain and decreasing cardiometabolic risk through improvements in diet and exercise as demonstrated through RCTs, is reinforced by prospective evidence that CRF, which increases in most adults in response to increasing PA, is negatively associated with all-cause mortality and CVD independent of obesity.

Interactions between cardiorespiratory fitness, obesity and health outcomes

Considerable evidence indicates that CRF markedly alters the relationship between obesity and both all-cause and CV[49] prognosis.[26,50] Although obesity and low CRF are associated with adverse CV risk factors and increased prevalence of CV diseases, the relative and combined impact of both remains

controversial.[26] Barry et al.[27] performed a meta-analysis of 10 major studies and quantified the combined association of CRF and weight on mortality. They demonstrated that compared to normal weight–fit individuals, unfit individuals had a 2-fold higher risk of mortality regardless of BMI, whereas overweight–fit and obese–fit individuals had a similar mortality risk as normal weight individuals. In a study of 3148 healthy adults, changes over time in both weight and CRF predicted development of hypertension, metabolic syndrome, and hypercholesterolemia, but changes in CRF were superior to increases in weight for future risk of these disorders.[51] In another study by Lee et al.,[20] a 1 metabolic equivalent (MET) increase in CRF over time was associated with reductions in all-cause and CV-mortality by 15% and 19%, respectively, in 14,345 men. In fact, BMI changes were not associated with CV or all-cause mortality after adjusting for changes in CRF and other baseline factors. Therefore, the constellation of these data suggests that CRF is more important than obesity regarding long-term prognosis.[52]

Summary

Current evidence suggests that a monolithic focus on weight loss as the only determinant of successful obesity reduction is not justified and, more importantly, eliminates opportunities to focus on the causal, lifestyle behaviors that are associated with benefit across a wide range of health outcomes including CRF regardless of weight loss. That obesity and related health risk can be significantly reduced in response to a physically active lifestyle and a healthful diet with minimal or no weight loss is encouraging, and provides the practitioner and the obese adult with options for successful obesity management. Indeed, a change in focus from weight loss to the causal lifestyle behaviors would provide health professionals with opportunities to counsel patients/clients on the benefits of healthy behaviors with or without weight loss. Adults seeking obesity management would necessarily change focus to adoption of healthy behaviors with success measured by a myriad of factors other than and/or including the bathroom scale.

We also present evidence in support of the position that through a pragmatic adoption of small changes in diet and exercise/PA habits, the prevention of weight gain may be a reasonable starting point for obesity management in today's environment. Sustaining changes in diet and exercise long-term of any magnitude presents a challenge for most obese persons and evidence from long-term RCTs demonstrating the effectiveness of even a small change approach is required. While we lack models for increasing PA combined with a healthy diet across age, gender and race in the long-term, overwhelming evidence demonstrates that it is time to stop using weight loss as the sole indictor of success for lifestyle-based strategies designed to reduce and/or prevent obesity and related co-morbid conditions.

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