INPLASY

THE EFFECT OF TEXT MESSAGE BASED MHEALTH INTERVENTIONS ON PHYSICAL ACTIVITY AND WEIGHT LOSS: A SYSTEMATIC REVIEW AND META-ANALYSIS

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ADMINISTRATIVE INFORMATION

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 18 July 2023 and was last updated on 18 July 2023.

INTRODUCTION

*R*eview question / Objective To determine the effectiveness of text message (tailored and non-tailored) and instant message based mobile health interventions on physical activity and weight related outcomes, in clinical and non-clinical adult populations.

Rationale Non-communicable diseases (NCDs) contribute to a large proportion of morbidity and mortality globally. Thus, many public health interventions have aimed to reduce modifiable risk factors for NCDs, such as diet and physical activity.

One such intervention is mobile health (mHealth), which involves the use of mobile technology such as phone calls, text messages and social media to promote and provide healthcare at a distance. Many studies have been published investigating the use of mHealth for the treatment and prevention of diseases, including NCDs.

However, few systematic reviews and meta-analyses have included instant messaging mHealth interventions. Furthermore, the number of studies on mHealth and NCD risk factors using text messaging and instant messaging have increased rapidly within the past few years.

Additionally, the evidence for mHealth use for the improvement of risk factors for NCDs are equivocal, with many reviews highlighting that the evidence of mHealth use for NCDs is limited, due to small effect sizes, low-quality studies and heterogeneity of studies.

Thus, we aim to add to the existing body of evidence on the effectiveness of mHealth in improving risk factors for NCDs, by having more strict inclusion criteria to reduce heterogeneity of studies. We also aim to include studies on instant messaging and to include more recent studies published on the topic.

As far as we are aware, no systematic review and meta-analysis has been conducted on studies using text messaging and/or instant messaging, and measuring physical activity and weight loss as health outcomes. Thus, we believe this review and meta-analysis will add to the existing evidence on

the effectiveness of mHealth for the prevention and treatment of risk factors of NCDs.

Condition being studied This review aims to study lifestyle and metabolic risk factors of non-communicable diseases, namely physical activity and weight loss related outcomes.

METHODS

Search strategy An electronic literature search was conducted between 7 November and 28 November 2022 searching the databases Pubmed, Scopus, and Web of Science. We searched for literature on mHealth text messaging and/or instant messaging interventions targeting physical activity and/or weight loss. Search terms included mHealth, eHealth, physical activity, exercise, weight loss, interventions, and programmes. The full search strategy with Boolean operators can be viewed below.

Filters included an adult population, English articles, and publishing dates between 2010 and 2022. This date range was used as we believed that the most relevant articles for our review would be found within the past 12 years due to the rapid growth of mHealth and mobile technology development in recent years. Only articles available in English were included due to English speaking reviewers. An adult population was chosen as the development and diagnosis of non-communicable diseases usually occur later in life. Additionally, most mHealth studies have been conducted on the adult population.

Boolean search terms for each outcome:

Outcome 1 Physical activity

Search 1 (((((((("physical activity") OR (exercise)) OR ("exercise training")) OR ("physical exercise")) OR ("physical training")) OR (steps)) OR ("sedentary lifestyle")) OR ("sedentary time")) OR ("physical inactivity")

Search 2 (((((((((mHealth) OR (m-health)) OR ("mobile health")) OR (eHealth)) OR (SMS)) OR ("text messag*")) OR ("instant messag*")) OR (WhatsApp)) OR (WeChat)) OR (messenger)

Search 3 (((intervention) OR (programme)) OR (program)) OR (initiative)

Search 4 (((#1) AND (#2) AND (#3) NOT (systematic review) NOT (meta-analysis) NOT (reviews) NOT (protocol)) Filters: English, Adult: 19+ years, from 2010 - 2022

Outcome 2 Weight loss

Search 1 (((("weight loss") OR (BMI)) OR ("body mass index")) OR ("weight reduction")) OR ("body weight")

Search 2 (((((((((mHealth) OR (m-health)) OR ("mobile health")) OR (eHealth)) OR (SMS)) OR ("text messag*")) OR ("instant messag*")) OR

(WhatsApp)) OR (WeChat)) OR (messenger)

Search 3 (((intervention) OR (programme)) OR (program)) OR (initiative)

Search 4 (((#1) AND (#2) AND (#3) NOT (systematic review) NOT (meta-analysis) NOT (reviews) NOT (protocol)) Filters: English, Adult: 19+ years, from 2010 - 2022

Participant or population Male and female, clinical and non-clinical populations, from any country were included in the screening criteria. Clinical populations had to have non-communicable diseases to be included. Participants over the age of 18 were included.

Intervention Eligible interventions included mHealth interventions that used text messaging and/or instant messaging to send one-way motivational, educational or advice messages to participants to improve physical activity levels and/or body weight. Studies using messages only as prompts, reminders, cues or feedback were excluded. However, if these messages were in combination with motivational or educational messages, they were included in the review. If the study had other intervention components in addition to the messages, they were excluded. Studies using two-way messages were also excluded. Interventions of any duration were included. Interventions that sent messages via an instant messaging app group chat as opposed to individual sent messages were also excluded. The above criteria were chosen to reduce the heterogeneity between the included studies.

Comparator A group of participants comparable to the intervention group, that either received standard of care or no intervention.

Study designs to be included Eligible study designs were pre-post intervention studies (randomised control trials (RCTs) non RCTs, quasi experimental and mixed method studies) with a comparator group that received either no intervention, 'standard-of-care' treatment, or treatments that was also given to the intervention group.

Eligibility criteria Studies were included if they were published between the years 2010 and 2022, were available in English and were conducted on a clinical or non-clinical adult population (18 + years). Only clinical populations with NCDs were included. Pregnant women were included as well. Eligible study designs were pre-post intervention studies (randomised control trials (RCTs) non RCTs, quasi experimental and mixed method studies) with a comparator group that received

either no intervention, or 'standard-of-care' treatment. Eligible interventions included mHealth interventions that used text messaging and/or instant messaging to send one-way motivational, educational or advice messages to participants to improve physical activity levels and/or body weight. Studies using messages only as prompts, reminders, cues or feedback were excluded. However, if these messages were in combination with motivational or educational messages, they were included in the review. If the study had other intervention components in addition to the messages, they were excluded. Studies using two-way messages were also excluded. Interventions of any duration were included. Interventions that sent messages via an instant messaging app group chat as opposed to individual sent messages were also excluded. The above criteria were chosen to reduce the heterogeneity between the included studies.Outcomes included physical activity-related outcomes and weight loss-related outcomes. Outcomes were eligible if they were self-reported or objectively measured, and if they were primary or secondary. Studies were included if they had only one or a combination of the above outcomes.

Information sources The following databases were used as information sources: Pubmed, Scopus, and Web of Science. Articles found in the reference sections of included articles were also used as information sources.

Main outcome(s) Outcomes included physical activity-related outcomes and weight loss-related outcomes. Because many studies had different measures of physical activity and weight loss, specific measures were chosen to be included in the following order of hierarchy: For physical activity-Metabolic equivalent of tasks (METS), moderate/vigorous physical activity (MVPA), step count, and lastly minutes of exercise per week. For weight loss-related outcomes-Body mass index (BMI) was used first. If BMI was not used as a measurement, then a change in body weight in kg was used, followed by percentage weight change. These measures were chosen as they were found to be the most frequent measured used in mhealth studies upon screening.
Outcomes were eligible if they were self-reported or objectively measured, and if they were primary or secondary. Studies were included if they had only one or a combination of the above outcomes.

Additional outcome(s) We also aim to explore potential factors that may influence the effect of the interventions, such as type of messages

(theory based, tailored), frequency of messages and study duration.

Data management Initial screening was performed using the programme Rayyan.ai, with at least two reviewers screening each study. Data was then extracted according to a study specific excel spreadsheet. The following information is included in the data extraction table: Primary author, article date, study design, study duration, sample size, type of participants, mean age of participants, percentage of males, type of country study was performed (High income versus lower to middle income), outcomes measured, comparator, intervention type, mode of message, message content, whether health feedback was present, whether the messages were tailored or non-tailored, message frequency, whether messages were linked to theory, and effect sizes (SMD) of each outcome.

Quality assessment / Risk of bias analysis The Mixed Methods Appraisal Tool (MMAT) version 2018 will be used for quality assessment of studies. Results will be presented in the form of a table showing which assessment criteria was met by each individual study.

Strategy of data synthesis JASP 0.17.02.1 will be used for meta-analyses. Standardized mean difference (SMD) as Hedges g will be used as a measure of effect sizes. A Random effects model will be used to calculate weighted averages and pooled estimates due to likely variance in included studies. Heterogeneity will be measured using the I2 statistic. IBM SPSS will be used for summary statistics.

Subgroup analysis Where sufficient studies exist, potential sub-group analysis will be done by patient group (example diabetes, cardiovascular diseases, obesity), age group, and gender. Text message frequency, message tailoring, text message content, and theory-based messages will also be explored as potential effect moderators.

Sensitivity analysis The programme JASP 0.17.02.1 will be used to produce funnel plots of effect sizes to assess publication bias, and forest plots to identify potential effect outliers. Further quality assessment will be measured using the MMAT tool.

Language restriction Only articles published in English will be included.

Country(ies) involved South Africa.

Dissemination plans We plan on disseminating results through publication, sharing results with funders, and submission for a master's thesis.

Contributions of each author
Author 1 - Aminah Emeran - Author 1 conducted all stages of article screening, data extraction, will conduct data analysis, and will draft the manuscript.
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