CULTURAL ADAPTATION OF A SMS DELIVERED WEIGHT MANAGEMENT INTERVENTION FOR MEN

by

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Abstract

Obesity is a risk factor for adverse health outcomes. In 2018, 26.8% of Canadians were classified as obese. Canadian men have higher obesity rates than women and few interventions target only men. This study aimed to, i) produce a culturally adapted library of text messages, and ii) to assess the acceptability of these texts. Mixed methods approach using semi-structured interviews, questionnaires, and text response data was used. Participants identified as male aged 19+ and owned a cellphone. Follow-up interviews were analyzed using the Framework Approach. Fifteen men participated, 14 completed one-month follow-up interviews, and 13 opted in to receive an additional 8-weeks of texts. Mean intervention satisfaction was 87.4%. Texts were acceptable to all men, and three main themes were identified: *outcomes, content, and timing.* This study created a culturally adapted library of weight loss SMS which was acceptable to a sample of Canadian men and feasible to deliver.

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Introductory Chapter

Classification and Prevalence of Obesity

One of the largest health risks threatening the global population today is obesity. Obesity can be defined broadly as having an excess bodyweight for a given height (Gadde et al., 2018), or as a complex chronic disease in which excess or abnormal body fat impairs health (Wharton et al., 2020). The most used equation to classify obesity at the population level is body mass index (BMI) (weight in kg/height in m^2). While BMI doesn't measure adiposity, it is simple to use for population health screening and epidemiological surveys (Gadde et al., 2018). The World Health Organization defines being overweight as having a BMI ≥25, and obesity as having a BMI ≥30 (WHO, 2020). Obesity can be further classified into class I (30-34.9kg/m^2), class II (35-39.9kg/m^2), class III (≥40kg/m^2), class IV (≥50kg/m^2), and class V (≥60kg/m^2)(Poirier Paul et al., 2011, Jensen et al., 2014, Navaneelan & Janz, 2014). A BMI ≥30 increases the risk of cardiovascular disease, diabetes, cancer, osteoarthritis, liver and kidney disease, and other chronic diseases (Pi-Sunyer, 2009, Kyrgiou et al., 2017, Jiang et al., 2016).

The prevalence of obesity in the western world is high (13%, WHO 2016), and Canada is no exception. Self-reported data from the 2018 Canadian Community Health Survey estimated that 26.8% of Canadians could be classified as having obesity, and a further 36.3% could be classified as having overweight (Canadian Community Health Survey, 2018). The same survey also noted the proportion of adults classified as healthy weight decreases with age from ages 18, up to age 64.

Obesity prevalence estimates differ between Canadian men and women. In Canada, men are more likely to be classified as obese than women across all age ranges starting at 20 (Stats Canada 2018). Canadian middle aged men (35-64) are most likely to be classified as obese (Navaneelan & Janz, 2014). Moreover, geographical disparities in obesity prevalence have been reported between Canadian provinces. The Atlantic provinces have been estimated to have the highest obesity rates in Canada (Navaneelan & Janz, 2014), and the estimated percentage of individuals with obesity in Newfoundland and Labrador (40.8%), Prince Edward Island (37.8%), New Brunswick (35.5%), and Nova Scotia (33.7%), are substantially higher than the national average (26.8%).

The prevalence of obesity in Canada has been steadily increasing over time. Although it is predicted that obesity rates among children and adolescents will remain stable, obesity rates among adults over the age of 18 are predicted to rise over the next two decades, with the largest increase seen among adult men (Bancej et al., 2015). A modelling study by O'Neill et al., (2019) used a validated obesity population risk tool (OPoRT) to assess the future burden of obesity in Canada using Canadian Community Health Survey data. The OPoRT tool uses 17 predictive factors in a logistic regression to predict the 10-year prevalence of obesity. The study estimated that the prevalence of obesity is expected to rise from 26.1% in 2013/2014, to 32.6% by 2023/2024, meaning roughly 8.54 million Canadians will be classified as obese by then. Men were predicted to have higher rates of obesity than women (34.7% vs. 30.5%). The highest obesity rates were predicted for those individuals from impoverished areas who are food insecure (45.2%). The prevalence of obesity in Canada has significant negative economic consequences for Canadians.

Economic Implications of Obesity

Obesity represents a large burden on the Canadian economy which can be examined at the individual or population level. A study based in Ontario aimed to estimate the compared costs of day procedures, hospitalizations, and physician costs between individuals classified as normal weight, overweight, and obese. Data obtained from the Canadian Community Health Survey was linked with hospital administrative databases and mapped onto BMI categories. Regression analysis found that hospitalization and physician costs were 40% higher for adults with obesity compared to adults classified as normal weight, and 22% higher for adults classified as overweight (Tarride et al., 2012). A study by Anis et al., (2010) examined the population health costs of obesity. The National Health Expenditure Database was used to allocate direct healthcare costs to obesity related comorbidities. It was estimated that the total direct healthcare costs of individuals with overweight and obesity is $6 billion dollars, or 4.1% of Canada's total health care spending for 2006. Moreover, Tran et al., (2013) conducted a systematic search of costs associated with obesity and prevention programs and found that the aggregated annual cost in Canada was $1.27-$11.08 billion dollars (Tran et al., 2013). This accounts for 2.2-12-% of Canada's total health care expenditure. A report from the Public Health Agency of Canada estimates the cost of obesity to be $4.7-$7.1 billion annually (PHAC/CIHI 2011). While estimates vary based on method of calculation, this data suggests that obesity represents a high amount of Canada's total healthcare expenditure.

Behavioural Weight-management Interventions for Men

There is a clear disparity in not only the prevalence of obesity between the sexes, but also the treatment. Men are less likely than women to perceive their weight as a health risk, or to consider self-managing their weight (Duncan et al., 2011), and are generally underrepresented in weight loss research. A literature review of behavioural weight loss interventions by Pagoto et al., (2012) found that 27% of participants in mixed-sex randomized controlled weight loss trials were male. Mixed sex interventions often offer the same intervention components for men and women, when some evidence suggests that men may require different intervention strategies than women (Lovejoy & Sainsbury, 2009). Robertson et al., (2017) conducted a systematic review of randomized controlled trials (RCTs) of weight loss and weight management interventions for men. The review found that a combination of reducing diet, physical activity, and behaviour change techniques was best for weight loss and weight loss maintenance (Robertson et al., 2017). Men preferred more factual information on how to lose weight and more emphasis on physical activity programs compared to women. Trials included in the review showed a high retention rate for participating men. Interventions should attempt to appeal to men to increase their effectiveness, by using preferred elements such as fact based language and individual feedback (Hunt et al., 2013, Patrick et al., 2011, Morgan et al., 2011), individualizing interventions, using personal goals (George et al., 2012, Newton et al., 2014), and humour (Hunt et al., 2013, Robertson et al., 2017).

SMS-delivered Behaviour Change Interventions for Weight Management

SMS-delivered interventions provide participants with reminders, education, or self-monitoring assistance for a broad range of chronic diseases or health conditions. A

2018 Canadian communications monitoring report by the Canadian Radio-television and Telecommunications Commission suggested that 31.7 million (88%) Canadians owned a cell phone capable of receiving and sending SMS, a 3% increase from the previous year (CRTC, 2018). SMS-delivered interventions have potential to reach large segments of the population at relatively low cost per unit. Text messages have the potential to embed intervention components that are suggested to increase the effectiveness of behaviour change interventions, such as evidence-based behaviour change techniques, tailoring content, interactivity, personalization, and high message repetition (Hall et al., 2015, Parvanta, 2011). Evidence supports the use of SMS-delivered interventions for health behaviour change and weight loss (Siopis et al., 2015, O'Reilly & Spruijt-Metz, 2013, Shaw & Bosworth, 2012, Head et al., 2013). A systematic review with meta-analysis by Skinner et al., (2020) examined the effectiveness of SMS-delivered behaviour change interventions for weight management. The review found that SMS-based behaviour change interventions for weight loss showed significant small to medium weight loss effects (-2.28kg, 95% CI -3.17, -1.39kg) and interventions targeting maintenance after weight loss showed significant small effects (-0.57kg, 95% CI, -1.31, -0.05kg). These effects are on par with the average weight loss from lifestyle weight management programs of 3% (NICE, 2018). SMS-delivered interventions for health behaviour change have been shown to have high levels of retention, acceptability, and feasibility (Dobson et al., 2018, Willcox et al., 2017 Speirs et al., 2016).

The remote location of many communities in the Atlantic provinces may increase the feasibility of SMS-delivered interventions. Access to resources is often limited and travelling to larger cities is not always feasible; other options for delivering interventions should be considered. SMS-delivered interventions have been suggested as cost effective

and feasible when delivering traditional interventions is impractical. A systematic review with meta-analysis by Porter et al., (2018) examined the effectiveness of behavioural weight loss interventions delivered in rural communities. Out of 45 studies that reported intervention outcomes, 40 reported mean participant weight loss (median = 3.64kg ± 2.72kg). The review found that 15 out of 17 interventions that measured weight outcomes post-intervention found sustained positive weight results. Longer intervention duration was associated with increased weight loss, and interventions lacking in-person components were associated with larger effects for participant weight loss than in-person delivery or combined interventions (in-person delivery and remotely delivered components).

Cultural Adaptation of Behavioural Interventions

Adapting interventions to new contexts can save time and resources associated with developing novel interventions for each context (Movsisyan et al., 2019). Stirman et al., (2013) define adaptation based on modifications made: (i) to the content of the intervention and its implementation; (ii) to the context; or (iii) to procedures for intervention evaluation (Stirman et al., 2013, Movsisyan et al., 2019). Resnicow et al., (2000) define adaptation based on the degree of modification to (i) observable characteristics of the intervention, and (ii) psycho-social and environmental factors (Resnicow et al., 2000, Movsisyan et al., 2019).

There is currently debate on the effectiveness of intervention adaptation. While there are multiple examples of successful adaptations (Gardner et al., 2016, Leijten et al., 2016), adaptations that were ineffective (Sundell et al., 2016, Skärstrand et al., 2014), or detrimental (Althabe et al., 2015) have also been documented (Movsisyan et

al., 2019). To examine this issue, Sundell et al., (2016) conducted two meta-analyses to compare the effectiveness of program adoption versus adaptation. They analyzed and evaluated studies from two regional samples: German child and youth prevention interventions (n=158), and Swedish psychological and social interventions (n=139). Interventions from each sample were placed into three categories: novel programs, international adoption, and adaptation. In both the Swedish and German samples, novel interventions were statistically the most effective. Interventions adapted for cultural reasons were more effective than programs adopted without change. Another systematic review conducted by Movsisyan et al., (2019) examined 35 studies that provided recommendations on how to adapt or re-evaluate interventions in new contexts. The review found that the overall aims of adaptation are enhancing cultural relevance and the sense of local ownership over the intervention. The sense of local ownership is seen as an important driver for acceptability and adoption. The available evidence indicates that culturally adapting interventions is preferable to adoption without change and is important for giving participants a sense of local ownership.

The Importance of Language in Healthcare

Obesity is a chronic condition that is often associated with weight bias and negative stigma that can contribute to increased morbidity and mortality (Sutin et al., 2015). This stigma is commonly expressed through emphasis on the personal responsibility of the individual with obesity. A 2019 survey that spanned four countries (i.e. Australia, New Zealand, UK, USA) found that 79% of people thought that obesity could be prevented, and 80% believed that it could be treated by following a healthy lifestyle (O'Keeffe et al., 2020). Healthcare professionals are not immune to this bias.

The same survey found that 57% of healthcare professionals believed obesity could be entirely prevented, and 62% that it could be cured with a healthy lifestyle.

The language used by healthcare professionals and others when talking about obesity can lead to discrimination and stigmatization. The terms ‘obese’ (Ward et al., 2009) and ‘morbidly obese’ (Gray et al., 2011) are perceived poorly by people living with obesity but are still widely used by healthcare professionals. To reduce the stigma of harmful language, Albury et al., (2020) provides examples of harmful communication with patients with obesity, insight on how they are harmful, and suggests alternative wordings and outline a set of guidelines for communication between healthcare professionals and people living with obesity to increase their wellbeing.

New Canadian clinical practice guidelines for obesity (Wharton et al., 2020) emphasize the risk of negative stigma related to obesity, and a shift towards person centered health outcomes as opposed to weight loss alone. The guidelines suggest that obesity care should validate patients lived experiences and focus on more than just ‘eat less and move more’ approaches to treating obesity. Language based interventions should be developed in a way that takes the participants perspective into account and should be phrased in a way that is empowering and avoids further stigma.

Co-Production Approach to Intervention Development

Many frameworks have been proposed to aid in the development of health behaviour change interventions. The Medical Research Council Framework (Craig et al., 2008), is one of the most widely used frameworks, but does not provide detailed information on how to develop intervention materials and delivery methods (Hawkins et al., 2017). Based on marketing perspectives, involving users in the creation of new

products is not a new idea for gaining consumer feedback and improving on product design (Kaulio, 1998). This has led to the suggestion that intervention development would benefit from incorporating the principles of iterative product design, and testing intervention components with stakeholders (Nesta, 2011).

The co-production approach to prototyping behaviour change interventions was created by Hawkins et al., (2017) to help researchers work with intervention providers to produce intervention content. The co-production approach has a three-stage framework and was initially tested by adapting the ASSIST smoking prevention intervention to two new peer led drug prevention interventions (ASSIST + Frank, Frank Friends). The three stages are: 1) Evidence review and stakeholder consultation; 2) Co-production; and 3) Prototyping. A feasibility trial conducted in Scotland by Malden et al., (2018) set out to adapt the Toybox Intervention – a preschool obesity prevention program – to the Scottish context using a coproduction approach (Hawkins et al., 2017). Preschool staff in Scotland were involved to provide stakeholder input, and meetings were held between researchers and stakeholders to agree on changes to classroom guides and materials. Mixed method analysis from the follow-up trial found that the adapted intervention was highly acceptably with preschool staff based on post-intervention surveys (80% acceptable) (Malden et al., 2020). The intervention was less acceptable to parents (49% acceptable), who cited lack of time as the main barrier, but perceived intervention materials to be simple to understand and visually appealing. Use of the co-production approach aids in making the intervention culturally relevant and more user-friendly for those responsible for intervention delivery.

Purpose

The current study aims to, i) produce a culturally adapted library of text messages ready for trialling in the Canadian context, and ii) to assess the acceptability and feasibility of these text messages using Canadian interested in losing weight.

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Chapter 2: Article

ABSTRACT

Background: Obesity is a major risk factor for cardiovascular diseases, musculoskeletal disorders, and certain cancers. In 2018, 26.8% of Canadians were classified as obese by BMI, and another 36% were classified as overweight. Canadian men have obesity at higher rates than women and few interventions target only men despite systematic review evidence suggesting that men may benefit from different intervention strategies. Study objectives were to, i) produce a culturally adapted library of text messages ready for trialling in the Canadian context, and ii) to assess the acceptability of these text messages using men with obesity.

Methods: Mixed methods approach using qualitative, semi-structured interviews and quantitative data from baseline and follow-up surveys and short message service (SMS) response data. Eligibility criteria included: identifying as male, ages 19 and older, own a cell phone capable of receiving and sending SMS, have the technology to engage in study procedures, and ability to understand text messages in English. Follow-up interviews were analyzed in Nvivo 12 using the Framework Approach to create a thematic framework.

Results: Fifteen men were recruited, 14 completed one-month follow-up interviews, and 13 opted in to receive an additional 8-weeks of SMS. Participants mean intervention satisfaction score was 87.4%. SMS were acceptable to all men, and 3 main themes related to acceptability were identified during follow-up interviews: *outcomes, content, and timing.* Participants reported engagement with strategies and use of study resources and some men set new routines. SMS content was important to nearly all participants. Some men requested more explicit information on how to lose weight while others

stated their desire for more texts prompting replies. Most men preferred the variable SMS schedule, but some would have preferred a more consistent schedule to allow for planning.

Conclusion: This study led to the creation of a culturally adapted library of weight loss SMS that were found to be acceptable to a sample of Canadian men and feasible to deliver.

Key words: obesity, behavior change, men, weight loss, text message

INTRODUCTION

An increasing number of Canadians are at risk of adverse health effects due to excess weight. Defined as a complex chronic disease in which excess or abnormal body fat impairs health (Wharton et al., 2020), obesity is a major risk factor for cardiovascular diseases, musculoskeletal disorders, and some cancers (World Health Organization). Self-reported data from the 2018 Canadian Community Health Survey estimated that 26.8% of Canadians are classified as obese by BMI, and a further 36% are classified as overweight. Canadian men have higher rates of obesity than women, but are generally underrepresented in weight loss research (Robertson et al., 2017). Men are less likely than women to perceive their weight as a health-risk, or consider self-managing their weight (Duncan et al., 2011). In a study by Skinner et al., (2008), mixed-sex participants who misperceived their weight as less severe than it actually was had worse diets, consumed more sugary drinks, fast food, had lower levels of physical activity and increased sedentary time.

A systematic review of randomized controlled trials of weight loss and weight management interventions for men conducted by Robertson et al., (2017) found that a combination of reducing diet, physical activity, and behavior change techniques was best for weight loss and weight loss maintenance (Robertson et al., 2017). Men from studies included in the trial preferred more factual information on how to lose weight, and more emphasis on physical activity programs compared to women. Evidence suggests that men may require different intervention strategies than women, and interventions targeting men should attempt to appeal to them to increase their effectiveness by using preferred elements such as fact based language and individual feedback (Hunt et al., 2013, Patrick et al., 2011, Morgan et al., 2011), individualization, using personal goals

(George et al., 2012, Newton et al., 2014), and humour (Hunt et al., 2013, Robertson et al., 2017).

Canadians' increasing use and reliance on mobile devices provides an opportunity for delivering behavioural interventions to support individuals with overweight and obesity. Systematic review evidence shows that text messages have the potential to embed intervention components that are suggested to increase the effectiveness of behaviour change interventions, such as; evidence-based behaviour change techniques, tailoring content, interactivity, personalization, and high message repetition (Hall et al., 2015).

Evidence supports the use of SMS delivered behaviour change interventions for weight management. A systematic review of SMS delivered behaviour change interventions by Skinner et al., (2020) found that SMS-based behaviour change interventions for weight loss showed significant small to medium weight loss effect (-2.28kg, 95% CI -3.17, -1.39kg), and interventions targeting maintenance after weight loss showed significant small effects (-0.57kg, 95% CI, -1.31, -0.05kg) (Skinner et al., 2020). These effects are on par with the average weight loss from behavioural weight management programs of 3% (NICE, 2018). SMS-delivered behaviour change interventions have the potential to reach large segments of the population at a relatively low cost per-unit, while still achieving results similar to traditional weight loss interventions.

Adapting interventions to new contexts can save time and resources associated with developing novel interventions for each context (Movsisyan et al., 2019). Although the available evidence suggests culturally adapting interventions is preferable to adoption without change (Sundell et al., 2015), there is currently debate on the

effectiveness of intervention adaptation. While there are multiple examples of successful adaptations (Gardner et al., 2016, Leijten et al., 2016), adaptations that were ineffective (Sundell et al., 2016, Skärstrand et al., 2014), or detrimental (Althabe et al., 2015) have also been documented (Movsisyan et al., 2019). A systematic review conducted by Movsisyan et al., (2019) examined 35 studies that provided recommendations on how to adapt or re-evaluate interventions in new contexts in an attempt to inform the development of guidelines on the adaptation of complex population health interventions. The review found that the overall aim of adaptation of adaptation for included studies was to enhance cultural relevance and the sense of local ownership over the intervention, which is seen is seen as an important driver of intervention acceptability and adoption.

The increasing prevalence of obesity in Canadian men and their underrepresentation in weight loss research highlights the importance of exploring feasible and effective solutions to providing evidence-based support for Canadian men interested in weight loss. The objectives of this study were to produce a culturally adapted library of text messages ready for trialling in the Canadian context, and to assess the acceptability of these text messages in men living with obesity.

METHODS

Game of Stones

This study builds on a recent feasibility trial conducted in Scotland by Dombrowski et al., (2020) titled “Game of Stones”. The trial aimed to assess the acceptability and feasibility of SMS to support weight loss for men and had four main objectives: 1) assess acceptability and willingness to be randomized, 2) assess the feasibility of recruiting from General Practitioner (GP) obesity registries and community

venues, 3) determine the acceptability of intervention content, feasibility of delivery, fidelity, and any unintended consequences, 4) assess indicative effects on weight change and progression criteria for a full trial. Outcomes were measured during 3, 6, and 12-month follow-ups. Participants (n=105 men) were randomized into three arms: SMS + financial incentives (FI), SMS only, or a waiting list control group. Participants could earn up to 400 pounds ($678) by meeting weight loss targets. Men in the SMS + FI and SMS only groups received 604 text messages over a period of 12 months. SMS were automated to be delivered at scheduled times and participants were sent between 0-5 texts per day. Retention at the 12-month follow-up was 74% and all groups lost weight (SMS+I: −2.51 kg (SD=4.94); SMS only: −1.29 kg (SD=5.03); control: −0.86 kg (SD=5.64) at 12 months). The trial had an acceptable retention rate at 12 months, was broadly acceptable to most participants and was feasible to deliver. All progression criteria for feasibility and acceptability were met and a full multi-centre trial to determine effectiveness is currently underway in the UK (Macaulay et al., 2022).

Adapting & Drafting SMS

This intervention was adapted in three stages: Stage 1) gathering information, Stage 2) drafting text messages, Stage 3) testing acceptability and feasibility of the new text messages.

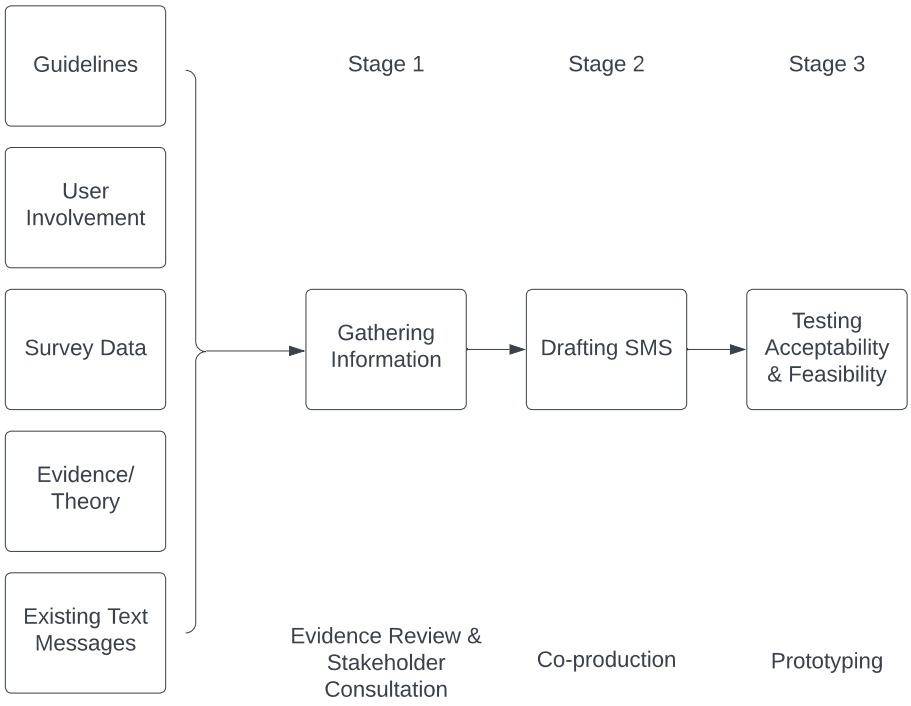

Figure 1*:* Stages of SMS adaptation.

Stage 1: Gathering Information

Information was gathered from five sources: i) existing SMS from the original Game of Stones (GoS) study ii) a weight management survey, iii) user involvement, iv) theory and evidence, and v) existing Canadian guidelines. Each source is discussed below.

i) Existing SMS from Game of Stones

A library of SMS was compiled and tested in the GoS study by Dombrowski et al., (2020) containing 84 text messages which were sent at a rate of one per day for 12 weeks. Text message content focused on weight management and included tips and experiences from men obtained through qualitative interviews. These text messages were overall seen to be acceptable in the previous UK based study (Dombrowski et al.,

2020) and participants gave feedback and improvement suggestions in qualitative interviews post-intervention. The existing library of SMS and the feedback given by men from the original Game of Stones formed the basis for the development of the current SMS library.

ii) Weight Management Survey

A cross-sectional survey assessing the perceptions of weight management in Canadian men was created to inform the development of new SMS. A nationwide sample of 1004 men with experience in weight loss was collected and common themes and relevant information from the survey were incorporated into the text messages. For example, weight loss strategies from the survey were incorporated into the texts to show participants the methods that 'real men' were using to achieve weight loss. Participants were recruited through IPSOS, a global marketing research and public opinion firm and the survey was distributed through Qualtrics. The survey consisted of four sections assessing weight history and perceptions, triggers, text messages, and demographics. Questions were developed based on a previous survey from the GoS study (Dombrowski et al., 2020), weight-loss strategies from the OxFab taxonomy associated with weight loss (Hartmann-Boyce et al., 2016), and discussion with the research team. Validated questions were used whenever available, and a mix of open and closed response questions were used, with Likert type questions used for attitudinal measurements. The results of this survey will be published elsewhere.

iii) User Involvement

User involvement was continuous, with feedback obtained through each stage of adaptation. Feedback on text messages was given by a health psychology PhD student, a

dietitian, and several men from the target population. Stakeholders were sent a document containing the SMS library. SMS were organized into columns with an adjacent column to give feedback on individual SMS. A template of this document can be found in Appendix C. Their feedback led to changes regarding language used in the SMS, with the overall content remaining largely unchanged.

iv) Theory and Evidence

The Game of Stones logic model (Dombrowski et al., 2020) (see Appendix D) outlines the theoretical framework that this intervention is based on and was used to organize the intervention into phases. The model was used to select the behaviour change techniques to be embedded in the SMS. Three psychological theories were drawn on to cover the three phases of behaviour change: i) motivation, ii) action iii) maintenance. These theories are Self-determination Theory (Deci & Ryan, 1985) (motivation), Health Action Process Approach (Schwarzer, 1992), (motivation and action) and the Behaviour Change Maintenance Model (Kwasnicka et al., 2016) (maintenance). The logic model combines the interactive psychological, behavioural, and physiological processes that are hypothesized to drive successful weight management interventions.

SMS contained evidence-based behaviour change techniques (BCTs) from the behaviour change technique taxonomy (Michie et al., 2013), and other weight management strategies in line with the logic model. Examples of BCTs used in this study include, demonstration of the behaviour (6.1), instruction on how to perform the behaviour (4.1), information about health consequences (5.1), and problem solving (1.2).

V) Guidelines and Recommendations

Intervention targets and recommendations were adapted to follow Canadian guidelines and recommendations. Guidelines used were the Canadian Physical Activity Guidelines (CSEP, 2020), Canada Food Guide (CFG) (Health Canada, 2018), and The Canadian Adult Obesity Clinical Practice Guidelines (Wharton et al., 2020). Information and recommendations provided through SMS were in line with guideline recommendations and links to the CFG and Canadian Physical Activity Guidelines were provided for participants to directly access relevant evidence-based information. Participants were also provided with links to resources such as the Healthy Eating Habits Guide and the Food Guide Snapshot from the CFG (Health Canada, 2018).

Stage 2: Drafting Text Messages

A library of 84 weight loss SMS was written by the study authors (A.K, S.D) based on the above sources of information. Weight loss SMS were sent to participants daily for a period of one month, with texts sent at a rate of 1 per day on a pre-determined schedule between 8am and 8pm. The timing of SMS did not follow a fixed pattern and was devised to enhance the content of the text messages. SMS providing suggestions for meals at home would be sent ahead of common mealtimes. For example, the SMS "*Greg likes detailed and specific action plans. One of his action plans is: every Tuesday after work he stops at the grocery store for fresh produce. Do you have any action plans?"* was sent at 5:00 PM. Participants could respond to texts but did not receive responses in return. Questions were used to prompt replies and a total of eight questions were asked in the first four weeks. Texts were personalized to include participant names to foster engagement and comradery, but no other personalization or tailoring was used.

Mosio was used as the SMS delivery system for this intervention. The SMS library was uploaded to Mosio prior to the beginning of the intervention and the SMS delivery schedule was programmed. Delivery of SMS was automated, with participants receiving the first text in the library on the first Sunday after being enrolled. Delivery of SMS was monitored on Mosio throughout the intervention. After all participants had completed the initial four weeks of SMS, replies from participants were exported into Microsoft Excel to be included in qualitative analysis.

SMS were written to serve 5 theoretical functions based on competencies identified by Michie et al., (2011) and adapted by Dombrowski et al., (2020): motivation (i.e. inviting participants to elaborate on reasons, desires, or targets for behavior change), self-regulation (i.e. inviting the participants to elaborate on behavioral performance aspects), adjuvant behaviours (i.e. inviting participants to perform preparatory behaviours facilitating dietary and physical activity change), engagement (i.e. inviting a response, both cognitive or by replying), and general communication techniques (i.e. techniques used to establish a relationship between the participant and the programme, recap, pacing, or use of humour). SMS content focused primarily on dietary and physical activity behaviours.

The overall timeline of SMS was organized into two distinct phases based on the GoS logic model: initiation and consolidation. The initiation phase served to increase motivation and promote engagement, with key considerations such as: providing resources and encouraging goal setting. Consolidation focused on habit formation, and self-regulation, with key considerations such as: overcoming triggers and barriers to weight loss, demonstration of ways to combat triggers, and action planning for social situations that may interfere with weight loss. Both phases served a specific function for

the intervention based on the GoS logic model and built upon the previous phase. Both phases had their own key considerations, examples, and resources. SMS were organized into weekly themes in line relevant evidence, including planning, goal setting, and self-monitoring. A full list of themes can be found in the appendix (Appendix E). Individual text messages were stand-alone and did not require the previous texts to be read. A sample week of SMS are provided below in Table 1.

Table 1: Sample of one week of SMS and Timings.

Day	Time	Text Message
		Week 3: Physical Activity
Monday	10:00	Week 3. Let's talk physical activity. Getting active can seem difficult when you've just worked a long day and spending the evening on the couch feels great. The thing is, getting moving will give you more energy!
Tuesday	16:00	You don't have to go to the gym to be physically active. Most men say they enjoy going for brisk walks or light bike rides. The goal is to be breathing a little harder and be slightly sweaty by the time you finish.
Wednesday	13:30	Life happens and you won't have time to fit in physical activity every day. James said on those days his goal is just to not sit for too long. Reducing sitting time is just as important for staying healthy as moving.
Thursday	11:15	Physical activity improves your energy levels, lowers your stress levels, and decreases your chances of getting diseases like cancer and heart disease. Not too shabby!
Friday	11:45	Here's another great thing about physical activity. Men have told us that when they are active they feel better, and when they feel better, they eat better. Win-win right there.
Saturday	14:30	Why couldn't the bicycle stand up on its own? Because it was two tired…. Sorry that one slipped, hope your day is going well!
Sunday	18:00	You've made it through physical activity week. Did you make any changes or start a new physical activity routine? Let us know, we'd love to hear about it.

Stage 3: Testing Acceptability and Feasibility

Design

This study used a mixed methods approach with qualitative, semi-structured interviews and quantitative data from baseline and follow-up surveys and SMS response data.

Eligibility Criteria

Eligibility criteria for this study were to: i) identify as male, ii) be 19 years of age or older, iii) be interested in losing weight, iv) own a cell phone capable of receiving and sending SMS, v) have the technology to fill out online surveys and participate in virtual remote interviews, and vi) understand English language text messages.

Recruitment

Participants were recruited through advertisements (see appendix A) which were distributed in public areas in the community (e.g., coffee shops, grocery stores, farmers market, bus stops) and online on social media (e.g., mailing lists, twitter, and Facebook) and word of mouth. Advertisements contained study details and the contact information of the research team. Potential participants could contact the research team by email or through the study phone number for further details. The study used rolling recruitment, beginning September 2021, until 15 participants were recruited by November 2021.

Men expressing an interest in participating were provided with an information letter (see Appendix B) via email containing full details of the study. Potential participants could then book an appointment to meet virtually via a remote communication platform (Microsoft Teams) where the information letter was reviewed to ensure full awareness of study procedures. Individuals that agreed to participate after

reviewing the information letter then gave verbal consent and filled out the baseline information survey before being entered into the SMS delivery system, Mosio. This study received approval from the University of New Brunswick Research Ethics Board (#2021-020).

Semi-Structured Interviews

After receiving the texts for one month, participants were invited to take part in a single semi-structured interview via a remote communication platform (Microsoft Teams) to provide feedback on the acceptability and experience of the intervention. Interview length ranged from 19 minutes to 44 minutes (median = 24 minutes). Participants were asked questions on their experience receiving the SMS, such as: "*How have you found receiving the texts over the last month? Have you been reading them?*" and commented on perceived helpfulness, suggestions for improvement, and if they would be interested in receiving SMS for a full twelve months instead of one month. A full topic guide for the interviews can be found in Appendix F.

Quantitative Survey Measures

Questionnaires were used at baseline and follow-up time periods to collect quantitative measures on weight history and perceptions, health and behaviours, text message satisfaction, and demographic information. Qualtrics was used to distribute surveys and collect data. Participants were prompted to fill out surveys after completing baseline and follow-up surveys. Survey items are listed below. Survey items were sourced from the Game of Stones National Institute for Health Research report (2020) unless indicated otherwise.

Weight History and Perceptions

Weight loss confidence and importance were assessed with the items: "*How confident are you in your ability to lose weight*?"; "*How confident are you in your ability to keep lost weight off in the long term?"* and *"How important is losing weight for you at this moment?"*. Responses were made on a 7-point scale from 1 (not confident) to 7 (very confident).

Highest past weight loss was assessed with the item: "*What is the most weight you have ever lost by changing your eating and/or activity*?". Responses were collected as pounds (lbs) ranging from 0 to 100 in increments of 1lb. The highest option was "*more than 100 lbs*".

Weight was assessed with the item: "*Roughly how much did you weigh during your most recent weigh in*?". Open text response option was provided.

Ideal weight was assessed with the item: "*What is your ideal weight*?". Response options were listed in a drop-down box from 100-500 pounds in increments of five.

Desired weight loss was assessed with the item "*How much weight do you want to lose by participating in this study?"*. Responses were listed in a drop-down box ranging from 5 pounds to 100+ pounds in increments of five.

Timing of most recent weight loss attempt was assessed with the item: "*Before beginning this study, when was the last time you tried to lose weight by changing your eating and/or activity for longer than one week?*". Response options included: "*I have never tried to lose weight*", "*Within the last 3 months*", "*Within the last 6 months*", "*Within the last 12 months*", or "*More than 12 months ago*".

Weight management success was assessed with the item: "*What statement would describe your weight management best*?", followed by the options "*I have been*

unsuccessful in losing weight", "*I have been successful in losing weight, but less successful in keeping it off*", and "*I have been successful in losing weight and keeping it off*".

Weight loss motives were assessed with the item: "*Why did you want to lose weight during your last weight loss attempt?"*. Response options included "*Improve health*", "*Increase fitness*", "*Improve appearance*", "*Feel better*", "*Fit into old clothes*", "*Increase confidence*", "*An occasion (e.g., wedding or anniversary)*", and "*Other*" with an option to provide specific details.

Reappraisal of obesity in light of the global COVID-19 pandemic was assessed with the item: "*Has the COVID-19 pandemic changed the way you think about overweight and obesity*?" with responses collected as "*Yes/No*". Participants selecting "*yes*" were then asked, "*How has the COVID-19 pandemic changed the way you think about overweight and obesity*?" followed by free text response. (Source: New)

Past weight loss attempts was assessed with the item: "*How many times in your life have you changed your eating and/or physical activity for longer than a week to lose weight?".* Responses were listed in a drop-down menu ranging from 1 to more than 30.

Health & Behaviours

Vigorous physical activity was assessed with the item "*During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, aerobics, or fast cycling?".* Number of days from 1-7 could be selected from a drop-down list.

Moderate physical activity was assessed with the item "*During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or walking?"*. Number of days from 1-7 could be selected from a drop-down list.

Sedentary behaviour was assessed with the item: "*During the last 7 days, how much time did you spend sitting?".* Response options included hours and minutes spent sitting during the week, and hours and minutes spent sitting on the weekend.

Alcohol consumption was assessed with the item: "*During the last month, how many days did you usually have any kind of drink containing alcohol?"*. Response options included: "*Everyday*", "*5-6 times a week*", "*3-4 times a week*", "*Twice a week*", "*Once a week*", "*2-3 times a month*", "*Once a month*".

Smoking history was assessed with the item: "*Do you currently smoke, or have you ever smoked?".* Response options included: "*Yes, I smoke everyday*", "*Yes, I currently smoke but not every day*", "*Yes, I used to smoke but have quit*", "*No, I have never smoked*".

Fruit and vegetable consumption was assessed with the item: "*How many portions of fruit and vegetables (including salads, fruit juices, and fresh, dried, or canned fruits) did you eat yesterday?"*. Response options range from 0 portions to 7+ portions.

Text Message Satisfaction

Text message satisfaction was assessed with the item: "*On a scale from 0 (not satisfied) to 100 (completely satisfied), how satisfied are you with the text messages?".* Responses were recorded on a sliding scale from 0-100.

Feelings around text messages were assessed with the item "*Overall the text messages are…"*, followed by the following statements: "*Understandable*", "*Useful*", "*Helpful*", "*Interesting*", "*Relevant*". Response options included: "*I totally disagree*", "*I somewhat disagree*", "*Neither agree or disagree*", "*I somewhat agree*", "*I totally agree*".

Frequency of reading SMS was assessed with the item: "*How often did you read the text messages".* Response options included: "*Daily", "Most days", "Some days", "Rarely",* and "*Never".*

Action control was assessed with the item: "*During the last month I have*…" followed by a list of statements. Statements were: "*Often had weight loss on my mind*", "*Always been aware of my weight loss plans*", "*Consistently monitored my eating and physical activity*", "*Taken care to eat healthily and be physically active*", "*Really tried hard to lose weight*", and "D*one my best to act in accordance with my weight loss plans*". Response options included: "*Strongly disagree*", "*Disagree*", "*Agree"*, "*Strongly Agree*".

Weight loss satisfaction was assessed with the item, "*Given the effort you've put into losing weight, how happy are you progress at this moment?"* Responses were made on a 7-point scale from 1 (not confident) to 7 (very confident).

Strategies used to assess weight loss were assessed with the item *"Which of the following strategies did you use in the last month?"* (Source: Hartmann-Boyce et al., 2018). A full list of strategies can be found in the appendix (See Appendix G).

Demographics

Demographic variables included: height, age, race, education level, employment status, marital status, and medical history. See Appendix H for details on questions.

Analysis

Quantitative Analysis

Continuous variables from baseline and follow-up surveys were analyzed using the following descriptive statistics: N (number of valid non-missing responses), mean,

95% confidence intervals, and counts. Likert scale variables were treated as continuous measures and frequency and percentages were used to represent all categorical data. SMS response frequency was calculated for individual participants, and for the cohort.

Measures are reported as estimates with 95% confidence intervals without p-values in line with the CONSORT statement to improve the transparency and quality of pilot and feasibility trials (Schulz et al., 2010).

Qualitative Analysis

All interviews were conducted by the study author (A.K), a male master's student. The study author was new to qualitative research but received instruction and guidance from the research supervisor (S.D). Interviews were transcribed, anonymized and uploaded to Nvivo 12 to be analyzed using the framework approach (Smith & Firth, 2011) in concert with participant baseline characteristics and theory-based mediators collected during the follow-up survey. A coding frame was developed by the study author (A.K) after familiarizing himself with the interview transcripts, followed by a discussion with the research supervisor (S.D) to finalize a framework and identify major themes. Interviews were then coded line-by-line by the study author to expand key themes and identify sub-themes. All SMS records were captured in the Mosio system, and logs were exported into excel to be included in qualitative analysis. SMS responses were a mix of spontaneous replies and responses to specific prompts.

RESULTS

Recruitment and Retention

Recruitment was completed over three months between September and November 2021, meeting the target goal of 15 participants (see Figure 2). Twenty-three men

expressed interest in participating, of which eight did not respond to requests for a meeting to discuss study details. Fifteen men gave consent and completed the baseline questionnaire and were entered into the study.

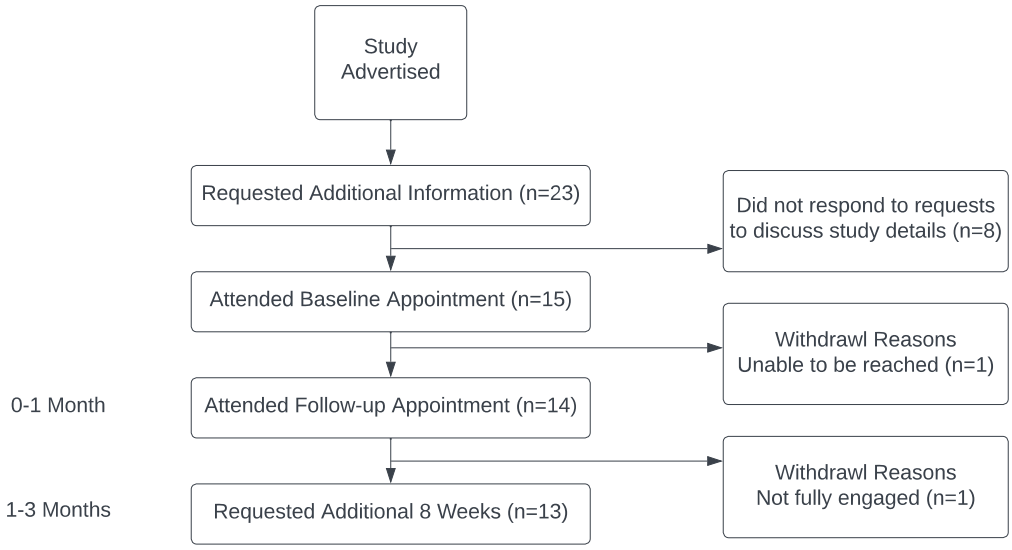

Figure 2: Study Flow Chart.

One-month follow-up interviews were attended virtually by 14/15 (93%) participants. One participant could not be reached to schedule the follow-up interview. Of the 14 men that participated in follow-up interviews, 13 (93%) requested the additional 8 weeks of SMS. The participant that did not request the additional texts stated the reasons as being a combination of '*life being too busy'* and '*not being fully captivated'* by the intervention.

Participant Characteristics

A total of 15 men consented to participate in this study and gave baseline information. The participant who could not be reached for follow-up was excluded from baseline analysis. The mean age of participants was 29.3 years (SD=11.0). Most

participants were white (n=13), single (n=10), and under the age of 30 (n=10). The average BMI of participants was 30.8 (SD=3.4), with nine men classified as obese by BMI and five classified as overweight. Goal weight loss from participating ranged from 4.5kg – 22.7kg (SD =4.8 kg). Half of participants (n=7) attempted to lose weight in the last 3 months before participating and most men (n=10) classified themselves as successful in losing weight, but unsuccessful in keeping lost weight off. The most common reasons for attempting weight loss were to improve health (n=14), feel better (n=13), increase fitness (n=13), improve appearance (n=12), and increase confidence (n=10). Participant characteristics are shown below in Table 2.

Table 2: Participant Baseline Characteristics.

Variable	**Baseline n=14**
Age (years), mean (95% CI)	29.3 (23.5, 35.0)
Weight (kg), mean (95% CI)	100.0 (94.0, 106.0)
Height (cm), mean (95% CI)	180.2 (176.6, 183.8)
BMI (Kg/m^2), mean (95% CI)	30.8 (29.1, 32.6)
BMI (Kg/m^2) categories, n (%)	
Overweight (25-29.9)	5 (36)
Obese (>30)	9 (64)
Marital Status, n (%)	
Single	10 (71)
Married	3 (21)
Divorced	1 (7)
Race, n (%)	
White	13 (93)
Prefer not to answer	1 (7)
Education, n (%)	
High school	5 (36)
Undergraduate	4 (29)
Graduate	4 (29)
College	1 (7)
Employment Status, n (%)	
Unemployed	1 (7)
Student	5 (36)
Full-time	7 (50)
Part-time	1 (7)

Comorbidities, n (%)	
Asthma	2 (14)
Hypertension	2 (14)
Obesity	2 (14)
Other	2 (14)
None	9 (64)
Weight Management Statement, n (%)	
Unsuccessful in losing weight	1 (7)
Successful in losing weight, but not in keeping it off	10 (71)
Successful in losing weight and keeping it off	3 (21)
Never tried to lose weight	0 (0)
Has Covid affected the way you think about obesity, n (%)	
Yes	6 (43)
No	8 (57)
Past weight loss attempts, mean (95% CI)	5.5 (1.9, 9.4)
Reason for weight loss, n (%)	
Improve health	14 (100)
Improve appearance	12 (86)
Increase fitness	13 (93)
Feel better	13 (93)
Increase confidence	10 (71)
Fit into old clothes	6 (43)
An occasion	1 (7)
Other	1 (7)
Most recent weight loss attempt, n (%)	
Within the last 3 months	7 (50)
Within the last 6 months	3 (21)
Within the last 12 months	0 (0)
More than 12 months	4(20)
I have never tried to lose weight	
Ideal Weight (kg), mean (95% CI)	86.5 (82.3, 90.7)
Most weight lost (kg), mean (95% CI)	13.8 (9.1, 18.5)
Goal weight loss (kg) mean (95% CI)	7.0 (4.4, 9.5)

Note: BMI, Body Mass Index; kg, kilogram; SD, standard deviation, n

Attitudinal Measurements

Attitudinal measures are displayed in Table 3. Participants reported increased confidence in their ability to lose weight (n=6), and their ability to keep lost weight off in the long term (n=6).

Table 3: Weight history and perceptions at baseline and one-month follow-up.

Variable	Baseline n=14	Follow-up n=14
Weight loss confidence (1-7), mean (95% CI)	5.2 (4.5, 5.0)	5.6 (5.0, 6.0)
Weight loss maintenance confidence (1-7), mean (95% CI)	4.4 (3.6, 5.2)	4.9 (4.3, 5.6)
Importance of weight loss (1-7), mean (95% CI)	6.1 (5.4, 6.8)	6.3 (5.7, 6.9)
Current Weight (kg), mean (95% CI)	100.0 (94.0, 106.0)	98.5 (93.0, 104.0)
Weight loss satisfaction (1-7), mean (95% CI)	NA	4.6 (1.0)
During the last month I have (1-4)….mean (95% CI)		
Often had weight loss on my mind	3.5 (3.1, 3.8)	3.7 (3.4, 4.0)
Always been aware of my weight loss plans	3.0 (2.6, 3.4)	3.3 (2.9, 3.7)
Consistently monitored my eating and physical activity	2.6 (2.1, 3.0)	3.1 (2.9, 3.4)
Taken care to eat healthily and be physically active	2.5 (2.1, 2.9)	3.1 (2.9, 3.4)
Really tried my best to lose weight	2.1 (1.7, 2.5)	2.9 (2.4, 3.3)
Done my best to act in accordance with my weight loss plans	2.4 (2.0, 2.9)	2.9 (2.4, 3.3)

Note: *N=10.

Health and Behaviours

Four men (29%) reported increased moderate physical activity, while eight men (57%) reported increased vigorous activity during the one-month follow-up. Six men (43%) reported decreased sedentary time during the week, and six men (43%) reported decreased sedentary time during the weekend. Five men (36%) reported a decrease in alcohol consumption, five (36%) reported an increase, and four (29%) reported no change. Smoking behaviors remained unchanged while five men (36%) reported increases in fruit and vegetable consumption from baseline to follow-up. Seven men

(50%) lost weight while four (29%) maintained their weight from baseline to 1-month follow-up. Participants lost an average of 1.5 kg (95% CI, -0.5, 3.5kg) from baseline to 1-month follow-up. The most common weight-loss strategies used during the program were: reminding yourself of the health benefits (n=13), weighing yourself (n=10), goal setting (n=9), and focusing on one small change at a time (n=9).

Table 4: Health and behaviours at baseline and one-month follow-up.

Variable	Baseline n=14	Follow-up n=14
Vigorous Physical Activity (0-7 days), mean (95%)	2.6 (1.9, 3.3)	3.1 (2.4, 3.7)
Moderate physical activity (0-7 days), mean (95% CI)	4.0 (3.2, 4.8)	3.9 (3.0, 4.9)
Weekday sedentary behaviour (Hrs), mean (95% CI)	12.9 (4.6, 21.1)	6.7 (5.4, 7.9)
Weekend sedentary behaviour (Hrs), mean (95% CI)	8.9 (5.6, 12.2)	7.6 (5.7, 9.5)
Alcohol, n (%)		
Never	2 (14)	1 (7.1)
2-3 times a month	4 (29)	5 (35.7)
Once a month	1 (7)	1 (7.1)
Once a week	1 (7)	2 (14.3)
2-4 times a week	6 (43)	5 (35.7)
Smoking, n (%)		
Never smoked	10 (71)	11 (78.6)
Used to, have since quit	4 (29)	2 (14.3)
Currently smoke, but not everyday	0 (0)	1 (7.1)
Portions of fruit+veg, mean (95% CI)	3.5 (2.5, 4.5)	3.1 (2.3, 4.0)

Note: Hrs, hours, veg, vegetables.

Acceptability of Intervention Components

Table 5 displays text message experience indicators during the one-month follow-up period. Overall mean satisfaction during the 1-month follow-up was 87.4% (70-100%). Most men read the SMS daily, and all men found them to be understandable.

Table 5: Participant programme experience at one-month follow-up.

Variable	Follow-up n=14
SMS Satisfaction (0-100), mean (95% CI)	87.4 (81.2, 98.4)*
Overall, the SMS are…	(1=totally disagree, 5=totally agree), mean (SD)
Understandable	5.0 (5.0) †
Useful	4.1 (3.7, 4.5) †
Helpful	4.5 (4.2, 4.7) †
Interesting	4.1 (3.6, 4.6)
Relevant	4.6 (4.3, 4.8)
How often did you read the SMS?	n (%)
Daily	10 (71)
Most days	4 (29)
Some days	0
Rarely	0
Never	
Weight Loss Strategies, n (%)	
Setting goals for weight loss	9 (64)
Identifying barriers to weight loss	7 (50)
Repeating actions at the same time	5 (36)
Weighing yourself	10 (71)
Reminding yourself of why you are trying to lose weight	8 (57)
Reminding yourself of the health benefits	13 (93)
Keeping track of what you eat and drink	7 (50)
Seeking out information from trusted sources	4 (29)
Setting goals for healthy eating	8 (57)
Changing your eating environment to remove temptation	7 (50)
Focusing on one small change at a time	9 (64)
Weight loss happiness (1-7), mean (95% CI)	4.6 (4.0, 5.1)

Note: *N=12, †N=13.

Acceptability of SMS Delivery and Content

There were no negative replies to any of the SMS. Seven men (47%) responded to SMS and four of those men (27%) responded to 5 or more SMS. Several reasons were given for responding to SMS during follow-up interviews, including sending positivity, ("*I felt like there was a lot of positivity coming from the texts, so I tried to feed that back*

into them"), stating they enjoyed a specific text, ("*there's 2 [SMS] I really liked and I just put down that I really liked that message*"), because the text prompted a response, ("*the ones [SMS] that prompted I [responded]*" and to provide progress updates, "*I basically said I weighed myself last night*"). One participant reported not being engaged with the study, ("*I kind of tuned out probably a week or so in. It's been a bit of a hectic month and I wasn't your most diligent participant.*").

Major Themes

Three major themes with corresponding sub-themes related to SMS acceptability were observed in the interviews conducted after 4 weeks of receiving text messages and SMS replies: 'outcomes', 'content', and 'timing' (Figure 3).

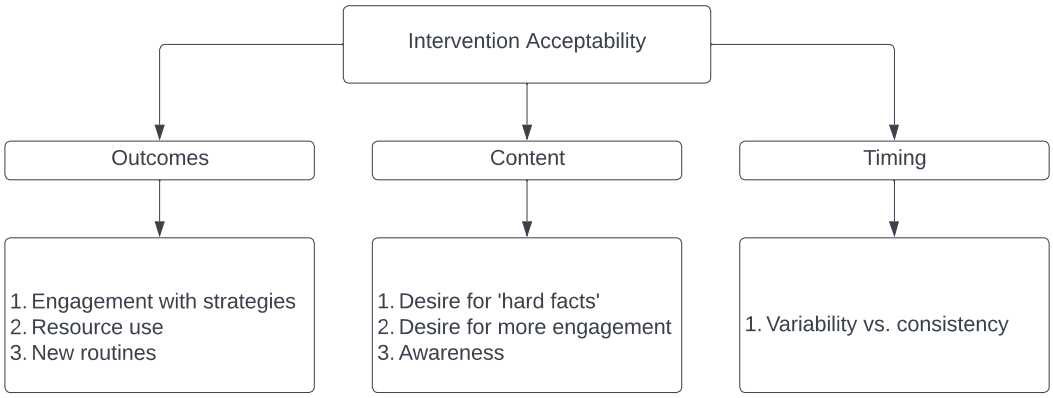

Figure 3: Major themes and sub-themes on SMS Acceptability.

Outcomes

'Outcomes' describes the behavioural and perceptual changes which were seen as resulting from participating in the intervention. Three sub-themes were identified: 'engagement with strategies, 'resource use', and 'new routines'.

Engagement with Strategies

'Engagement with Strategies' refers to participants reporting to have engaged with behaviour change techniques and weight loss strategies promoted through SMS. The theme of week four was goal setting, and SMS encouraged participants to set and share goals related to weight loss and health. Men replied to SMS stating they had set process goals used to achieve a goal ("*I really want to focus on going to bed on a regular schedule*"), and outcome goals of the desired outcome ("*Lose around 1 inch around my waist/stomach in 1 month or so. And lose 4 pounds*.").

Some men reported using various weight loss strategies suggested in the text messages such as self-weighing ("*I weighed myself last night")*, action planning, ("*my current action plan is to try and have a fruit-based protein smoothie shortly after going to the gym*") and identifying barriers to weight loss ("*boredom is my biggest trigger. Having something to chew on helps me*"). Some replied to texts and shared their weight loss plans for the week.

> *"I've been planning my times to be physically active and planning better mealtimes around my work/gym schedule*" (Participant 8).

During follow-up interviews, some participants elaborated on their replies to SMS encouraging them to share weight-loss goals. One participant stated his goal was maintenance ("*I did set a goal to continue doing what I was doing").* Others set goals for being physically active *("I tried to go for a walk every day at lunch time")*, demonstrating flexible application of intervention content by the participants tailoring it to their personal circumstances.

Resource Use

'Resource use' describes participants reporting to use study resources delivered in SMS. Several men reported following the links provided to the Food Guide website. One

participant stated that the SMS he found most helpful contained links to the Food Guide, and that while he was aware the guide was recently updated, he had yet to visit it before participating in this study.

> *"Actually referring to that [Canada Food Guide], that was helpful. I did know that the food guide was updated, and I remember taking a look at it a while ago" (Participant 9).*

'Seeking out information from trusted sources' was a common weight loss strategies used by participants as stated in the follow-up survey, suggesting men interested in losing weight may have benefited from using the resources provided.

New Routines

'New routines' describes accounts of behavioural and routine changes after receiving SMS. Men noted beginning several new routines, as well as making changes to old routines. One participant reported beginning to run regularly after a few weeks of receiving SMS. When asked if the texts had an influence on this, he stated:

> "*Definitely a little bit, yeah. So the ones [SMS] later on where they were saying, like you know, even if you get out just for a brisk walk or whatever, just to kind of keep energy levels up and that sort of thing that definitely was helpful*" (*Participant 11*).

Another participant set a designated takeout night and started thinking about scheduling after receiving a text about planning. One participant stated that receiving the SMS was beneficial for developing new routines in behaviours which were not related to weight loss.

> "*…Having those reminders that like. To not put stuff off and just like go and do it, it kinda helps with like everything and not just physical activity and like weight loss related stuff. So that was also a bonus too."* (Participant 5).

This may suggest that participation in the intervention had a spillover effect by participants applying strategies suggested through SMS into other areas of their lives.

Content

'Content' describes participants views and attitudes toward SMS content and the resulting implications for outcomes, engagement, and awareness. Three sub-themes were identified: 'desire for hard facts', 'desire for increased engagement', and 'awareness'.

Desire for Hard Facts

'Desire for hard facts' describes participants wanting additional concrete information on nutrition and physical activity in the SMS. While some SMS contained facts and tips on weight loss, many participants suggested that more concrete information would have been beneficial. Men primarily desired more SMS with information on nutrition. Participants generally agreed that they understood physical activity ("*I have a pretty good understanding of how to be physically active"),* but that nutrition was an area where they lacked clarity. One man asked questions such as foods to avoid ("*What types of food shouldn't you eat?")* and weight loss supporting food ("*…what types of food can help you lose weight?").* Another asked for help with what time to eat meals ("*More information on what time to eat would be helpful").* This may suggest that men are uncertain about how to eat to lose weight, potentially due to the amount of conflicting information about nutrition that is currently available.

When asked about their experience receiving the SMS, one participant thought before participating that the intervention would contain more explicit instruction on how to lose weight and stated:

"*I thought it [the intervention] was going to be a little more like information I guess on how to actually lose the weight*." (Participant 11).

Participant were asked during follow-up interviews if they found any particular text messages helpful, and many indicated that SMS providing weight-loss facts resonated with them. One participant talked about his experience attempting to lose weight and where he struggles:

> *"I'm a fairly active guy, but nutrition has always been my struggle. Those are the texts that really got to me. The drinking water, yeah the nutrition*" (Participant 1).

Desire for increased engagement

'Desire for increased engagement' refers to participants expressing the desire for more SMS that ask questions and prompt replies. Engagement is one of five theoretical functions that SMS were written to serve, and several participants suggested that more SMS that prompted a response would have been beneficial for engagement. One participant said that more engagement would aid with motivation and staying accountable.

> *"I think that might be like you would kinda feel more motivated in a way to kind of keep yourself accountable to weight loss and to kind of check in even on your own progress*" (Participant 4).

Another participant added that SMS that asked for a response prompted him to reflect on his behaviours and their implications.

> "*I think I like the ones [SMS] that ask for a response the most. I think that's adding more of those types of text messages where it prompts a response, because that's where I felt I really thought about the information that was*

> *presented, or even how far I'd come since starting it. Or just furthered my contemplation about the topic*. (Participant 10).

When asked about how SMS could be improved, one participant suggested including small challenges suggests which could be enacted on the day *("walk five flights of stairs today")*.

Men may have felt that answering more direct questions would have made the intervention feel more interactive and less automated. This could serve to increase rapport with participants.

Awareness

'Awareness' refers to participants reporting increased awareness of their weight loss plans and behaviours as a result of receiving the SMS. Participants repeatedly stated that seeing study SMS acted as a reminder to stick with their weight loss plans. For some, this aided in overcoming behavioral triggers.

> *"There was one day where I think it [the SMS] came in at like 12:15 and me and some co-workers were going to lunch and I wanted to try a burger but I didn't*" (Participant 9).

Other participants referred to SMS as a nudge to act on behaviours, and that seeing SMS increased their conscious awareness of their weight loss plans.

> *"I don't know if it would be easy for a person to remind me as easily as a text. So the text was a good way to bring it [weight loss] into my conscious awareness"* (Participant 2).

Awareness was assessed during baseline and follow-up surveys using the items "*During the last month I… have often had weight loss on my mind"* and "*… have always been aware of my weight loss plans".* Four (29%) and 6 (43%) men respectively, reported

increases in awareness from baseline to follow-up, suggesting SMS may have increased awareness of weight loss plans and behaviours for some.

Timing

'Timing' refers to the importance of SMS delivery time for participants. One identified sub-theme was 'variability vs consistency'.

Variability vs. Consistency

SMS timing was seen as an important factor by all participants. Participants were divided on SMS schedules with some finding the variable schedule helpful and engaging, whilst others stated that they would have preferred a more predictable schedule. Men who preferred a more predictable schedule often expressed the desire to be able to choose which times they receive texts.

> *"Honestly, I'm the guy that's pretty regimented so I like receiving them at the same time. If I could hand pick a time to receive them, I would"* (Participant 1).

This may be due to having work or school schedules that leave participants unable to check their phones during certain hours, ('*I'm so busy from 8-3pm'*) or because they believe receiving SMS at specific times amplifies the message ('*I would have more chance taking in more and thinking about it more'*).

Participants who preferred the variable schedule of the text messages believed it made them more likely to read the message and engage with the content. They expressed that had SMS come in at regular times, it would have been easy to ignore the notifications.

> *"I did like the random timing because […] I think if they came at the same time I would be likely to ignore them but when I heard my phone I was like oh what is that. And then I was like oh it's the study, good stuff"* (Participant 9).

Discussion

Principal Findings

This study culturally adapted an existing library of weight-loss SMS (Dombrowski et al., 2020) and tested its acceptability and feasibility with adult Canadian men interested in losing weight. The recruitment goal was met within the designated timeframe and most men (93%) were retained through the one-month follow-up period. Overall mean satisfactions scores were high (87/100) and similar to satisfaction measures from GoS (80/100, SD=20.1) (Dombrowski et al., 2020). SMS were acceptable to all men based on data gathered during qualitative interviews, evidence of engagement with SMS content, replies sent to individual texts, and a lack of negative SMS replies received. Of the 14 men who completed follow-up interviews, 13 (93%) chose to receive an additional eight weeks of text messages. This study demonstrates that SMS-delivered weight loss interventions are acceptable to men and feasible to deliver.

Many participants requested more SMS with explicit information on how to lose weight, such as what to eat, how much to eat, and when to eat. Although more explicit information was the most requested SMS content change by participants, information techniques, such as provide information, and provide information on consequences, are associated with less weight loss when compared to other specific change techniques (Dombrowski et al., 2012). This suggests there may be a gap in participants understanding of effective change techniques for weight loss. Providing specific weight loss information may cause some participants to view the information as less relevant as not everyone has the same needs with regards to weight loss. Participants not identifying

with or finding specific information relevant may cause them to become disengaged with intervention content. Alternatively, failing to provide enough specific information may cause participants to perceive the intervention as unhelpful. Finding a balance between information specificity and general applicability is likely an important factor for engagement with intervention content. This phenomenon of desiring explicit weight-loss information when research shows providing information is associated with less weight loss can be termed the instructions-desire paradox.

Strengths and Limitations

This study culturally adapted a library of SMS which were acceptable in the UK context from the Game of Stones feasibility randomized controlled trial, which had been underpinned by the ROMEO systematic reviews and qualitative evidence synthesis of weight loss interventions for men with obesity (Dombrowski et al., 2020, Robertson et al., 2019, Archibald et al., 2015). The remote nature of this intervention is feasible to deliver to remote populations and during the global Covid-19 pandemic as it requires no in-person interaction. The relatively low cost of delivering SMS and high number of Canadians owning cell phones (88%, CRTC, 2018) makes this intervention scalable and has potential for reaching underserved populations such as low-income Canadians. SMS content and timing were informed by the feedback of over 1000 Canadian men with experience losing weight, potentially increasing their relevance and applicability.

There were numerous limitations which need to be taken into consideration when interpreting the findings of this research study. This study used a small sample with most participants recruited in a single geographic area. A majority of participants were recruited through a university setting which led to a younger sample of participants

(29.3, SD = 10.6) when compared to other SMS acceptability studies which had average ages of 56, 53, and 38 respectively. (Jr et al., 2018, Shaw et al., 2013, Garcia et al., 2022). There was no control group and follow-up data were collected at only the one-month time-period. All information was self-reported which can lead to inaccurate and/or socially desirable responses, specifically for habitual behaviours such as physical activity levels and sedentary behaviours (Paulhus, 2017). Researchers were unable to collect follow-up data from the one participant who dropped out before the one-month follow-up period, making it unclear if his drop-out was study-related.

Relation to Other Studies

This is the first Canadian study to assess the acceptability of a SMS delivered behaviour change intervention for weight loss. It is also one of the few SMS weight loss studies worldwide targeting only men. While there are systematic reviews for the use of SMS for weight loss and weight loss maintenance (Skinner et al., 2020), there are no systematic reviews of men-only SMS weight loss interventions.

The average age of the study participants of around 29.3 is notably younger than other SMS weight loss studies, while the average BMI of 30.8 is similar. Three international mixed-sex SMS weight loss studies recruited older participants with average ages of 41.9 (Shapiro et al., 2012), 46.9 (Ahn & Choi, 2016), and 36.6 (Silina et al., 2017). These same studies recruited participants with average BMI's of around 32.2, 28.0, and 31.9 respectively. One intervention assessing the acceptability of SMS for treating IBS recruited participants with an average age of 29, with ages ranging from 19-53, similar to this study (Rohde et al., 2022).

Retention levels of 93% at one month were higher than systematic review evidence of men-only weight loss interventions, which found an average retention rate of 78% (Robertson et al., 2017). Three USA-based SMS weight loss studies assessing acceptability reported retention levels of 85% (R. J. Shaw et al., 2013), 74% (Jr et al., 2018), and 90% (Kolodziejczyk et al., 2013) at time-points ranging from 8-weeks to 6-months. High retention rates across SMS based weight loss studies suggest this means of delivering intervention content is acceptable to most intervention participants.

Four previous SMS studies assessed acceptability using metrics such as, intervention satisfaction, SMS response rates, perceived utility, and if participants would enroll again. (Shaw et al., 2013, Jr et al., 2018, Kolodziejczyk et al., 2013, Rohde et al., 2022). More than 80% of participants in a study by Jr et al., (2018) agreed or strongly agreed with questions assessing intervention satisfaction. Ninety-four percent of participants in a study by Kolodziejczyck et al., (2013) reported satisfaction with the program, and 88% of SMS were responded to. In a study by Rohde et al., (2022), 94% of participants said they would participate again, 93% said they would recommend the intervention to others, and 91% said they read all the SMS. Three of these studies had similar SMS delivery frequencies of one SMS daily (Shaw et al., 2013, Jr et al., 2018, Rohde et al., 2022), while one sent a greater number of SMS (3-5 daily) in a shorter 2-week time-period (Kolodziejczyk et al., 2013). Acceptability in this study was measured using SMS satisfaction questions during follow-up surveys, retention levels, and SMS response data. At the follow-up time-period, men in this study rated the intervention as relevant and understandable and men indicated they read most SMS. There were no negative replies to text messages and willingness to opt into additional weeks of SMS indicates a high level of acceptability.

A three-arm randomized controlled trial by Shaw et al., (2013) allocated 120 participants to a promotion (37% male), prevention (50% male), or attention-control control group (36% male) to test the acceptability and feasibility of text messages on sustained weight loss. SMS were sent once daily for 30 days that targeted physical activity, diet, and self-monitoring of body weight. SMS in the current study were sent with the same frequency and contained similar content. Overall retention levels were similar (85% at 3M time), and the intervention was found to be acceptable to most participants and feasible to deliver. During the one-month follow-up, 98% of participants in the SMS groups reported they would like at least 1 SMS a day, consistent with the frequency of SMS in this study. Thematic analysis of follow-up interviews produced 6-major themes: cue to action, enjoyable, useful, importance of content, support, and duration. Participants in the study stated that SMS served as a cue to action, and a reminder to stay on track with their weight loss plans. Content was important to most participants, and a mix of content on diet, physical activity, monitoring, motivation, and behavioural strategies was desired. This is line with qualitative interview findings from this study. Participants in the current study felt SMS were cues to action and acted as a daily reminder to stay on track with their weight loss goals. SMS content was identified to be important by many participants who also reported engagement with study resources.

A study by Garcia et al., (2022) examined the acceptability and feasibility of integrating mHealth technology into a culturally and gender sensitive weight loss intervention for Hispanic men with obesity. Eighteen Hispanic men were recruited to participate in a 12-week study. The retention rate of 89% is consistent with this study with a similar number of participants, and with systematic review evidence of men-only

weight loss studies (Robertson et al., 2017). SMS in this study were tailored to participants and were delivered twice a week in addition to weekly-in person sessions. The average age and BMI of Hispanic men in this study was higher than in the current study. This study was able to recruit a similar number of participants and the intervention was acceptable to deliver and deemed culturally appropriate by most participants. Similar to the current study, participants reported high levels of intervention satisfaction with the majority stating they would recommend the intervention to others.

Implications and Future Research

This study's findings may be used to inform the development of SMS delivered weight loss interventions for men. The library of text messages developed in this study may be used in future SMS delivered weight loss interventions targeting Canadian men. Qualitative findings related to SMS acceptability may be used to inform the development of additional libraries of SMS. Researchers developing SMS interventions should consider the instructions-desire paradox when drafting text messages, as a balance between specific weight-loss information and general applicability of SMS content is likely an important factor for intervention engagement. A randomized controlled pilot study with a view to informing intervention implementation and to assess weight loss and improvements in other outcomes should follow this acceptability study. Participants from different age groups, ethnic backgrounds, and education status should be targeted for this pilot study.

Conclusion

This study led to the creation of a library of weight loss SMS that were tested for acceptability and feasibility with a sample of Canadian men. This was the first Canadian study to specifically target men with a SMS delivered behaviour change intervention for weight loss. The recruitment goals for this study were met, and SMS were found to be feasible to deliver and acceptable to the majority of participants. This intervention needs to be tested in a full randomised controlled trial.

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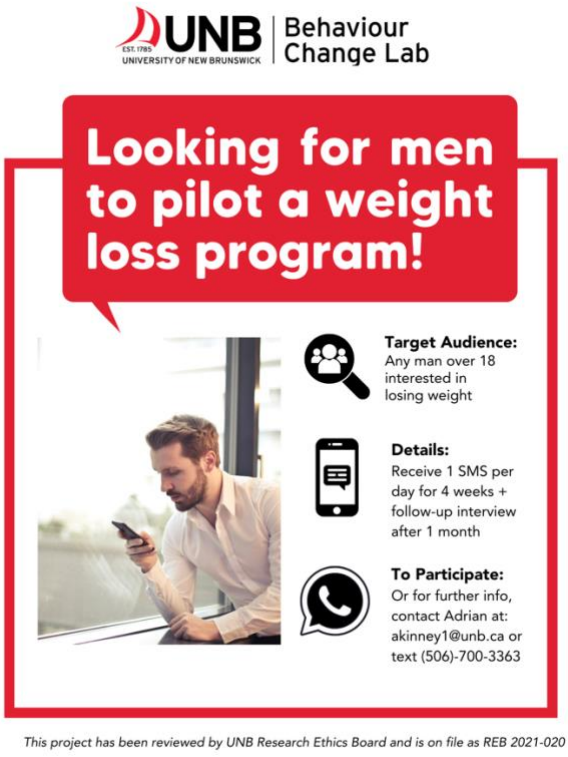
Appendix

Appendix A

Study Advertisement



Appendix B

Information Letter

University of New Brunswick

Date: December 8th, 2021

Participant Name: Paul Breneol

You are invited to participate in the CAN Men Lose Weight study being conducted by the UNB Behaviour Change Lab under the supervision of Dr. Stephan Dombrowski. This letter provides you with information on the project, and what your involvement would involve if you decide to take part.

Eligibility Criteria:
To be eligible to participate, you must be an English-speaking adult male interested in losing weight. You must also own a cell phone capable of receiving and sending text messages and possess the necessary technology to fill out an online survey and participate in a virtual interview, via TEAMS, or phone.

Why is this study being done?
Text messages have been shown to be effective in supporting weight loss. A study conducted in Scotland sent text messages to men for 12 months and found that most men liked them and lost some weight. This study adapted those text messages, and tests if Canadian men also like them.

What does this study involve?
After filling in a short survey you will receive one text message a day for one month, texts will be sent to your cell phone. The text messages will provide you with weight loss information and resources. You can respond to these texts to give feedback or provide criticism. After one month, you will be asked to participate in an interview to get your feedback on your experience. The interview will last roughly 45 minutes and will be conducted via Microsoft Teams. You may decline to answer any interview questions, and you may with withdraw from this study at any time without any negative consequences. With your permission, audio from the interview will be recorded to facilitate collection of information and will be transcribed for analysis. After the interview you may choose to receive an additional eight (8) weeks of texts. If you choose this option, you will be asked to fill out a follow-up survey after the text messages finish.

All information that you provide is considered completely confidential. Your name will not appear in any reports resulting from this study, however, with your permission, anonymous quotes may be used. Data collected from this study will stored on the University of New Brunswick's secure cloud server OneDrive. Only researchers

associated with this project will have access. There are no known or anticipated risks to you as a participant in this study.

This study has been reviewed and received ethics clearance through a University of New Brunswick Research Ethics Board (REB 2021-020). If you have questions for the Committee contact the Chair of the UNB Research Ethics Board, Dr. David Coleman at ethics@unb.ca.

For all other questions, or if you would like additional information about participation, please contact Adrian Kinney by email at akinney1@unb.ca, or Dr. Stephan Dombrowski at, stephan.dombrowski@unb.ca.

Thank you for considering participation in this study.

Yours sincerely,
Adrian Kinney

Appendix C

SMS Feedback Formatting

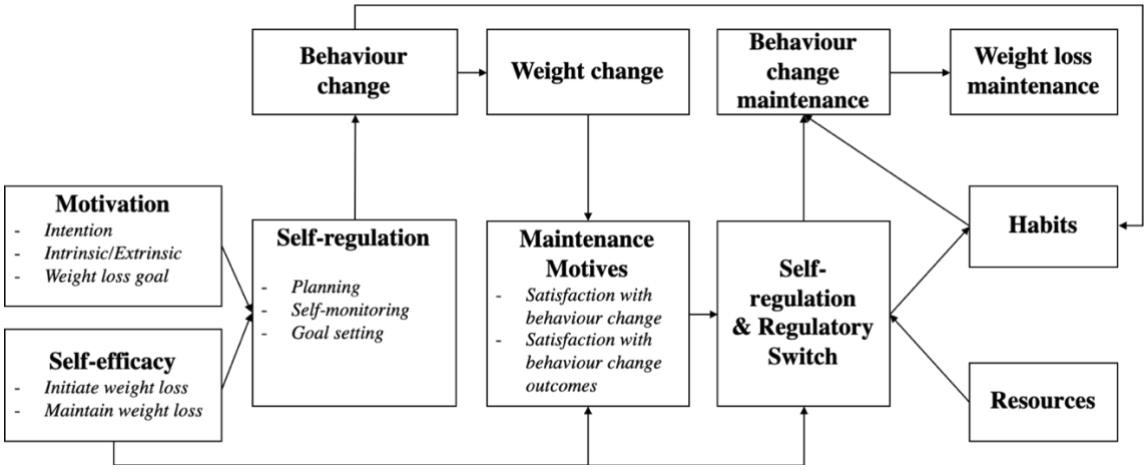
Message #	Time 10:00-17:00	Text Message Week 1: Introduction	Feedback
1	10:00	Welcome to Men Can Lose Weight! For the next few weeks we'll send you texts. The bad news: reading them won't change your weight. The good news: they're low calorie! We've written the texts with the help of men who lost weight, based on facts and real-life experience.	
2	14:30	The goal: lose 3-5% of your weight in 12 weeks. James said having a goal gave him the drive to change his eating. Losing more than 3% of your weight has health benefits like cutting your risk of heart disease, diabetes, and cancer.	
3	11:15	Here's the deal. You'll find some texts useful, some you won't. Take what works for you, ignore the rest. You can respond to the texts if you want. We read every response, but won't be able to text back.	

4	10:15	You've signed up to receive these texts, so you've taken the first step to making changes, well done. Staying the same is the comfortable thing to do, it takes courage to put yourself out there!	
5	16:00	There's a lot of information out there on weight loss, but what should you believe? A good first step is avoiding 'quick fixes' and pricey weight loss programs. If it seems too good to be true, it probably is.	
6	11:20	Losing weight is about 80% what you eat, and 20% physical activity. Carson told us he started using smaller plates so he eats less at each meal. Try a few strategies and find what works for you.	
7	12:00	Congrats, you've made it through week 1! Did you make any changes? We'll see you next week.	
8	10:00	**Week 2: The base** Week 2. Let's talk about basics. Over half of the men we talk to tell us that they're confused about healthy eating. How much should I be eating? When should I be eating? This week we'll send you some facts on healthy eating.	
9	12:30	Let's get away from 'dieting'. You're looking to change what you eat and drink, no fad diets. Ryan says this page is his go-to for all information on weight loss. When you have questions or are struggling, go back to it. https://food-guide.canada.ca/en/healthy-eating-recommendations	
10	18:00	Check out the Canada Food Guide. Click on any of the links to learn more about healthy eating. You might know some of it already, but it's always good to remind yourself. https://food-guide.canada.ca/en/healthy-eating-habits	

11	17:30	If you're feeling lost, the Food Guide Snapshot are great. Have plenty of vegetables and fruits, eat protein foods, make water your drink of choice, choose whole grain options. It's not flashy but doing it every day will make all the difference.	
12	10:30	Consistency creates habits. Change your eating for the long term. Staying consistent for more than a few weeks will help make sure your changes stick.	
13	11:15	What's the best way to lose weight? The way you can stick with. Studies tell us there's not much difference between low vs high carb, and other popular diets. Find what works for you and stick with it.	
14	19:00	We've given you a lot of information this week, hopefully it's gotten you excited to lose weight. Now it's time to take what you've learned and apply it the next few weeks. Refer back to this week if you need a reminder, it's our foundation.	

Appendix D

Game of Stones Logic Model



Appendix E

Weekly Theme List

Week	Theme
1	Introduction
2	The base
3	Physical activity
4	Goal Setting
5	Planning
6	Self-monitoring
7	Triggers
8	Environment
9	Tips
10	Special Occasions
11	Habits
12	Setbacks

Appendix F

Semi-Structured Interview Guide:

1) How have you found taking part in the study?
2) Do you have any suggestions about how the study could be improved?
3) How have you found receiving the texts over the last month? Have you been reading them?
4) Did you respond to the text messages?
5) Have you shown them to anyone? What did they say?
6) Have you found any particular text messages helpful?
7) Have you found any particular text messages unhelpful?
8) How have the text messages worked/not worked for you?
9) How could the text messages be improved? Do you have any suggestions?
10) How would you feel about receiving these text messages for 12 months instead of one month?
11) How did you hear about this study?
12) Is there any other feedback about any part of the trial that you would like to give us?

Appendix G

Weight Loss Strategies

- Setting goals for weight loss
- Setting goals for healthy eating
- Identifying barriers for weight loss and planning how to deal with them
- Repeating actions at the same time to make them automatic
- Keeping track of what you eat and drink

- Weighing yourself
- Changing your eating environment to reduce temptation
- Reminding yourself of why you are trying to lose weight in the first place
- Focusing on one small change at a time
- Reminding yourself of the health benefits of weight loss
- Seeking out information from trusted sources
- Other (please specify)

Appendix H

Demographics

Height was assessed with the item: "*How tall are you without shoes on?".* Participants selected a height in feet(ft) and inches(in) from a drop-down list.

Current weight was assessed with the item: "*What is your current weight without clothes?".* Response options were listed in a drop-down box ranging from 100-500lbs.

Age was assessed with the item: "*How old are you?"*. Participants could select their age from a drop-down list.

Race was assessed with the item: "*Which race category best describes you?*" Response options included: "*Black", "East/Southeast Asian", "Indigenous (First Nations, Métis, Inuk/Inuit)", "Latino", "Middle Eastern", "South Asian", "White", "Another race category", "Do not know", "Prefer not to answer".*

Education level was assessed with the item: "*What is the highest level of education you have completed?".* Response options included: "*Middle school", "High School", "College", "Trade school", "Undergraduate", "Graduate", and "Other",* with the ability to specify.

Employment status was assessed with the item: "*What is your employment status?".* Response options included: "*Full-time employee", "Part-time employee",*

"Self-employed", "Student", "Retired", "Permanent disability", "Unemployed", and "Other" with the option to specify.

Marital status was assessed with the item: "*What is your marital status?".* Response options included: "*Single", "Married", "Common-law", "Divorced", "Widowed",* and "*Other",* with the option to specify.

Medical history was assessed with the item "*Has the doctor ever told you that you have a chronic medical condition? Tick all that apply".* Response options included: "*Arthritis", "Asthma", "Cancer", "COPD", "Heart disease", "Hypertension", "Obesity", "Stroke", "Type 1 diabetes", "Type 2 diabetes",* and *"Other chronic medical condition"* with the ability to specify.

Appendix I

SMS Acceptability Study - Baseline Information - FINAL

Start of Block: Intro

Q1 **SMS Acceptability Study - Baseline Information**

End of Block: Intro

Start of Block: Section 1 - Weight history and perceptions

Q1 Section 1: Your personal weight experiences - This section asks about your views about weight loss and weight management.

Q1 How confident are you in your ability to lose weight?

- ○ Not confident 1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)
- ○ 5 (5)
- ○ 6 (6)
- ○ Very confident 7 (7)

Q2 How confident are you in your ability to keep lost weight off in the long-term?

- ○ Not confident 1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)
- ○ 5 (5)
- ○ 6 (6)
- ○ Very confident 7 (7)

Q3 How important is losing weight for you at this moment?

- ○ Not important 1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)
- ○ 5 (5)
- ○ 6 (6)
- ○ Very important 7 (7)

Q4 During the past 7 days, on how many days did you weigh yourself?

- ○ Days per week 1 (1)
- ○ 11 (11)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)
- ○ 5 (5)
- ○ 6 (6)
- ○ 7 (7)

Q5 What is your ideal weight?

Q6 How much weight do you want to lose by participating in this study?

Q7 Before beginning this study, when was the last time you tried to lose weight by changing your eating and/or activity for longer than one week?

- ○ Within the last 3 months (2)
- ○ Within the last 6 months (3)
- ○ Within the last 12 months (4)
- ○ More than 12 months ago (5)
- ○ I have never tried to lose weight (6)

Q8 What statement would describe your weight management best?

- ○ I have been unsuccessful in losing weight (1)
- ○ I have been successful in losing weight, but less successful in keeping it off (2)
- ○ I have been successful in losing weight and keeping it off (3)
- ○ I have never tried to lose weight (4)

Q9 How many times in your life have you changed your eating and/or activity for longer than a week to lose weight?

Q10 Why do you want to lose weight? *tick all that apply*

- ☐ Improve health (1)
- ☐ Increase fitness (2)
- ☐ Improve appearance (3)
- ☐ Feel better (4)
- ☐ Fit into old clothes (5)
- ☐ Increase confidence (6)
- ☐ An occasion (e.g. wedding or anniversary) (7)
- ☐ Other (please specify) (8) _____

X→

Q11 What is the most weight you have ever lost by changing your eating and/or activity?

X→

Q12 Has the COVID-19 pandemic changed the way you think about overweight and obesity?

- ○ Yes (1)
- ○ No (2)

Q13 How has the COVID-19 pandemic changed the way you think about overweight and obesity?

- [ ] I have become more concerned about my weight (4)
- [ ] I have become more concerned about the weight of my friends and family (5)
- [ ] I have become more aware of my eating behaviours (6)
- [ ] I have become more aware of my physical activity behaviours (7)
- [ ] I have become more aware of my eating and physical activity environment (8)
- [ ] Other (please specify) (9)

_____

Q14 During the last month I have...

	Strongly disagree (1)	Disagree (2)	Agree (3)	Strongly agree (4)
Often had weight loss on my mind (1)	○	○	○	○
Always been aware of my weight loss plans (2)	○	○	○	○
Consistently monitored my eating and physical activity (3)	○	○	○	○
Taken care to eat healthily and be physically active (4)	○	○	○	○
Really tried hard to lose weight (5)	○	○	○	○
Done my best to act in accordance with my weight loss plans (6)	○	○	○	○

End of Block: Section 1 - Weight history and perceptions

Start of Block: Section 2: Health and Behaviours

Q15 During the past 7 days, on how many days did you do **vigorous physical activity** like heavy lifting, aerobics, or fast cycling?

- Days per week 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)

Q16 During the past 7 days, on how many days did you do **moderate physical activity** like carrying light loads, bicycling at a regular pace, or walking?

- Days per week 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)

Q17 This question is about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

During the last 7 days, how much time did you spend sitting...

	Hours (1)	Minutes (2)
On a weekday? (1)		
On a weekend? (2)		

Q18 During the last month, how many days did you have any kind of drink containing alcohol?

- 5-6 times a week (1)
- 3-4 times a week (2)
- Twice a week (3)
- Once a week (4)
- 2-3 times a month (5)
- Once a month (6)
- Never (7)

Q19 Do you currently smoke or have you ever smoked?

- Yes, I currently smoke everyday (1)
- Yes, I currently smoke but not every day (2)
- Yes, I used to smoke but have quit (3)
- No, I have never smoked (4)

Q20 How many portions of fruits and vegetables (including salad, vegetables, fruit juices, and fresh, dried, and canned fruit) did you eat yesterday?

- ○ Portions of fruit and vegetables 0 (1)
- ○ 1 (2)
- ○ 2 (8)
- ○ 3 (9)
- ○ 4 (10)
- ○ 5 (11)
- ○ 6 (12)
- ○ 7 (13)
- ○ 8 (15)
- ○ 9 (16)
- ○ 10 (17)
- ○ 10+ (18)

End of Block: Section 2: Health and Behaviours

Start of Block: Section 3: Demographic Information

Q21 **Section 5: This last section asks you questions about yourself.**

Q21 How tall are you without shoes on?

Q22 What is your current weight without clothes?

Q23 How old are you?

Q24 Which race category best describes you?

- ○ Black (1)
- ○ East/Southeast Asian (2)
- ○ Indigenous (First Nations, Métis, Inuk/Inuit) (3)
- ○ Latino (4)
- ○ Middle Eastern (5)
- ○ South Asian (6)
- ○ White (7)
- ○ Another race category (8)
- ○ Do not know (9)
- ○ Prefer not to answer (10)

X→

Q25 What is the highest level of education you have completed?

- ○ Middle School (1)
- ○ High School (2)
- ○ College (3)
- ○ Trade School (4)
- ○ Undergraduate (5)
- ○ Graduate (6)
- ○ Other (please specify) (7) _____

X→

Q26 What is your employment status?

- ○ Full-time employee (1)
- ○ Part-time employee (2)
- ○ Self-employed (3)
- ○ Student (4)
- ○ Retired (5)
- ○ Permanent disability (6)
- ○ Unemployed (7)
- ○ Other (please specify) (8) _____

X→

Q27 What is your marital status?

- ○ Single (1)
- ○ Married (2)
- ○ Common-law (3)
- ○ Divorced (4)
- ○ Widowed (5)
- ○ Other (please specify) (6) _____

X→

Q28 Has the doctor ever told you that you have a chronic medical condition? *tick all that apply*

- ☐ Arthritis (1)
- ☐ Asthma (2)
- ☐ Cancer (3)
- ☐ COPD (4)
- ☐ Heart disease (5)
- ☐ Hypertension (6)
- ☐ Obesity (7)
- ☐ Stroke (8)
- ☐ Type 1 diabetes (9)
- ☐ Type 2 diabetes (10)
- ☐ Other chronic medical condition (please specify) (11)

_____

- ☐ No (12)

End of Block: Section 3: Demographic Information

Appendix J Follow-up Survey

1 Month Follow-up - FINAL

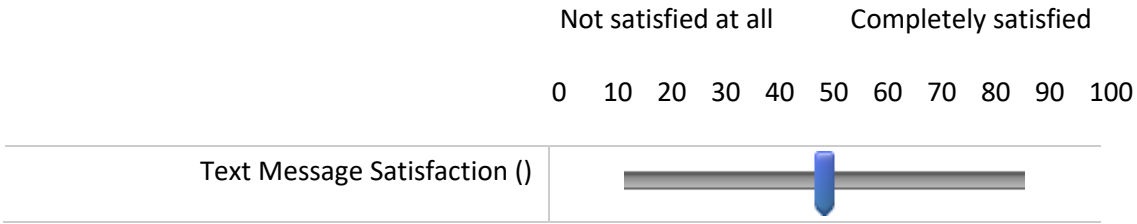
Start of Block: Introduction

Q1 Thank you for taking the time to fill out this questionnaire. We are interested in the weight loss experience of men included in this study. Please answer every question as honestly as you can. For most questions there are no right or wrong answers so please answer the questions as best as you can.

End of Block: Introduction

Start of Block: Section 1: Text Message Experience

Q1 On a scale from 0 (not satisfied at all) to 100 (very satisfied). How satisfied are you with the text messages?



Q2 Overall the text messages are...

	I totally disagree (1)	I somewhat disagree (2)	Neither agree or disagree (3)	I somewhat agree (4)	I totally agree (5)
Understandable (1)	○	○	○	○	○
Useful (2)	○	○	○	○	○
Helpful (3)	○	○	○	○	○
Interesting (4)	○	○	○	○	○
Relevant (5)	○	○	○	○	○

Q3 During the last month I have...

	Strongly disagree (1)	Disagree (2)	Agree (3)	Strongly agree (4)
Often had weight loss on my mind (1)	○	○	○	○
Always been aware of my weight loss plans (2)	○	○	○	○
Consistently monitored my eating and physical activity (3)	○	○	○	○
Taken care to eat healthily and be physically active (4)	○	○	○	○
Really tried hard to lose weight (5)	○	○	○	○
Done my best to act in accordance with my weight loss plans (6)	○	○	○	○

Q4 How often did you read the text messages?

- ○ Daily (1)
- ○ Most days (2)
- ○ Somedays (3)
- ○ Rarely (4)
- ○ Never (5)

Q5 Which of the following strategies did you use in the last month?

- ☐ Setting goals for weight loss (1)
- ☐ Setting goals for healthy eating (2)
- ☐ Identifying barriers to weight loss and planning how to deal with them (3)
- ☐ Repeating actions at the same times to make them automatic (4)
- ☐ Keeping track of what you eat and drink (5)
- ☐ Weighing yourself (6)
- ☐ Changing your eating environment to reduce temptation (7)
- ☐ Reminding yourself of why you are trying to lose weight in the first place (8)
- ☐ Focusing on one small change at a time (9)
- ☐ Reminding yourself of the health benefits of weight loss (10)
- ☐ Seeking out information from trusted sources (11)
- ☐ Other (please specify) (12)

_____

End of Block: Section 1: Text Message Experience

Start of Block: Section 2: Weight

Q6 This section asks about your weight and any weight changes you might have experienced.

Q7 Given the effort you've put into losing weight, how happy are you with your progress at this moment?

- ○ Very Unhappy1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)
- ○ 5 (5)
- ○ 6 (6)
- ○ Very Happy7 (7)

Q8 How confident are you in your ability to lose weight?

- ○ Not Confident1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)
- ○ 5 (5)
- ○ 6 (6)
- ○ Very Confident7 (7)

Q9 How confident are you in your ability to keep lost weight off in the long term?

- ○ Not Confident 1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)
- ○ 5 (5)
- ○ 6 (6)
- ○ Very Confident7 (7)

Q10 How important is losing weight for you at this moment?

- ○ Not Important 1 (1)
- ○ 2 (2)
- ○ 3 (3)
- ○ 4 (4)
- ○ 5 (5)
- ○ 6 (6)
- ○ Very Important 7 (7)

Q11 During the past 7 days, how many times did you weigh yourself?

Q12 How much do you currently weigh?

End of Block: Section 2: Weight

Start of Block: Section 3: Health and Behaviours

Q13 During the last **7 Days,** how many days did you do vigorous physical activities like heavy lifting, running, or fast cycling?

Vigorous activities are activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

Q14 During the last 7 days, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace, or walking?

Moderate activities are activities that take hard physical effort and make you breathe somewhat harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time

Q15 This question is about the time you spend sitting while at work, at home, while doing coursework and during leisure time. This may include time sitting at a desk, visiting friends, reading or sitting or lying down to watch television.

During the last 7 days, how much time did you spend sitting..

	Hours (1)	Minutes (2)
On a weekday (1)		
On the weekend (2)		

Q16 During the last **month,** how many days did you have any kind of drink containing alcohol?

- Everyday (1)
- 5-6 times a week (2)
- 3-4 times a week (3)
- Twice a week (4)
- Once a week (5)
- 2-3 times a month (6)
- Once a month (7)
- Never (8)

Q17 Do you currently smoke or have you ever smoked?

- Yes, I currently smoke everyday (1)
- Yes, I currently smoke but not every day (2)
- Yes, I used to smoke but I have quit (3)
- No, I have never smoked (4)

Q18 How many servings of fruit and vegetables (including salads, fruit juices, and canned fruit) did you eat yesterday?

End of Block: Section 3: Health and Behaviours

Appendix I: One-month Follow-up Survey

Curriculum Vitae

Candidate's full name: Adrian Kinney

Universities attended with dates and degrees obtained:

1) St Francis Xavier University (2015-2019): Bachelor of Science in Kinesiology

Publications: None

Conference presentations: None