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Evaluating the effects of a gamified app and physical nudges on physical activity

Submission date
30/10/2020

Recruitment status
No longer recruiting

Registration date
17/12/2020

Overall study status
Completed

Last Edited
02/03/2026

Condition category
Other

[_] Prospectively registered
[_] Protocol
[_] Statistical analysis plan
[X] Results
[_] Individual participant data

Plain English summary of protocol
Background and study aims
Sedentary behaviour (SB) and lack of physical activity (PA) have been associated with negative health outcomes and are increasingly common in individuals working in sedentary occupations, such as office jobs. Gamification (the application of typical elements of game playing [e.g. point scoring, competition with others, rules of play] to other areas of activity) and nudges (positive reinforcement and indirect suggestions as ways to influence behavior and decision making) have attracted attention as promising strategies to promote health behaviour change. However, most studies of effectiveness so far lacked active controls, and few studies have tested interventions combining these two strategies. This study investigated the effectiveness of an intervention combining a gamified digital intervention with physical nudges to increase PA and reduce SB in Dutch office workers.

Who can participate?
Participants were healthy office workers from two government workplaces in the city center of Rotterdam (office locations A and B). Individuals were eligible to participate if they: (1) were fluent in the Dutch language; (2) worked at a department that was not involved in another physical activity-related intervention; (3) had a smartphone capable of running the required digital application; and (4) provided written informed consent for participating in the research.

What does the study involve?
Employees of the municipality of Rotterdam from two office locations were randomized at the location-level to either a 10-week intervention, combining a five-week gamification phase encompassing a gamified digital intervention with social support features and a five-week physical nudges phase, or to an active control (i.e. limited digital application with self-monitoring and goal-setting). The primary outcome was daily step count objectively measured via accelerometers. Secondary outcomes were self-reported PA and SB. Mixed-effects models were used to analyse the effects of the intervention on the primary and secondary outcome measures of participants up to one month after the intervention.

What are the possible benefits and risks of participating?
Possible benefits for participants included increases in physical activity and reductions in sedentary behaviour. There were no significant risks associated with participation in this study.

Where is the study run from?
This study was part of a collaboration between the Municipality of Rotterdam and the Erasmus University of Rotterdam (Netherlands). The study took place in two office buildings of the Municipality of Rotterdam, and was managed by researchers from the Erasmus University of Rotterdam.

When is the study starting and how long is it expected to run for?
July 2017 to June 2019

Who is funding the study?
The costs of the accelerometers, physical nudges and digital applications utilized in this study were funded by the Municipality of Rotterdam (Netherlands). The content is solely the responsibility of the authors and does not necessarily represent the official views and interests of the funders or the authors' affiliated academic institutions. The funders had no role in the design of the study, and were not involved in data analysis, decision to publish or preparation of the manuscript.

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Scientific

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Additional identifiers

Protocol serial number
18-039

Study information

Scientific Title
MoveMore: Combining gamification and physical nudges to promote walking and reduce sedentary behaviour of office workers. A randomized controlled trial.

Acronym
MoveMore

Study objectives
1. During the gamification phase, participants in the intervention condition will increase their levels of objectively measured light-PA (i.e. daily step count), compared to the control.
2. During the gamification phase, we would observe increases in self-reported light-PA, moderate-to-vigorous PA, and reductions in self-reported SB in participants in the intervention condition, compared to control.
3. Improvements in the primary and secondary measures achieved during the gamification phase would be maintained during the physical nudges phase and at a one month follow-up.

Ethics approval required
Old ethics approval format

Ethics approval(s)
Approved 26/03/2019, Ethics Review Committee of the Department of Psychology, Education and Child Studies, Erasmus University Rotterdam (Postbus 1738, 3000 DR Rotterdam, The Netherlands; no telephone number provided; EC-dpecs@essb.eur.nl), ref: 18-039

Primary study design
Interventional

Study design
Two-arm cluster randomized controlled trial

Study type(s)
Quality of life

Health condition(s) or problem(s) studied
Reducing sedentary behaviour and promoting walking behaviour in office workers

Interventions
Allocation
Each of the two office locations was randomly allocated to either the control or intervention condition to minimize treatment contamination.

Intervention and Control
Participants in the location receiving the MoveMore intervention were given the full version of the digital application, whereas those in the control location were given a limited version of the application. Both versions of the application were linked to the accelerometer, allowing participants to monitor their own PA in terms of step count and set daily goals. In the first five weeks of the MoveMore intervention condition (i.e. gamification phase), office workers were invited to participate in PA challenges through the digital application, which incorporated elements of gamification and social support and comparison features. After the gamification phase, physical nudges were introduced to the workplace of participants in the MoveMore intervention for another five weeks (i.e. physical nudges phase).

Gamification Phase
Relative to the control condition, participants in the MoveMore intervention had access to several additional components to motivate participants to engage in PA and help them self-

regulate their behaviour. For example, the digital application used in the MoveMore intervention combined elements of gamification with several components enhancing social support and social comparison in an interactive platform 42. During the first five weeks, office workers were invited to participate in two PA challenges with different themes, lasting two weeks each, with one week in between them. The challenges consisted of a "Virtual walking tour" (e.g. a roundtrip across Europe) representing a large goal, such as 19,0000 steps, that could be achieved by participants by attaining their daily goal of 8,500 steps for two weeks. Participant's progress was illustrated in the application by their virtual avatars crossing the virtual tour scenarios. To enhance motivation for PA, the two challenges became gradually more difficult. The default PA goal for the first challenge was the same as for default goal presented to those in the control condition (i.e. 8,500 daily steps), while for the second challenge participants in the MoveMore intervention were encouraged to reach a more difficult default goal of 10,000 daily steps. Participants could also set more challenging daily step goals.

During the challenge, participants in the MoveMore intervention were allocated to different teams (20 to 30 subjects), according to the department they worked on. In addition to progressing towards their daily step goals, participants daily steps contributed towards their team step goal (i.e. set as the number of participants in the team multiplied by their default daily step goal). A leaderboard served to enhance intra team cooperation and individual accountability, while promoting competition between the teams. Each team was allocated as a representative of a different charity organization, and by earning points and climbing the leaderboard ranks during each challenge teams could win gradually bigger prizes for their charity, which were sponsored by the Municipality. The first team earned 100 euros, the second team earned 90 euros, and so forth with the sixth and last team earning 50 euros. The application used in the gamification phase of the intervention also rewarded participants with virtual awards for certain individual (e.g. "Daily step goal achieved!") and team-based PA achievements (e.g. "Your team completed a challenge!"). In addition to the weekly feedback on their personal step goals which is also provided by the limited digital application used in the control condition, participants in the MoveMore intervention received biweekly newsletters during the challenges with updates on the competition and their team's progress.

Physical Nudges Phase

After the gamification phase, physical nudges were introduced to the office workspace of participants in the intervention condition for five weeks to promote maintenance of behaviour change achieved. These nudges consisted of table signs aiming to: 1) further motivate participants to engage in PA and reduce SB, and 2) remind participants of the opportunities for PA in their work environment and routine. To achieve the former, motivational nudges incorporating several different behavioural insights were implemented. For example, one table sign poster portrayed an interaction between an employee and the office physician, in which the latter advises that "walking breaks are healthy and increase work productivity!" Another type of motivational nudge utilized social comparison to increase motivation for PA, with the following message: "Half of your colleagues try to move at least 10,000 steps per day. What about you?" Complementarily, another type of nudge, namely point-of-choice prompts, reminded participants of their PA goals, highlighting opportunities for PA in a timely manner and prompting cognitive and behavioural rehearsal. For instance, a point-of-choice prompt nudge was placed in the coffee area of the workspace with the message "Grabbing a drink? Perfect moment to be healthy and go for a walking break!" The messages hereby reported have been translated from Dutch.

Control condition

Similarly to the application used in the Move More intervention, the limited digital application used in the control condition allowed participants to self-monitor, and to set their own daily step

goal. The limited application gave participants a default daily step goal of 8,500 steps, which remained the same throughout the study duration. Participants in the control condition also received a weekly personalized feedback detailing their progress with their step count via email. This limited application served as an active control because it allowed for objective assessment of PA and its components (i.e. self-monitoring, goal-setting and personalized feedback) are effective in promoting PA.

Intervention Type
Behavioural

Primary outcome(s)
The primary outcome measure of walking behaviour was the number of daily steps objectively measured via FitBit Flex accelerometers (objective light-PA). Participants daily steps were measured for 15 days before the intervention to establish a baseline measurement, as well as for 10 weeks during the intervention period (5 weeks gamification and 5 weeks of physical nudges phase) and for an additional 4 weeks of follow-up.

Key secondary outcome(s)
At baseline, as well as at 5 weeks, 10 weeks, and 14 weeks after the start of the intervention
1. Self-report of worktime light-PA, moderate-to-vigorous PA and SB using a novel questionnaire
2. SB at work was assessed with two-item self-report measures of workplace sitting time and breaks in sitting time
3. To assess the intensity and levels of PA in various settings (i.e. at work, at home, active transport) the validated Dutch version of the SQUASH questionnaire was utilized

Completion date
01/06/2019

Eligibility

Key inclusion criteria
1. Fluent in the Dutch language
2. Work at a department that was not involved in another physical activity-related intervention
3. Have a smartphone capable of running the required digital application
4. Provide written informed consent for participating in the research

Participant type(s)
Healthy volunteer

Healthy volunteers allowed
No

Age group
Adult

Sex
All

Total final enrolment
298

Key exclusion criteria
Does not meet inclusion criteria

Date of first enrolment
15/09/2018

Date of final enrolment
29/10/2018

Locations

Countries of recruitment
Netherlands

Study participating centre
Office buildings of the Municipality of Rotterdam (De Rotterdam)
Office location A - De Rotterdam: Wilhelminakade 139, 3072 AP Rotterdam
Office location B - Het Timmerhuis: Halvemaanpassage 1, 3011 AH Rotterdam
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Sponsor information

Organisation
Erasmus University Rotterdam

ROR
https://ror.org/057w15z03

Funder(s)

Funder type
University/education

Funder Name
Erasmus Universiteit Rotterdam

Alternative Name(s)
Erasmus University Rotterdam, Erasmus Universiteit, Erasmus University, Erasmus University Rotterdam in Netherlands, EUR

Funding Body Type
Government organisation

Funding Body Subtype
Universities (academic only)

Location
Netherlands

Funder Name
Gemeente Rotterdam (Municipality of Rotterdam)

Results and Publications

Individual participant data (IPD) sharing plan

IPD sharing plan summary
Not expected to be made available

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article		12/04/2026	02/03/2026	Yes	No