

BMJ Open Effectiveness of mHealth/eHealth interventions on obesity treatment: a protocol for umbrella review of meta-analyses

Xiang-Guo Lei ^{1,2}, Zhongheng Huang,³ Tamrakar Rashi,^{1,2} Xi Yang^{1,2}

To cite: Lei X-G, Huang Z, Rashi T, *et al.* Effectiveness of mHealth/eHealth interventions on obesity treatment: a protocol for umbrella review of meta-analyses. *BMJ Open* 2022;**12**:e052443. doi:10.1136/bmjopen-2021-052443

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2021-052443>).

Received 15 April 2021

Accepted 14 March 2022



© Author(s) (or their employer(s)) 2022. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

¹Geriatrics Department of Endocrinology and Metabolism, Guangxi Medical University First Affiliated Hospital, Nanning, Guangxi, China

²Guangxi Clinical Research Center for Cardiocerebrovascular Diseases, Guangxi Medical University First Affiliated Hospital, Nanning, Guangxi, China

³Key Laboratory of Early Prevention and Treatment for Regional High Frequency Tumor, Guangxi Medical University, Nanning, Guangxi, China

Correspondence to

Dr Xi Yang;
yangxicc2008@sina.cn

ABSTRACT

Introduction Mobile health (mHealth)/electronic health (eHealth) have the effect of facilitating weight loss in overweight and obese populations. However, studies have shown varied results and relatively high heterogeneity in the efficacy of mHealth/eHealth interventions. The aim of the paper was to systematically summarise published studies about the weight loss efficacy of mHealth/eHealth.

Methods and analysis A comprehensive review of PubMed, Embase and Cochrane Library databases published from inception to 21 March 2021 will be conducted. The selected articles are meta-analyses that integrated the studies, which evaluated efficacy of mHealth/eHealth. Two people will select eligible articles and extract data independently. Any disputes will be resolved by discussion or the arbitration of a third person. The methodological quality of the included meta-analyses will be assessed with AMSTAR V.2 and the quality of evidence will be obtained with Grade of Recommendations Assessment, Development and Evaluation (GRADE). The study selection process will be presented using a flowchart. We will reanalyse each outcome with random effect methods. If possible, we will use funnel plot and Egger's test to evaluate if publication bias existed.

Ethics and dissemination Ethical approval is not required for the study, as we collected data only from available published materials. This umbrella review will also be submitted to a peer-reviewed journal for publication after completion.

PROSPERO registration number CRD42021247006.

INTRODUCTION

Description of the condition

Obesity is a chronic illness characterised by inordinate accumulation of body fat.¹ In 2005, 23.2% (937 million) of the global adult population was diagnosed as having overweight and 9.8% (396 million) as having obesity; the respective numbers of adults with overweight and obesity are projected to be 1.35 billion and 573 million individuals in 2030, without adjusting for secular trends.² Obesity is responsible for about 5% of all deaths a year worldwide, and its global economic impact amounts to roughly \$2 trillion annually,

Strengths and limitations of this study

- ⇒ This study differs from previous studies as it aims to reanalyse each outcome.
- ⇒ A comprehensive search strategy will be used with a large number of databases searched.
- ⇒ The methodological quality of the included meta-analyses will be assessed with AMSTAR V.2 and the quality of evidence with GRADE.
- ⇒ Mobile health/electronic health interventions for obesity treatment include multiple modalities, so we may not include all interventions in an umbrella review.
- ⇒ Studies related to rare intervention methods might not be included in systematic reviews and thus would not be represented in this umbrella review, a main limitation of our work.

or 2.8% of global Gross Domestic Product (GDP).³ Research suggests that by delivering interventions via mobile health (mHealth) or electronic health (eHealth), some of the cost problems of obesity interventions are mitigated.^{4–6} These two modalities have the potential to effectively facilitate weight loss in overweight and obese populations.^{6,7}

Description of the intervention

The WHO proposes eHealth as a facilitator of health, and mHealth is a component of eHealth. mHealth/eHealth generally refers to the health services delivered or enhanced through mobile/electronic-related technology.^{8,9} There is a lot of overlap between them; mHealth helps patients improve their adherence to healthcare providers' advice and enhance patient-provider communication; specifically, mobile apps^{10,11} and eHealth interventions combine the use of emerging communication technologies, such as the internet and smartphones, to facilitate behaviour changes and improvements in health.¹² To date, mHealth and eHealth have no standard definition. In this study, we

defined mHealth/eHealth as health practices or services supported by mobile phones, tablets and computers without using a text message reminder for a close-physical proximity face-to-face service. One previous review of reviews has described the development of mHealth and its utility for patients with obesity.¹³ Nonetheless, their scope neither adequately addressed the effectiveness of eHealth for obesity treatment nor analysed the findings from the original studies. At present, there are many meta-analyses about mHealth/eHealth,¹⁴⁻¹⁷ and we are specifically looking at weight reduction and behaviour change. Therefore, this umbrella review evaluated the effectiveness of mHealth/eHealth interventions and weighed the strength and validity of mHealth/eHealth interventions in the literature.

Aim

This study aimed to conduct an umbrella review of meta-analyses regarding the associations between mHealth/eHealth interventions and obesity treatment, and to reanalyse its strength and validity.

METHODS

Stage 1: identifying relevant studies

At this stage, authors will establish a team and discuss the eligibility criteria, electronic databases and search strategy.

Eligibility criteria

Eligibility criteria include meta-analyses of observational studies or meta-analyses of randomised controlled trials. Follow-up duration of at least 4 weeks.

Original studies and studies with no summary of relative risks (eg, systematic reviews) and those reported in languages other than English will be excluded.

Databases

The identification of studies relevant to this overview will be obtained by searching the published reviews from inception of databases until 21 March 2021, which are listed as follows: PubMed, Embase and Cochrane Library. We will also manually search all reference lists of the included studies to identify additional reviews of relevance.

Search strategy

We will use the search strategy with these specified keywords: (Overweight OR Obesity OR weight gain OR weight loss OR body mass index OR skinfold thickness OR waist-hip ratio OR Abdominal Fat) AND (mhealth OR ehealth OR telemedicine OR digital health OR telehealth OR virtual medicine) AND (Metaanalysis OR Meta OR meta-analys* OR systematic review). We will modify the search strategy to suit PubMed, Embase and Cochrane Library databases.

Stage 2: study selection

We will import our search results into software and then start selection. The review process consists of two levels

of screening: (1) a title and abstract review and (2) a full-text review. In the first phase of screening, the titles and abstracts of the retrieved articles will be browsed through and analysed by two independent investigators to identify potential eligibility. In the second phase, the two investigators will then independently evaluate the full-text articles to decide whether each should be included/excluded. Any discrepancies in the two phases will be reconsidered, and unresolved disagreements will be further discussed with a third investigator until a full consensus is reached.

Stage 3: data extraction

Data extraction tables will be established in Excel and the data from selected articles will be extracted independently by two people. Disputes will be resolved by discussion or the arbitration of a third person, if necessary.

The following categories of data will be extracted: the first author, year of publication, number of trials included, sample size, intervention, control, quality assessment and main conclusion.

Population

Adult population with overweight or obesity will be included in the study.

We will define overweight as a body mass index (BMI) of 25 and <30 kg/m² (AAFP 2010, WHO 2021). Obesity will be defined by a BMI of 30 kg/m² (AAFP 2010, WHO 2021).^{18 19}

Intervention

mHealth/eHealth as health practices or services were supported by mobile phones, tablets or computers.

Comparators

Use other methods other than mHealth/eHealth or orthobiosis.

Type of studies

The study includes meta-analyses.

Outcomes

Primary outcomes

Primary outcomes include weight loss and weight loss subgroup analyses (mobile phone base weight loss group, computer base weight loss group, tablet base weight loss group, mobile phone+computer base weight loss group, mobile phone+tablet base weight loss group and computer+tablet base weight loss group).

Secondary outcomes

The secondary outcomes include BMI change and waist change.

Stage 4: data synthesis and statistical analysis

Statistical analysis will be conducted with RevMan V.5.4 software provided by Cochrane Collaboration and Stata software V.12. In our analysis, when possible, we will stratify the comparisons into several groups, such as group that uses other methods other than mHealth/eHealth and orthobiosis group. We will do subgroup analysis

according to the forms of intervention, such as mobile app group, text message group and website group.

Qualitative and quantitative analyses will be provided. The quantitative analysis will be performed through calculation of weighted mean differences for continuous outcomes and risk ratio for the dichotomous.

Heterogeneity will be evaluated using the I^2 statistic. We will use 25%, 50% and 75% as cut-offs for low, moderate and high heterogeneity, respectively.

Stage 5: identifying possible publication bias

Small study effects and publication bias will be assessed by using graphical and statistical tests, namely, the funnel plot and Egger's test. A p value of <0.10 indicates the presence of publication bias.

Stage 6: evaluating quality of included studies

We will assess both the methodological quality and the quality of evidence for each, including meta-analysis using validated tools. The methodological quality of the included meta-analyses will be assessed with AMSTAR V.2 and the quality of evidence will be measured with Grade of Recommendations Assessment, Development and Evaluation (GRADE).

Patient and public involvement

No patients are involved in developing plans for project and implementation of this study. None of them are asked to advise on interpretation of results. The results will be disseminated to the general population through public presentations by the authors.

DISCUSSION

In meta-analyses that focused on outcomes of mHealth/eHealth interventions, some of the results are widely divergent. When sufficient data are available, we will stratify our comparisons and do subgroup analysis.

The limitations of our study are the heterogeneity and quality of the selected reviews. To address the limitations, we will reanalyse each outcome using the random effects model. We will also use AMSTAR V.2 and GRADE to evaluate the quality of studies that we will include. These factors will be carefully considered while interpreting the results. Furthermore, we will discuss non-mHealth/eHealth interventions on obesity treatment, including drug intervention and surgical intervention.

Ethics and dissemination

Ethical approval is not required for the study, as we only collected data from available materials. This umbrella review will also be submitted to a peer-reviewed journal for publication.

Contributors XY carried on the conception and construction of this protocol. X-GL developed the search strategy and wrote the protocol. X-GL and ZH found the tools for evaluating quality of included reviews. TR reviewed and amended the draft of the protocol. X-GL and TR added grammar editing and conceptual clarification. All authors read and approved the final manuscript.

Funding This work was supported by Medical and Health Appropriate Technology Development, Promotion and Application Project of Guangxi (grant number 2 016 018) and The Excellent Medical Elite Training Program of The First Affiliated Hospital of Guangxi Medical University (grant number 2 017 025).

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, conduct, reporting or dissemination plans of this research.

Patient consent for publication Not applicable.

Provenance and peer review Not commissioned; externally peer reviewed.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iD

Xiang-Guo Lei <http://orcid.org/0000-0002-0094-7910>

REFERENCES

- Haslam DW, James WPT. Obesity. *Lancet* 2005;366:1197–209.
- Kelly T, Yang W, Chen C-S, et al. Global burden of obesity in 2005 and projections to 2030. *Int J Obes* 2008;32:1431–7.
- Dobbs R, Sawers C, Thompson F. How the world could better fight obesity, 2014. Available: <https://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/how-the-world-could-better-fight-obesity> [Accessed 11 Apr 2021].
- Steinhubl SR, Muse ED, Topol EJ. Can mobile health technologies transform health care? *JAMA* 2013;310:2395–6.
- Eysenbach G. The law of attrition. *J Med Internet Res* 2005;7:e11.
- Hutchesson MJ, Rollo ME, Krukowski R, et al. eHealth interventions for the prevention and treatment of overweight and obesity in adults: a systematic review with meta-analysis. *Obes Rev* 2015;16:376–92.
- Khokhar B, Jones J, Ronksley PE, et al. Effectiveness of mobile electronic devices in weight loss among overweight and obese populations: a systematic review and meta-analysis. *BMC Obes* 2014;1:22.
- World Health Organization. mHealth: new horizons for health through mobile technologies: second global survey on eHealth (global Observatory for eHealth series volume 3), 2011. Available: https://apps.who.int/iris/bitstream/handle/10665/44607/9789241564250_eng.pdf?sequence=1&isAllowed=y [Accessed 11 Apr 2021].
- Eysenbach G. What is e-health? *J Med Internet Res* 2001;3:E20.
- Goyal S, Cafazzo JA. Mobile phone health apps for diabetes management: current evidence and future developments. *QJM* 2013;106:1067–9.
- Flores Mateo G, Granado-Font E, Ferré-Grau C, et al. Mobile phone Apps to promote weight loss and increase physical activity: a systematic review and meta-analysis. *J Med Internet Res* 2015;17:e253.
- Orlikoff JE, Totten MK. Trustee workbook 3. e-health and the board: the Brave new world of governance, part 1. In: *Trustee workbook 3*. United States, 2000: 4–14.
- Wang Y, Min J, Khuri J, et al. Effectiveness of mobile health interventions on diabetes and obesity treatment and management: systematic review of systematic reviews. *JMIR Mhealth Uhealth* 2020;8:e15400.
- Wieland LS, Falzon L, Sciamanna CN, et al. Interactive computer-based interventions for weight loss or weight maintenance in overweight or obese people. *Cochrane Database Syst Rev* 2012;18.
- Islam MM, Poly TN, Walther BA, et al. Use of mobile phone App interventions to promote weight loss: meta-analysis. *JMIR Mhealth Uhealth* 2020;8:e17039.
- Lau Y, Chee DGH, Chow XP, et al. Personalised eHealth interventions in adults with overweight and obesity: a systematic review and meta-analysis of randomised controlled trials. *Prev Med* 2020;132:106001.
- Hutchesson MJ, Rollo ME, Krukowski R. EHealth interventions for the prevention and treatment of overweight and obesity in adults: a systematic review with meta-analysis. *Diabetes Technology and Therapeutics* 2016;18:S67.
- Delaet D, Schauer D. Obesity in adults. *American Academy of Family Physicians* 2010;82:974–5 <https://www.aafp.org/pubs/afp/issues/2010/1015/p974.html>
- WHO. Obesity and overweight; 2021. <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>