



Review Article

Effectiveness of eHealth interventions for the promotion of physical activity in older adults: A systematic review



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ABSTRACT

Regular physical activity (PA) is central to healthy ageing. However, only a minority of older adults currently meet the WHO-recommended PA levels. The aim of this systematic review is to compare the effectiveness of eHealth interventions promoting PA in older adults aged 55 years and above with either no intervention or a non-eHealth intervention (review registration: PROSPERO CRD42015023875). Eight electronic databases were searched to identify experimental and quasi-experimental studies examining the effectiveness of eHealth interventions for PA promotion in adults aged 55 years and above. Two authors independently selected and reviewed references, extracted data, and assessed study quality. In the search, 5771 records were retrieved, 20 studies met all inclusion criteria. Studies varied greatly in intervention mode, content, duration and assessed outcomes. Study quality ranged from poor to moderate. All interventions comprised tailored PA advice and the majority of interventions included goal setting and feedback, as well as PA tracking. Participation in eHealth interventions to promote PA led to increased levels of PA in adults aged 55 years and above when compared to no intervention control groups, at least in the short term. However, the results were inconclusive regarding the question of whether eHealth interventions have a greater impact on PA behavior among older adults than non-eHealth interventions (e.g., print interventions). eHealth interventions can effectively promote PA in older adults aged 55 years and above in the short-term, while evidence regarding long-term effects and the added benefit of eHealth compared to non-eHealth intervention components is still lacking.

1. Introduction

Regular physical activity (PA) is of central importance to healthy ageing because it is associated with improved physical, functional, psychological, and cognitive health (Warburton et al., 2006; Hong et al., 2008; Hupin et al., 2015). According to the recommendations of the World Health Organization (WHO), older adults should moderately exercise 150 min per week to obtain health benefits. In addition, strength and flexibility training at least two times per week is recommended (WHO, 2010). In the systematic review by Sun and colleagues, the percentages of older adults meeting the recommended PA levels ranged from 2% to 83%. In the majority of studies included in this systematic review, 20% to 60% of older adults met the recommendations (Sun et al., 2013). Sun et al. explain this broad range of older adults meeting the recommendations with discrepancies and inconsistencies in the measurement of various types of PA (including

instrumentation) across studies and in the guidelines or recommendations which were also not consistently applied to assess whether individuals met the guidelines or not.

To promote PA in older adults, effective interventions are needed. Interventions providing information on PA in the form of printed materials or face-to-face have a long tradition and appear to be effective for PA promotion in older adults (Noar et al., 2007; Short et al., 2011; Richards et al., 2013). The increased use of the internet and mobile technologies in recent years may open new opportunities to promote PA in adult populations, including older adults (Worldbank, 2013). In the older segments of the general population, a growing number of individuals use electronic devices, such as computers, smartphones or tablets (Smith, 2014). eHealth is defined as “the use of information and communication technologies for health” (WHO, 2015). Potential advantages of eHealth interventions for promoting PA are that information can be accessed easier and quicker by users and that populations

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can be reached who may not otherwise get into contact with traditional person- or print-based PA interventions (Norman et al., 2007). Results of previous systematic reviews and meta-analyses suggest that eHealth interventions are an effective intervention vehicle for the promotion of PA among adults of various ages (Norman et al., 2007; Krebs et al., 2010; Davies et al., 2012; Foster et al., 2013; Aalbers et al., 2011). However, the evidence for the effectiveness of these interventions in regard to PA promotion among older adults is mixed. Two studies (King et al., 2013a; Silveira et al., 2013) reported increases in participants' activity levels (aged 45–81 years) after receiving an eHealth PA intervention which was delivered by smartphone or tablet. Also, when compared to a no intervention control group, participants aged 55 years and above who received a web-based or telephone-based PA intervention displayed an increase in PA-levels (Irvine et al., 2013; Pinto et al., 2005). On the other hand, Kim and Kang (2006), as well as Peels et al. (2013) could not find an added beneficial effect of eHealth PA interventions compared to non-eHealth interventions in persons aged 55 years and above (i.e., print-delivered intervention, face-to-face intervention). Müller and Khoo (2014) reported that non-face-to-face PA interventions for older adults aged 50 years and above appear to positively affect uptake and maintenance of PA. However, this review did not solely compare eHealth PA interventions to non-eHealth interventions or to no intervention control groups. Hence, the current systematic review aims to compare the effectiveness of eHealth interventions promoting PA in older adults (aged 55 years and above) with either no intervention or a non-eHealth intervention.

2. Methods

Reporting guidelines of the “Preferred Reporting Items for Systematic Review and Meta-Analyses statement (PRISMA)” are followed for this article (Moher et al., 2009).

2.1. Study registration and protocol

This systematic review is registered at PROSPERO (registration number: CRD42015023875; <http://www.crd.york.ac.uk/PROSPERO>). The study protocol is published in Systematic Reviews (Muellmann et al., 2016).

2.2. Study inclusion and exclusion criteria

2.2.1. Study designs

Experimental (randomized controlled trial [RCT]) or quasi-experimental study designs that compare an eHealth PA intervention targeting older adults aged 55 years and above with either a non-eHealth PA intervention or a group that is not exposed to any intervention were included in this review.

2.2.2. Participants

Studies examining older adults of both sexes without severe pre-existing chronic medical conditions (e.g., cancer) aged ≥ 55 years were included in this review. Studies that did not target the general population of older adults (e.g., patients in rehabilitation settings after stroke or heart attack, diabetic patients) were excluded. Globally, there is no consistent definition of older adulthood, definitions range somewhere between 50 and 65 years. We used a relatively low cut-off point for defining older adulthood, so that studies were eligible for inclusion if participants' mean age was at least 55 years.

2.2.3. Interventions

Studies on eHealth interventions promoting PA in older adults were included. eHealth interventions encompass interventions accessible via computer or other handheld devices, such as Personal Digital Assistants (PDAs), telephones or smartphones, or tablets. Studies were included if the main intervention component was delivered via computer (i.e.,

website, e-mail, PDA), telephone or smartphone (i.e., telephone calls, text messaging, mobile application [app]) or tablet (i.e., app). Mass-media interventions, DVD-based interventions, and interventions delivered using gaming consoles (e.g., Nintendo Wii) were excluded.

2.2.4. Comparators

Comparator conditions included participation in a.) A non-eHealth intervention (e.g., paper-pencil intervention without eHealth component, face-to-face consultation, e.g., prescription of PA by a physician, or exercise in groups or with a personal trainer) or b.) No intervention. Studies that compared one or more eHealth interventions without a comparison to a non-eHealth intervention or a no intervention control group were excluded.

2.2.5. Outcomes

In the included studies, PA was assessed using objective (e.g., pedometer, accelerometer), subjective (e.g., PA diary, questionnaires), or a combination of objective and subjective methods. Studies that did not report data regarding intervention effectiveness for PA promotion were excluded (e.g., PA only reported as baseline variable).

2.3. Search strategy

The following databases were searched by one author (SM), including publications until the end of March 2017:

- Medline (via PubMed, 1946 to present),
- PsycINFO (via Ovid, 1806 to present),
- Web of Science including Social Sciences Citation Index and Science Citation Index Expanded (1900 to present),
- Cumulative Index to Nursing & Allied Health Literature (CINAHL) (via EBSCO Host, 1981 to present),
- Excerpta Medica database (EMBASE) (via Ovid, 1974 to present),
- Cochrane Central Register of Controlled Trials (CENTRAL) (via Cochrane Library, 1948 to present),
- Physical Education Index (PEI) (via ProQuest, 1970 to present),
- and OpenGrey (1980 to present).

The search was restricted to studies published in English or German. Keywords were related to PA, older adults, and eHealth interventions, using MeSH terms and other index terms, as well as appropriate synonyms. The keywords were combined using the Boolean operation OR and AND. Validated RCT-filters were used for the searches in Medline, PsycINFO, Web of Science, CINAHL, and EMBASE. For PEI and OpenGrey, no validated RCT-filters were available. Therefore, appropriate keywords to identify studies using an experimental or quasi-experimental study design were employed. For the search in CENTRAL, no RCT-filter was necessary because the database only includes controlled trials. The search strategy is illustrated in Supplementary file 1 using the Medline search as an example and is included in the study protocol (Muellmann et al., 2016). References of the included studies were checked to identify additional potentially relevant studies.

2.4. Selection of studies

First, titles and abstracts of studies identified, using the search strategy outlined above, were screened independently by two authors to select the relevant studies (SM and SF or TM). Any disagreements between the two authors regarding the selection of the articles were discussed until consensus was reached. A third author was involved in this discussion when necessary (SF or TM). In a second step, full texts of potentially relevant studies were obtained and reviewed independently by two authors (SM and SF or TM). Any disagreements between the two authors were resolved by consensus and/or discussion with a third author (SF or TM).

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