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The BestFIT trial: A SMART approach to developing individualized weight loss treatments☆

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ABSTRACT

Behavioral weight loss programs help people achieve clinically meaningful weight losses (8–10% of starting body weight). Despite data showing that only half of participants achieve this goal, a "one size fits all" approach is normative. This weight loss intervention science gap calls for adaptive interventions that provide the "right treatment at the right time for the right person." Sequential Multiple Assignment Randomized Trials (SMART), use experimental design principles to answer questions for building adaptive interventions including whether, how, or when to alter treatment intensity, type, or delivery. This paper describes the rationale and design of the BestFIT study, a SMART designed to evaluate the optimal timing for intervening with sub-optimal responders to weight loss treatment and relative efficacy of two treatments that address self-regulation challenges which impede weight loss: 1) augmenting treatment with portion-controlled meals (PCM) which decrease the need for self-regulation; and 2) switching to acceptance-based behavior treatment (ABT) which boosts capacity for self-regulation. The primary aim is to evaluate the benefit of changing treatment with PCM versus ABT. The secondary aim is to evaluate the best time to intervene with sub-optimal responders. BestFIT results will lead to the empirically-supported construction of an adaptive intervention that will optimize weight loss outcomes and associated health benefits.

1. Introduction

Obesity remains a public health problem [1–3]. State-of-the art behavioral interventions achieve clinically significant weight losses of 8–10% [4,5], but only 40–60% of people achieve this goal [6]. This treatment response heterogeneity calls for the development of adaptive interventions which are sequential, tailored approaches whereby treatment is adapted over time based on an individual's evolving status and specific needs [7,8]. Adaptive interventions include stepped care intervention designs [9–16], which have previously been used in weight loss research. Sequential Multiple Assignment Randomized Trials (SMART) use experimental design principles to answer whether, how, and when to alter treatment intensity, type or delivery [17] to build adaptive interventions [18–21].

Choosing candidate "second stage" treatments for sub-optimal responders to "first stage" state-of-the-art behavioral weight loss therapy (SBT), requires consideration of weight loss barriers. In this "obesogenic" [22,23] environment, the seemingly straightforward process of managing energy balance is challenging. Although nutrition knowledge could interfere, most people experience self-regulation rather than knowledge problems [24–28]. Moreover, people vary in the extent to which they experience food-specific [27,29] and general self-regulation difficulties [30–32], that contribute to difficulty managing eating in the context of continual cues that trigger overconsumption. Two approaches to address these challenges include augmenting treatment with meal replacements (MRs) which reduce the need for behavioral control and decision-making [33–39] or augmenting SBT with a skill set drawn from acceptance and commitment therapy designed to boost capacity for self-regulation [40–47]. Each has an empirical research base, but may not be an optimal "first stage" treatment. Although some MRs (e.g., liquids, bars) can be inexpensive, portion-controlled meals (PCM), most likely to be acceptable long-term, tend to be expensive, i.e., $100–150.00 per week [48] and difficult to fit into a person's lifestyle. Empirical support for incorporating acceptance-based principles into SBT is building [49–54]; acceptance-based behavioral weight loss treatment (ABT) is particularly effective for certain individuals (e.g., those with higher depression levels) and may be a viable "second

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stage" treatment for sub-optimal responders [55]. PCM and ABT may have differential short- and long-term effects. MRs reduce the need for self-regulation, but may be less effective long-term given their inflexibility. In contrast, ABT skill development and self-regulation capacity may accelerate over time.

Identifying when to identify sub-optimal responders is also important. Previous studies of stepped care interventions have intensified treatment from 3 to 12 weeks with little empirical justification [13–16,56]. Data from multiple weight loss trials [57–60], including Mind Your Health II (R01 DK095069) and ENACT (R01 DK92374), suggests sessions 3 and 7 as candidate time points for intervening with sub-optimal responders. Participants who lost at least 2.5% of their body weight by session 3 were twice as likely to lose 10% of their body weight at 6 months compared to those not meeting this threshold. Participants who lost at least 5.0% of their body weight by session 7 were 3 times more likely than those not meeting this threshold to achieve a 10% weight loss.

This paper describes the BestFIT study, a SMART addressing two critical questions for developing an adaptive weight loss intervention: 1) when to identify SBT sub-optimal responders; and 2) whether PCM or ABT is more effective for sub-optimal responders.

2. Methods

2.1. Trial design overview

The study design is a two-stage sequential multiple assignment randomized trial (SMART). 500 adults with body mass index (BMI) between 30 kg/m^2 and 45 kg/m^2 will be offered standard behavioral weight loss treatment (SBT) as first stage treatment (Fig. 1). Participants will be randomized initially, with equal probability, to response assessment at Week 3 or Week 7. Participants who are randomized to Week 3 will be considered sub-optimal responders if they lose less than 2.5% of their session 1 starting body weight by week 3 and/or 28 days after session 1 whichever comes first; and those randomized to Week 7 will be considered sub-optimal responders if they lose less than 5.0% of their session 1 starting body weight by week 7 or 63 days after session 1, whichever comes first. Participants identified as sub-optimal responders (at either Week 3 or Week 7) will be re-randomized, with equal probability, to one of two second-stage treatments: augmentation of SBT with portion-controlled meals (PCM) or switching from SBT to an acceptance-based enhanced version of SBT (Acceptance-based behavioral treatment, ABT). Participants identified as responders continue with SBT.

2.2. Study aims

The primary aim is to evaluate, among sub-optimal responders to SBT, the benefit of augmenting initial treatment with portion-controlled meals (PCM) versus switching to an acceptance-based behavioral treatment (ABT). The primary hypothesis is that, on average, a) sub-optimal responders re-randomized to augmenting SBT with PCMs will weigh less at 6 months relative to those randomized to ABT, but that b) those re-randomized to ABT will weigh less at 18 months (12 months post-treatment) relative to those randomized to augmenting SBT with PCMs. The study sample size was chosen to ensure sufficient statistical power for examining this primary aim (see below).

The goal of the secondary aim is to evaluate the optimal timing for identifying sub-optimal responders. Although session 3 and session 7 are both potentially good candidates for identifying and intervening with sub-optimal responders to weight loss treatment, we hypothesize that intervening at the later time point may be less beneficial because participants who are having difficulty losing weight may begin to feel less optimistic about their likelihood of success and less motivated to make the necessary changes due to their lack of success [61]. Thus, it is hypothesized that participants who undergo session 3 response assessment will weigh less at 6 and 18 months relative those assessed at session 7.

The goal of the exploratory third aim is to make further progress toward building an individually-tailored adaptive intervention, by examining food-specific (e.g., binge eating) and general self-regulation (e.g., executive functioning) as moderators of the effect of potential

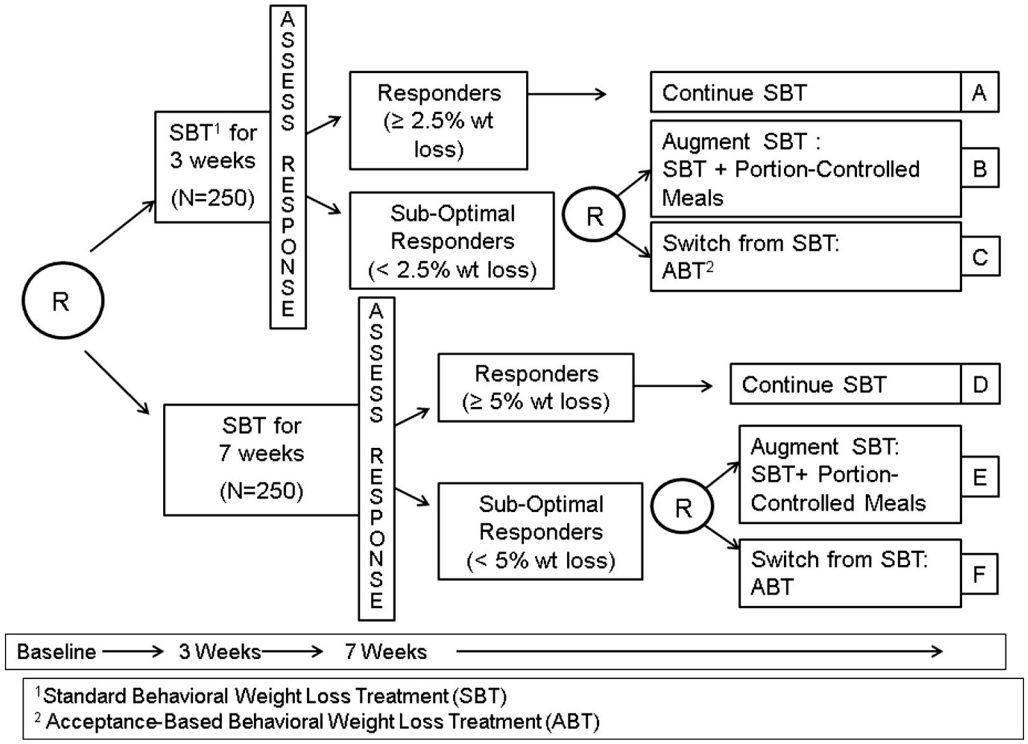

Fig. 1. Overview of the BestFIT Study Design.