
SMART 2.0: A Multimodal Weight Loss Intervention for Young Adults

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ABSTRACT

A significant number of young Americans are vulnerable to excess weight gain, especially during the college years. While technology-based weight loss interventions have the potential to be very engaging, short-term approaches showed limited success. In our work we aim to better understand the impact of long-term, multimodal, technology-based weight loss interventions, and study their potential for greater effect among college students. In this paper we lay the basis for our approach towards a multimodal health intervention for young adults: we present formative work based on interviews and a design workshop with 26 young adults. We discuss our intervention at the intersection of user feedback, empirical evidence from previous work, and behavior change theory.

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KEYWORDS

SMART, Physical Activity, Weight Management, Interventions, Multimodal, Design

INTRODUCTION

Young adults in the United States are highly vulnerable to unhealthy weight-related behaviors, especially during the college years as they transition to adulthood [8]. It is estimated that 40% of college students are overweight or obese [1], increasing their risk for future weight gain and chronic cardiovascular disease.

Prior research suggests that a technology-based weight loss intervention may be more successful in engaging young adults as it could be conveniently delivered within the digital spaces they often occupy. Additionally, it may better adapt to their continuously changing schedules [6]. However, a majority of studies and Randomized Control Trials (RCTs) investigating technology-based behavioral weight loss interventions are less than 18 months long and have primarily focused on middle-aged and older adults, or only include a single intervention modality [3]. It is important that we extend this research to younger adults as people in this age range are particularly vulnerable to weight gain.

The purpose of this qualitative study was to inform the design of a multi-modal, technology-based weight loss intervention for young adults. In this context, we use multi-modal to describe a system that uses multiple platforms to provide different intervention modes. We conducted semi-structured interviews, a design workshop, and translated findings into design parameters for an intervention. We drew from three sources of information: interactions with target users, behavioral theory, and prior empirical evidence. Our paper discusses each design feature as a way to illustrate strategies for developing intervention parameters that balance insights across the three domains.

BACKGROUND AND RELATED WORK

The SMART (Social Mobile Approaches to Reduce weight) [2] study, predecessor to our study (SMART 2.0), was part of a consortium researching changes in lifestyle to reduce weight among young adults [5]. The 2-year intervention built on behavioral change techniques (BCTs) [7] and strategies for weight management (SWMs) [4] delivered to college students from large western universities via mobile apps, text messaging, Facebook, email, website, and technology-mediated health coaching sessions. Findings from this study show that weight was significantly less for the intervention group compared to the control group at 6 and 12 months, but it did not differ significantly at 18 and 24 months. Additionally, engagement declined over time due to participants reportedly switching to consumer-level weight loss apps and devices and reportedly lacking sufficient online interaction with other participants.

To improve upon the efficacy of SMART, we propose to utilize user-centered design to inform the SMART 2.0 intervention, which we plan to deliver to a large group of young adults over 2 years. Our starting premise was that SMART 2.0 would adopt consumer-level technology and social media platforms to deliver evidence- and theory-based weight loss content. Our formative research aimed to inform which content was prioritized and best delivered through a particular modality.

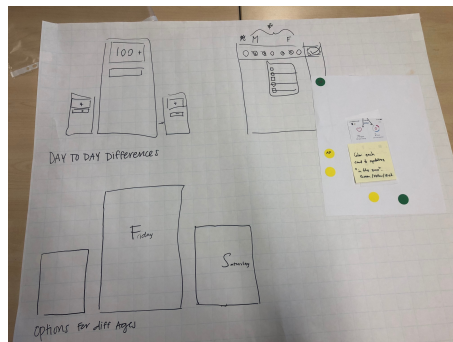


Figure 1: Day-to-day improvements to build up to long term goals. A Fitbit-like application tracks minute changes while text messaging and social media promote general health behaviors. Goals are customized to the individual, especially if they have special considerations like a student lifestyle.

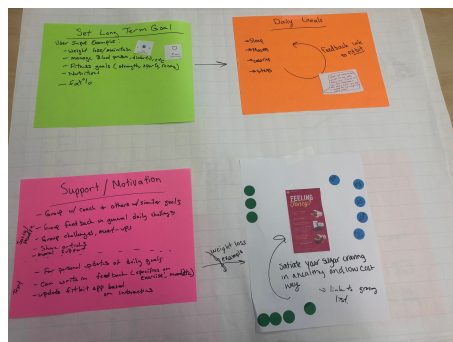


Figure 2: Plan for personal long term goals like weight loss or a desired fitness level. Sort users into like-minded groups for weekly updates and posts. On Fitbit, individualized goals are given and updated as the person progresses. Text messages are reserved for daily check-ins.

FORMATIVE RESEARCH

Our formative work focuses on uncovering needs, hurdles, and existing strategies for managing physical activity and weight loss across our stakeholders' group – young adults between 18 and 35 years old, living and working around large western universities.

Participants and Methods

We conducted 26 hour-long semi-structured interviews among young adults in order to expand our understanding of their current health habits and perceptions, and to update our knowledge on social media norms in a continuously changing technological landscape. Questions addressed current health behaviors, social media use, online social networks, and experience with wearable sensors and SMS.

After interviews, we invited participants to return for a design workshop where they could provide feedback on basic prototypes and design their ideal intervention. Out of the 26 interviewees, 9 returned to participate in the workshop. The outcomes informed the integration of these user-driven intervention strategies into a cohesive program that we are planning to deploy in a RCT across 642 participants. The 2-hour workshop session involved guiding participants through Design Thinking to expand and focus on ideas for weight loss interventions. We used “How Might You” style prompts (e.g. “How might you ensure that you are on track with your goals?”) to stimulate the ideation process and participants narrowed down to the ideas that resonated with them. To better understand the specific way these ideas could help, we asked participants to use two dimensions for their vote: (1) overall helpfulness to reach their goal, and (2) fit into their lifestyle. A total of 56 individual ideas were generated, and among those 19 ideas were highly rated along both dimensions and were reviewed in-depth by the researchers after the workshop. Ideas were deemed suitable to be incorporated into the final RCT design if they were considered feasible and theoretically sound by the researchers.

Emerging Themes

Two researchers defined themes and group ideas based on the interviews and the design workshop. We classified ideas into 4 groups by applying a thematic analysis informed by grounded theory [9].

Contextual Barriers. As they experience a major life transition, young adults, including college students, struggle to maintain healthy lifestyles on top of the demands of tertiary education, as well as new and changing careers. College campuses have a notable lack of healthy food options which makes it difficult for students and staff to find affordable and healthy options. Several participants also noted a lack of opportunities to make healthy lifestyle choices due to their living arrangements. For example, several participants mentioned lengthy commutes as a barrier to exercising regularly.

Mental Health. A majority of participants cited mental health as both an important aspect of health and as a tool to gauge one's state of health. In the words of one participant, “Even though I'm heavier now, I feel healthier because I'm taking care of my mental health.”

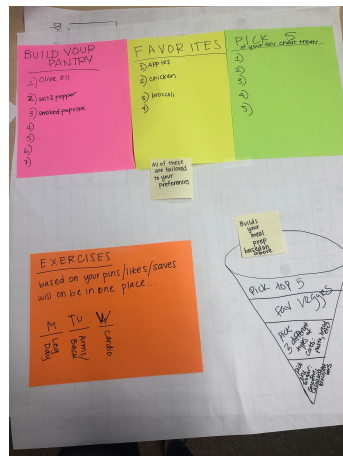


Figure 3: This intervention helps with meal prepping. Users enter a list of foods they own or want to eat and receive suggested recipes. Similarly, exercise suggestions are given based on a basic desired plan.

Behavior on Social Media. Social Media was constantly referred to as an important tool to both access information related to health, as well as to engage with friends on healthy behaviors. However, participants often mentioned lurking – the tendency to view online content without actively contributing – as an important way that social media was used also in the context of health behavior. In general, participants appeared to use social media right after waking, during lunch, or in the evening.

Social Media Apprehension. Participants discussed apprehension for social media due to doubt over information accuracy regarding health topics. They felt that social media encourages users to post polished, often unrealistic, versions of their lives. Fitness gurus “who seem like they have always been healthy” are often exceedingly fit and without body diversity. Their physiques and lifestyles are considered unrealistic and unobtainable for participants at the beginning of their fitness journeys.

Intervention Proposals

After showcasing the 56 ideas during voting sessions, we asked participants to work collaboratively on incorporating these ideas into three complete interventions. The themes outlined above were also represented in the proposed interventions that participants designed in our workshop.

- The first intervention focused on Fitbit tracking and a personalized social media and texting engagement strategy that would take into account the participant’s lifestyle (Fig. 1).
- The second intervention focused on creating like-minded participants’ groups with similar goals who would receive regular progress updates through text messages (Fig. 2).
- The third intervention focused on meal preparation and exercise suggestions based on food specifically available to the participant, or their personal desired exercise plan (Fig. 3).

While the three interventions were designed in different ways, they all encompassed similar concepts:

- Detailed and demonstrative instructions, like basic recipes or workout routines.
- Educational or scientifically-minded social media posts.
- Small group messages that are conducive to open discussion and member bonding.
- Health expert present in groups in cases of fact checking or to provide more structure.
- Behavior responsive, limited, and individualized text messages centered around personal goals.
- Group challenges or competitions.

TOWARDS AN EFFECTIVE MULTIMODAL INTERVENTION

Our goal is to design an intervention that is informed by users’ goals and strategies, takes into consideration empirical evidence from previous studies, and is grounded in evidence-based theory. Specifically, in this work we want to integrate the user input collected throughout our formative

research with theory- and evidence-supported input from BCTs and SWMs; we also aim to use experience from previous studies and our group's collaborative expertise in health and design when definitive decisions using solely theory and users' feedback were not easy to make.

Intervention Design

As shown in Fig. 4, building on our formative research we decided to design our intervention around delivering SWMs and BCTs via 5 different modalities: Fitbit, Social Media, Online Groups, SMS, and Health Coaching Sessions. Figure 5 shows how the different elements of the intervention have been balanced across the three dimensions (theory, user feedback, and empirical evidence) described above.

For the most part, our intervention is based on previous evidence, is supported by theory, and is also backed up by the formative work described earlier. The proposed intervention includes support for many of the described contextual barriers, apprehension over social media, the role of the health coach, and the structure of groups described in the emerging themes above.

On the other hand, we avoid behavioral and health challenges (e.g., competition to accumulate the most steps in a week) like the ones suggested in the design workshop, as they were regarded negatively during interviews that spanned a wider frame of user input. We propose to maintain the same essence of social influence and support that can arise from competition by keeping the groups small.

Due to the pervasiveness of lurking and apprehension of social media, we avoid modeling our intervention directly around active engagement on social media. Instead, we propose to use social media as a central way of distributing generic content. Other streams, like group messaging and health coaching sessions, are dedicated to stimulating discussions and responses.

Delivery Method	Frequency	Description
Fitbit	Daily (Charge 3) Weekly (Aria 2)	Participants are encouraged to use the Charge 3 wearable fitness tracker to automatically track physical activity and sleep and to enter their dietary intake at least 3 consecutive days a month. They are asked to weigh themselves on the Aria 2 scale at least once a week. All Fitbit data is collected and used to inform the SMS and health coaching sessions.
Social Media	1/Day	Social media content is posted daily in the morning on Facebook, Twitter, and Instagram. Each day of the week has its own health theme (diet, physical activity, sleep, resilience, weight). Content ranges from detailed recipes and exercise routines to specific tips and strategies. Social media posts are also relevant to commonly shared experiences like breaks, holidays, exam periods, and campus resources.
Groups	1-3/Week	Participants are organized into groups of 10-15 on Facebook Messenger. The health coach sends out messages throughout the week intended to stimulate participation and discussion. The first weeks are focused on group bonding and the rest on various health topics following a predefined curriculum, in addition to encouraging participants to ask questions about their own interests. The health coach gradually reduces involvement as the intervention progresses to encourage participants to initiate and maintain conversation on their own.
SMS	1-2/Day	Texts are sent daily in the morning and focus on goal progress and building using the Fitbit data, as well as the occasional health tip. Text content is designed to be representative of the SWM and BCTs, and will also be organized according to daily themes as with the social media content.
Health Coaching	12-26/Year	Participants meet with the health coach for a total of 26 10-minutes sessions during the first year of the intervention at a cadence that gradually reduces from weekly, biweekly, to monthly sessions. The sessions will review predetermined weight loss topics. The second year, participants will meet with the health coach monthly for a total of 12 sessions. The content of each session will be guided by the individual's unique circumstances. Sessions are technology-mediated and take place over the phone or video chat.

Figure 4: SMART 2.0 intervention. The table shows when participants are expected to interact with each modality and the information delivered at each interaction

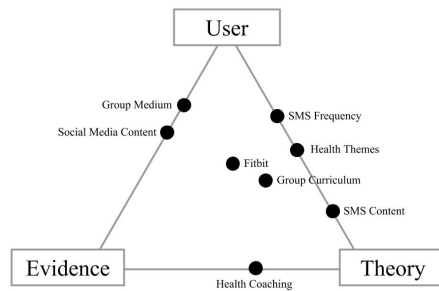


Figure 5: Triangulation of design decisions. Each point represents a category of decisions made for the intervention design. The degree to which each source of information influenced each category of decision determined the plotting of the points. Most decisions are positioned between the User and the Theory dimensions, except in cases like Health Coaching, which relied heavily on theoretical constructs and empirical evidence from previous studies. Decisions over Health Themes, SMS Content, Group Curriculum, and Fitbit were already discussed before the formative work but because user input supported or refined these decisions, they are mapped along the User dimension as well.

Finally, based on strong user feedback, we changed the way messaging is delivered. Motivated by the clear aversion by our participants to a particularly involved messaging system, texting is reduced down to 1-2 highly personalized SMS a day. Our guiding principle was that if a participant received any SMS intended for another participant, then it would not make sense to them.

CONCLUSION AND FUTURE WORK

In this paper we described the formative work that lead us to design a weight-loss intervention we believe is valid across the user-evidence-theory triangle. Following the design phase we are now embarking in a 2-year deployment of our intervention as part of a 4-year-long, 3-arms RCT study. All participants will receive Fitbit devices, two treatment groups will receive a personalized intervention, but only one will engage with a health coach. This differentiation will allow us to better understand how the designed intervention will play within a technology-focused, highly automated system.

Due to the nature of an RCT study, we will be limited in our ability to iterate on the design as it is deployed. However, we will be tracking reception of all modalities and efficacy for weight loss on a regular basis. This feedback will provide rich data on the downfalls and successes of a weight-loss intervention of this kind and scale, which we foresee to be incredibly informative for any future health intervention designs and research.

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