Short-term influence of physical activity on the expectation to use an exercise app

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Abstract *- The effects of mobile exercise applications (apps) on physical activity have often been investigated. An unexplored question is formed by turning around the variables and to investigate whether physical activity has an influence on the expectation to use mobile exercise apps. Research has shown that future exercise behaviour can be predicted by past exercise behaviour.*

In an online questionnaire, participants were randomly distributed between two condition groups and were instructed to do a physically active or inactive task. Subsequently, three physically active and inactive app overviews were reviewed by the participants and assessed on different topics, including expectation to use the app.

The study shows no significant difference between experimental condition group in expectation to use physically active or inactive apps. However, a significant result is found in the interaction between task condition and gender regardless of the app type. This result shows that after exercising for 10 minutes at a moderate intensity level, the expectation to use an app for males decreases whereas for females it increases. This implies that exercising in combination with gender has a reverse effect on the expectation to use an app, regardless whether the app is an exercise or inactive app. Similar significant results were found in other assessment questions about willingness to use, recommend and install the app and the rating given to the app. This reverse effect is novel and has never been investigated in existing literature. Further research is necessary to confirm the results.

Index Terms- Physical activity/exercise, expectation, mobile-based exergames, exercise apps and app reviews.

I. Introduction

The majority (60%) of the Dutch population does not exercise enough (Nannes & Van der Hoeve, 2018). A lack of motivation and physical complaints are the main factors for not exercising (Nannes & Van der Hoeve, 2018). It is not only a large problem in the Netherlands, but all over the world physical inactivity is a big problem for the public health (Kennedy & Blair, 2014). Physical inactivity in the United States leads to 30% more mortality (Booth et al., 2012). Additionally, life expectancy decreases by long-term insufficient physical activity. The main cause-of-death nowadays are chronic diseases, while the most important factor to prevent or delay chronic diseases is exercising (Booth et al., 2012). Type 2 Diabetes (T2D) is one of the 40 most common chronic diseases, the increasing number of cases worldwide makes it a pandemic (9% of the US population is diagnosed with T2D), this will increase if no action will be taken. Besides the many benefits of physical activity, exercising also has a positive effect on mental health conditions such as Alzheimer, Parkinson, depression, anxiety and drug addiction (Ruegsegger & Booth, 2018). The few aforementioned studies already give an impression of the advantages which physical activity has on health. According to Ruegsegger and Booth (2018) a positive correlation between health and physical activity has been found in over 100.000 studies.

To tackle the health problems related to physical inactivity, smartphones can be used to stimulate an active lifestyle since the global popularity of smartphones has increased and the entire society is focussed on mobile applications (apps). An ever increasing number of mobile apps are mobile health apps (Olla & Shimskey, 2015). Mobile health apps are also commonly used in prevention and improvement of long-term disease (Birkhoff & Smeltzer, 2017). However, for those apps it is important that they provide a high level of usability to motivate the users.

Beside health apps, exergames have become more popular. Exergames combine game play and physical exercise. The goal of exergames is to create an enjoyable exercise experience by using a digital game (Laine & Suk, 2016). When exergames are well-designed they immerse the players which can make players exceedingly motivated to be physically active (Csikszentmihalyi, 1998). A meta-analysis study of Peng et al. (2011) indicates that normal physical activity and physically active video games do have an equal effect on heart rate, energy expenditure and oxygen consumption.

Although quite a lot of literature is available about the impact of exercise apps on physical activity, the other way around has not been investigated yet. Does physical activity have impact on the use of exercise apps? In order to get people motivated to exercise more by using a mobile app they first need to get motivated to use the exercise apps. This research will examine whether exercising directly influences people's expectation to use exercise apps. The expectation to use an app will be investigated by exposing participants to app overview pages of different apps (physically active and inactive), as a consequence expectation is more based on "first impression" than knowing all the functions of the apps.

The results of this study will contribute to the knowledge of motivation to use an exercise app. If a positive correlation will be found, it will provide new insights how to effectively introduce new exercise apps to potential users. Sport grounds or indoor sport complexes could be a suitable space for the promotion of exercise apps. For physicians, exercise apps could provide new information how to stimulate patients in the best way becoming more physically active. It could be that to motivate people to use an exercise app, they must be persuaded once to be physically active in order to become more physically active in the future by using an exercise app.

In the following section a short literature review is described. In section III, the research question and hypotheses are posed. To examine if physical activity has a short-term influence on the expectation to use exercise apps, an empirical study has been performed. This study includes two conditions, participants were asked to either exercise or to be in a sedentary position for 10 minutes. Subsequently, participants were asked in a questionnaire to rate apps and to fill in their expectation to use it in the future. An elaborated description of the method can be found in section IV, after which the results are discussed in section V. The conclusion is presented at the end of the paper in section VI.

II. Related Work

In current literature, much is found about the impact of exercise apps on physical activity. The other way around, the effect of physical activity on the expectation to use exercise apps has not been studied. We did research in the current literature about the influence of motivation, the relation between intention and expectation and research on (gamified) exercise apps.

A. Motivation

Different models are used for lifestyle behaviour change. According to Kennedy and Blair (2014) the social ecological model, transtheoretical model and social cognitive theory are the most successful models for lifestyle behaviour change.

In addition to these models, the Self-Determination Theory (SDT) is well applicable to use as a framework to analyse motivation behind choices for physical activity (Rodrigues et al., 2019). The SDT poses that motivation can be understood by using three innate psychological needs (Deci & Ryan, 2000). Fulfilment of the three basic psychological needs autonomy (i.e., self-regulated), competence (i.e., feel mastery) and relatedness (i.e., connectedness) improves integration of extrinsic motivation, intrinsic motivation, psychological health, performance and well-being (Deci & Ryan, 2000; Deci & Ryan, 2018).

As visible in the aforementioned studies, the role of motivation is often investigated for predicting exercise behaviour. The impact of past exercise behaviour on future exercise behaviour has been investigated by Rodrigues et al. (2019), Dishman et al. (1985) and others. In addition, Rodrigues et al. (2019) study investigated the effect of past exercise behaviour on intention to exercise more. Results of Rodrigues et al. (2019) study show that past exercise behaviour can predict future exercise behaviour, as a strong significant effect has been found between past exercise behaviour on future exercise behaviour and intention. Past behaviour is a better predictor of exercise adherence than motivational antecedents. Five percent of the variance between the intention to exercise and future behaviour can be explained by the fact that all the participants in Rodrigues et al. (2019) study exercised routinely over 1 year before participating in the study. Therefore, exercising could have been part of their habits.
Although, assuming past behaviour frequency as a factor to determine habits is incorrect according to Ajzen (2002). Behaviour will not be activated automatically after performing an activity frequently. Even if behaviour is executed regularly, it should not decline the impact of intention. According to these results, the minor variance found in Rodrigues et al. (2019) study between the intention to exercise and future behaviour has likely not been affected because the behaviour was routinely. Decisions had probably been made with conscious attention and therefore intention is a predictable way of measuring future behaviour.

In a review study of Dishman et al. (1985) three determinants concerning the initiation and continuation of physical activity were defined. The determinants are characteristics of the environments, person and activity. The determinant personal characteristics includes past participation. Past exercise participation has been found as most reliable predictor of contemporary exercise participation in a supervised setting (this means that the exercising activity was observed)

B. Intention and expectation

The previous section shows a positive relation between past and future exercise adherence, however past exercise behaviour and the expectation to use physically active apps has not been investigated. In this study, actual use of exercise apps will not be examined, but expectation to use the apps regularly over the next two weeks will be measured, which provides an indication about the actual use.

Intention and expectation are commonly used to get an indication about the actual behaviour. In the best scenario the intention-behaviour relationship is positively related. A high correlation between intention and actual behaviour creates insights about the actual use of the apps after exercising. Generally intention is a great determinant to predict behaviour, but the correlation seems relatively unsuccessful for physical activity to measure the correlation between intention and action (Courneya & McAuley, 1994). Two issues were mentioned. First, expectation (the probability of carrying out physical exercises) turns out to be a better indicator for physical activity than intention (conscious plan of carrying out physical exercises). The main reason for this difference is that physical activity likely has practical constraints and expectation has been found as a better predictor for behaviour that is not entirely voluntary. Expectation has a stronger correlation with physical activity, because it includes supplementary information (e.g., expected changes, perceived skills and non-cognitive routinely behaviour). Frequency had a stronger correlation with expectation than intention, while intensity and duration remained the same. A reason for this is that frequency is less controllable. Secondly, often in intention-physical activity research, scale correspondence is missing, not corresponding scales are used to measure both intention and

physical activity. Using continuous-open scales for intention and physical activity gives the highest correlation.
In line with these results, Rhodes and Matheson (2005) also show a difference in the correlation between exercise intention-behaviour and expectation-behaviour. Rhodes and Matheson (2005) investigated the differences between intention and expectation in the exercise domain by asking participants their intention and expectation to exercise regularly over the next two weeks. Besides this, the actual exercise behaviour of the participants was also measured. Results show a higher correlation between expectation and behaviour compared with the correlation between intention and behaviour, which implies that measuring expectation gives a more realistic view about actual behaviour than intention. This effect has only been found by participants with low exercise intention or expectation and behaviour. For participants with medium and high level of exercise intention or expectation and behaviour, no difference was found.

According to Burgess et al. (2010) the situational circumstances when intentions are created, can explain the difference between exercise intention and behaviour. In their study, intention and expectation to go to the fitness was asked to all the participants who were distributed over three groups: Hypothetical (H), Hypothetical with Corrective Entreaty (HE) and Real (R). In the Hypothetical group, participants thought that they could get free access to the fitness. Participants are also in a hypothetical situation in the Hypothetical with Corrective Entreaty group, the difference is that participants in this group are stimulated to describe their intention similarly to a real life situation. Participants in the Real group believed that they could really go to the fitness for free. The results show that the relation between expectation and behaviour in the HE and R group was higher than the H group. Again, expectation has a stronger relation with behaviour than intention. To provide an as reliable as possible expectation-behaviour relationship, the Real approach is used in the questionnaire of this study by describing that the participants are welcome to download the app(s) from the Google Play Store and Apple App Store after finishing the survey.

Besides the benefits of measuring expectation in the exercise domain, Mahardika et al. (2018) found that expectation was a better predictor than intention for the adoption of new technologies. The study researched behavioural expectation and intention related to consumers' willingness to adopt a new technology. The result of the study showed that anticipated and unanticipated factors that may challenge the actual behaviour of a consumer were taken into account by asking about the expectation.

C. Basic affective state during exercise and future exercise participation

As described by Williams et al. (2008), a positive basic affective (i.e., displeasure/bad versus pleasure/good) state experienced by acute moderate-intensity exercising has a positive effect on future moderate-intensity exercise participation after 6 and 12 months. If participants in this study created a pleasure/good affective state during acute exercising in the physically active condition group, it could lead to more exercise participation on long-term, however there is no evidence for the short-term effect and expectation to exercise more.

D. (Gamified) exercise apps

Despite the good intentions, using health related apps to help change behaviour to a healthier lifestyle, is by most people not received with much enthusiasm (Dennison et al., 2013). In the US 45.7% of the population discontinued using mobile health apps, one of the main reasons for this is the lack of interest (Krebs & Duncan, 2015). Adding gamification to mobile health apps could help for longer term motivation to use a health app (Schmidt-Kraepelin et al., 2019; Schmidt-Kraepelin et al., 2018). In addition, adding game elements to health apps also results in more ratings in the Google Play Store and the Apple App Store (Schmidt-Kraepelin et al., 2019). Based on the results, the rating and expectations could be higher in the physically active gamified exercise app compared with the physically active exercise app.

Keyfindings

Based on the current literature, past exercise behaviour can predict future exercise behaviour, but there is no solid evidence that it will have a positive effect on the expectation to use exercise apps. To get an as accurate as possible result about the actual exercise behaviour of participants based on the view towards using exercise apps after a physically active or inactive task, measuring the expectation instead of the intention is more reliable (Burgess et al., 2010; Courneya & McAuley, 1994; Mahardika et al., 2018; Rhodes & Matheson, 2005). Although health apps are not likely to change people's behaviour (Dennison et al., 2013), adding gamification to the app could help for longer term motivation using the app (Schmidt-Kraepelin et al., 2019; Schmidt-Kraepelin et al., 2018). To investigate if past exercise behaviour has not only an effect on future exercise behaviour but also on the expectation to use exercise apps, the following research questions are formulated in the following section.

III. Research Question

Based on prior findings in the literature and the different health advantages found after exercising for 10 minutes, the following hypotheses were composed (Samani & Heath, 2018; Stanner, 2004; Suwabe et al., 2018).

H_0. Exercising for 10 minutes will not have an effect on the expectation to use mobile physical activity apps.

H_1. People who exercise for 10 minutes will have a higher or lower expectation to use mobile physical activity apps than those who are in a sedentary position for 10 minutes.

RQ: What is the short-term influence of exercise behaviour on the expectation to use mobile exercise apps?

IV. Method

In this between-subject study, two randomly distributed experimental condition groups were considered. Subjects were either physically active or inactive for 10 minutes after which they reviewed six mobile app overview pages. For the app overview pages two app types were examined, namely physically inactive and active apps. Details are further presented in the remainder of this section.

A. Subjects and Procedures

The criteria for participating in this research were speaking English, owning a mobile phone and being an adult (age 18 years and older). Since the questionnaire was only provided in English and basic English skills were necessary for understanding the questionnaire and app overview pages, participants were asked to self-report their English proficiency.

B. Design and Procedures

Participants underwent the experiment by conducting an online survey. The survey consisted of general questions, a task (physically active or inactive) and reviewing six apps (see appendix A). The experiment was conducted during the COVID-19 pandemic. As a consequence, performing the task on location was not possible.

Experimental condition groups

After the first part of the questionnaire, which consisted of demographic and exercise frequency questions, participants were randomly distributed between two experimental condition groups, namely physically active or inactive. In both conditions three options were provided to the participants. The options were chosen based on the metabolic equivalent of task (MET) value. MET is calculated as ratio between the metabolical rate while doing physical activity, relative to the metabolical rate while resting (Ainsworth et al., 2000). The MET rate can classify physical activity intensity in three groups namely, light (<3 METs), moderate (3-6 METs) and vigorous (>6 METs) (Ainsworth et al., 2000). For the physically inactive condition, the following three light intensity tasks were selectable: reading a book, newspaper, magazine etc. while you are sitting quietly (1.3 METs), watching television while you are sitting quietly (1.0 METs) and making an origami dinosaur while sitting (1.5 METs). For the physically active condition the three subsequently mentioned moderate intensity tasks were selectable: brisk walk (3.8 METs), vacuuming (3.5 METs) and aerobic low impact workout (5.0 METs).

Participants were asked to perform the task for exactly 10 minutes, for several reasons. People are recommended to exercise at a moderate intensity level for 30 minutes every day (Stanner, 2004). However, as Stanner (2004) reported, dividing exercising in periods of 10 minutes distributed over the day is equally valuable concerning health benefits and might even contribute to more exercising on the long-term. Exercising for 10 minutes can be seen as comprehensive enough to benefit from different health advantages (Samani & Heath, 2018; Stanner, 2004; Suwabe et al., 2018). Besides this, we were concerned that participants would stop with the questionnaire or skip the exercise task, if they had to exercise for longer than 10 minutes.

Apps

Subsequent to the 10 minutes task, the survey provided six separate links (QR code and URL) to the webpages where app overviews were shown. All participants reviewed the same app overview pages, but in a randomized order. The six app overview pages were divided in three physically active and three physically inactive apps. The three physically active apps consist of a moderate intensity exercise app, a vigorous intensity exercise app and a mobile-based exergame. To make the comparison as equal as possible two self-improvement apps were also chosen for the physically inactive condition, namely a productivity and a language improvement app. A mobile based game with similar game mechanics as the mobile-based exergame was used as well. Both games have the same goal namely, users should move in the right direction to collect specific objects and they need to avoid other objects in order to win the game. The app overview pages used for this study are BetterMe: Fitness Game (BetterMe Limited, 2021), Stretching Exercises Flexibility By Gym Fitness (World Gym Fitness JS, 2019), Hiit Workout Generator: Free Wod Tabata Workouts (Qrcoy, 2021), Missiles! (2ndBoss, 2021; Macaque, 2019), Boosted - Productivity & Time Tracker (Boosted Productivity, 2021) and Rosetta Stone: Learn Languages (Rosetta Stone, Ltd., 2021). The apps used in the app overview pages are available in the Google Play Store and/or Apple App Store. Screenshots of the app overview pages can be found in appendix A. The descriptions and images of the apps in this research are copied with minor modifications from the Google Play Store and the Apple App Store. The different apps are presented in a custom made app store existing of recognizable elements of the Google Play Store and Apple App Store to make it as familiar as possible for everyone.

All apps are presented in a textual overview together with images and the logo belonging to the apps. We chose to use a consistent medium for presenting the apps, as the medium used to communicate the app could have an influence on the expectation to use the apps.

The medium used to communicate the app overviews in relation to cognitive effort can influence the persuasive effect in narratives and thereby possibly expectation. The relation between the need for cognition, medium (film and print) and transportation is investigated by Green et al. (2008). Need for cognition describes people's expectation of enjoyment when doing a task that includes high cognitive effort. This is particularly interesting because film requires less cognitive effort than print (Salomon, 1984). Results of Green et al. (2008) research indicate that a corresponding cognitive effort level in need for cognition and medium (i.e., low cognitive effort - film and high cognitive effort - print) results in a higher transportation. The transportation theory explains the experience where people highly engage in a narrative reality (Green & Sestir, 2017). When immersed, the narrative reality has an influence on thoughts and emotions such that it almost feels like reality. An increase in transportation results in an increase in persuasive effect in narratives. Corresponding research shows that when people have a lower need for cognition, a higher time spent watching television was measured (Henning & Vorderer, 2001).

The study of Radel et al. (2016) gives insights in cognitive effort while exercising. The results indicate that the expected duration of exercising is corresponding with cognitive effort, when a longer exercise duration was expected it decreased activity in brain regions linked to cognitive effort. Two conditions of expected duration were examined, 10 minutes and 60 minutes. After 200, 400 and 600 seconds ratings of perceived exertion and attentional focus were measured. The expectation to exercise for a longer duration (60 minutes) decreases activity in brain regions linked to cognitive effort compared with the shorter duration (10 minutes).

In the longer exercise duration case, the brain decreases regions related to cognitive effort to preserve mental resources necessary to continue exercising. No other evidence exists yet that investigated the influence of exercising on cognitive effort.

Elaborating on these results in this study's context, there is chosen to expose participants only to the print (with images) descriptions of mobile apps. It could be that exercising increases cognitive effort and therefore a video is a more suitable medium, while for the sedentary condition print could be more suitable. If the medium matches the participant's need for cognition after exercising or being in a sedentary position, it will improve the persuasive effect and likely expectation. If exercising for 10 minutes is correlated with cognitive effort, an overall higher expectation should be expected for the sedentary inactive condition as the cognitive effort would match with the medium used in this study. The focus of this research is not the medium used, however as the medium might be accountable for a possible difference in expectation in the two experimental condition groups we take this information into account as influencing factor during the study.

App selection procedure

Apps were chosen based on several selection requirements. Overall, for all the apps chosen a rating of at least three stars is required. As Fu et al. (2013) reported, a threshold of three stars is a good indicator whether people like or dislike an app. Apps that require additional equipment were also excluded, to avoid requirements that participants do not possess and thereby influencing their results. For all the apps no prior exercise experience is needed. Explanation for exercises will be given in the app.

Furthermore, the health apps chosen do not have weight loss as their main goal, as this might not be pursued by everyone. Besides this, in the images associated to some of the apps, both traditional binary genders are presented, so that nearly everyone is able to identify themselves with them.

App modifications procedure

Several modifications are made in the representation of the selected apps for the purpose of this study. Existing literature shows different outcomes when it concerns the linkage of health apps and social media. People were against linking contacts from social media and in their health app in a research executed by Dennison et al. (2013). Most participants felt a bit ashamed that they are using health apps and therefore want to keep their use private. On the contrary, Facebook enabled a forum for participants who are suffering from diabetes so they can share their experiences, getting feedback and letting them be able to ask questions (Greene et al., 2011).

For overweight and sedentary adults, peer support and professional support engage participants to change their lifestyle through a mobile phone-based healthy lifestyle program (Fukuoka et al., 2011). Although participants in Fukuoka et al. (2011) study did not mention social media platforms as a way for support.

In addition, Anderson et al. (2007) developed a mobile phone prototype, to encourage a healthier lifestyle. This prototype monitors physical activity and shares the activity data with peers selected by the participant. Participants enjoyed and reacted positive to the tool. By sharing activity levels with peers, a competitive character appeared which is comparable with certain game-like features.

To exclude the influence of social support (peer, professional, social media support, etc.) we decided to withhold information about social support from all the app descriptions.

In the app overview pages, ratings are also omitted. As a research on online ratings of Muchnik et al. (2013) shows, existing ratings influence people. Ratings that were positively manipulated resulted in 25% higher final rating on average. Besides the influence of existing rating on people's given ratings, existing ratings also influence people's mobile phone app selection. In 80%, participants in Dogruel et al. (2015) study based their decision to download an app on "take the first" heuristics. In this case, highly rated and ranked apps particularly influenced app selection. Although, participants read the descriptions more often from apps with multiple discrete-functions (i.e., apps created to perform multiple tasks and actions such as a running app) compared with apps with one discrete function (e.g., flashlight app) (Dogruel et al., 2015). Nevertheless, due to the influential nature of ratings, they are omitted from the app overview pages.

One of the main reasons in the US for not using health apps are the costs (Krebs & Duncan, 2015). As some of the selected apps contain in-app purchases, the description was modified by omitting information about these purchases. All apps in this study communicate the message that downloading the app is for free. Therefore, this factor cannot influence the results.

Participants used their own device to visit the webpages. Benefits of the online survey and thereby the use of their own device is the familiarity and not having to touch other objects regarding the COVID-19 virus. Unfortunately, we could not measure the participant's behaviour while reviewing the app overview pages on a device, which could have provided more valid duration results.

Assessment questions

After reviewing an app overview page, participants were asked to complete a questionnaire, asking about their expectation to use the app, familiarity with the app, willingness to use and install the app, willingness to recommend the app to friends and family, and the rating given to the app. Although expectation is the main question, the other variables give a broader insight of the participants view towards the app. Exercise expectation was measured using the similar question formulated in Rhodes and Matheson (2005) study. As these results show a larger expectation-behaviour correlation than intention-behaviour correlation by using this question. Expectation to use the app, willingness to use, install and recommend the app, and the rating given to the app were all measured on a 7-point Likert scale with a range from 1 (strongly disagree) to 7 (strongly agree).

C. Measures

Exercise frequency in the past will be measured using the Godin Leisure-Time Exercise Questionnaire (GSLTPAQ) (Godin & Shephard, 1985). The GSLTPAQ divides participants into different categories of activity level. Amireault and Godin (2015) conducted a validity study for the GSLTPAQ, results support the categorization structure (i.e., active and insufficiently active categories) for healthy adults. Furthermore, past exercise frequency on the short-term was measured by asking participants to indicate whether they were physically active on the same day before filling in the questionnaire. Participants who were physically active had to describe the duration of being physically active, how many hours ago they performed the activity and the exercise intensity of the activity (i.e., vigorous, moderate and mild/light exercise intensity).

Prior downloaded mobile phone exercise apps will be asked in the questionnaire. In the US, mobile phone health apps are used by 58.23% of the population (Krebs & Duncan, 2015). Of all the installed health apps, fitness apps were one of the most installed categories. To get the full picture of participant's familiarity with exercise apps we also asked to indicate how often they used the apps.

The questionnaire consists of multiple 7-point Likert scales with an ascending-order. As is reported by Chyung and Miller (2019), survey results can differ between ascending or descending-ordered Likert scales. In order to prevent inflated results an ascending-ordered Likert scale is used, as descending ordered Likert scales can induce results that are more positive. Only ascending-ordered Likert scale questions are used in this study to minimize this effect.

D. Recruited participants

Participants were recruited by our own social network, online social platforms (e.g., Facebook groups), peer students from the Media Technology MSc Program, Communication & Multimedia Design students at The Hague University of Applied Sciences and Rotterdam University of Applied Sciences and online survey-sharing platforms.

V. RESULTS

For every test in this study a value of $p \leq 0.05$ is used to determine statistical significance.

A. Studied population

The questionnaire has been spread largely over bachelor and master students. Consequently, the education level could be higher than the average education level. In addition, the questionnaire has likely been completed by mainly participants with a Dutch nationality, as the questionnaire has primarily been distributed in the Netherlands. These assumptions cannot be verified, as education level and nationality were not asked to preserve anonymity.

B. Data quality

A total of 108 subjects responded to our questionnaire. To ensure data with high quality, 56 participants were excluded from the data sample. Although exclusion of a participant can be caused by multiple factors, only one excluding factor is recorded per participant. Table 1 shows the reason why participants were excluded in a subsequent order.

All subjects that did not complete the questionnaire were reported as invalid (29 participants). Subsequently, participants who did not perform a task according to self-report were removed from the data set (8 participants). Two participants in the physically active condition decided to do another task, namely gardening 4.0 METs and stretching low impact 2.5 METs (Ainsworth et al., 2000). As mild stretching falls under the light physical activity intensity category (<3 METs) instead of moderate physical activity intensity category (3-6 METs) this participant is excluded from the data sample (Ainsworth et al., 2000).

Additionally, we only included participants who performed the task (or an equivalent task) for at least 10 minutes. The reason for selecting only participants who exercised for 10 minutes, are the different cognitive and health benefits that occur after exercising for 10 minutes (Samani & Heath, 2018; Stanner, 2004; Suwabe et al., 2018). Exclusion caused by duration (15 participants) was based on the total duration of completing the questionnaire (< 15 min) and self-reported task duration (< 10 min).

Besides this, two participants are excluded, because their self-reported English language skills were extremely and moderately bad. Although a high level of English skills is not required for the experiment, basic English skills are necessary for understanding the questionnaire and app overviews.

As is visible in table 1, more participants of the physically active experimental condition group were excluded relative to the respondence value. This should be taken into account while interpretating the results. However, self-reported exercise frequency measured with the Godin Leisure-Time Exercise Questionnaire is almost equal for the physically active and inactive experimental condition group (average active=32.50 and average inactive=32.09, both values can be interpretated as physically active). This suggests that the current physical activity level of the participants in the different experimental condition groups does not influence the results, as these are almost equal.

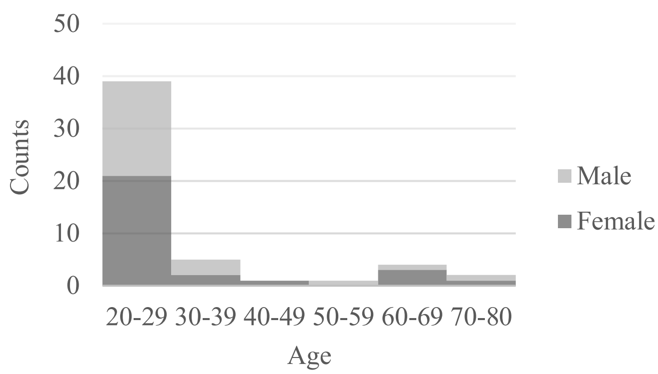
Table 1 Number of excluded participants per experimental category, plus the reasons for their exclusion.

				Reason to exclude				
Experimental condition group	Respondence	Included	Excluded	Did not complete	Did not perform (the appropriate) task	Total duration <10 or <15 minutes	Language skills	Problems with survey
Active	48	18	30	10	8	10	1	1
Inactive	53	34	19	12	1	5	1	0
Not assigned	7	0	7	7	0	0	0	0
Total	108	52	56	29	9	15	2	1

C. Participant characteristics

In total, 108 participants participated in this research, 56 participants were excluded from data analyses. In total, the (data) sample contained 52 participants (mean age 31, SD=14.3, min=20 and max=71). Of these, 28 were female, 24 were men and none reported unknown gender, for more details see figure 1 and table 2. There are 18 participants in the physically active experimental condition group (7 females and 11 males) and 34 participants in the physically inactive experimental condition group (21 females and 13 males). In this between-subjects study design, every participant was observed under the physically active or inactive condition. All participants agreed with the informed consent at the beginning of the survey.

Figure 1 Histogram illustrating age distribution over the sample group (n = 52).



All participants owned a smartphone. The mean self-reported smartphone skills measured by a 7-point Likert scale (1=extremely bad and 7=extremely good) is 6.0 (SD=0.8, min=4 and max=7). English skills were measured similarly, with a mean result of 6.0 (SD=1.1, min=3 and max=7). The average number of installed exercise apps from the data sample is 1.1 (SD=1.4 min=0 and max=6). On average, participants use an exercise app 11.1 times a month (SD=20.6, min=0 and max=112). The data of one participant was excluded as a high outlier, by using exercise apps 243 times a month. The maximum included value of 112 is still a high value, a possible reason for the higher values in the data sample is that certain participants use apps that track physical activity. These apps track your physical activity during the entire day and participants might check these results multiple times a day. This assumption cannot be verified with the collected data in this study. For more details about demographic, technology and exercise variables, see table 2.

As mentioned, participants were randomly distributed over two experimental condition groups (*ExperimentalConditionGroup*). The assessment variables summed over the physically active and inactive apps and split by the *ExperimentalConditionGroup* are shown in table 3.

Table 2 Overview of several demographic/technology/exercise variables. Smartphone and English skills were all measured on a 7-point Likert scale. Significant outcomes of the Shapiro-Wilk test are highlighted (*) and indicate deviation from normal distribution. The mean Godin Leisure-Time Exercise Questionnaire scores (**) of 36.6 and 32.2 can be interpretated as active (>23).

Independent variable	Valid	Missing	Mean	SD	Shapiro-Wilk	Shapiro-Wilk *p*-value	Min.	Max.
Age	52	0	31.192	14.310	0.637	**< .001***	20	71
Smartphone skills	52	0	5.962	0.791	0.821	**< .001***	4	7
English	52	0	5.962	1.066	0.758	**< .001***	3	7
Installed exercise apps total usage per month	49	3	11.057	20.604	0.598	**< .001***	0	112
Godin score exercise frequency (pre COVID-19)	52	0	36.567**	24.032	0.926	**0.003***	3	120
Godin score exercise frequency (current)	52	0	32.231**	20.771	0.896	**< .001***	3	104

Table 3 Overview of variables representing willingness to use/recommend/install, expectation to use, and ratings of the physically active and inactive apps. These variables are summed per physically active/inactive apps and split per subject condition group. Significant outcomes of the Shapiro-Wilk test are highlighted (*) and indicate deviation from normal distribution.

Dependent variable	App type	Experimental condition group	Valid	Missing	Mean	SD	Shapiro-Wilk	Shapiro-Wilk *p*-value	Min.	Max. [1]
Willingness to use	Active apps	**Active**	18	0	11.056	4.569	0.972	0.831	3	19
		Inactive	34	0	11.735	3.502	0.949	0.112	4	17
	Inactive apps	**Active**	18	0	10.944	4.518	0.926	0.168	3	17
		Inactive	34	0	12.147	3.886	0.973	0.555	3	19
Willingness to recommend	Active apps	**Active**	18	0	10.611	4.448	0.934	0.231	3	17
		Inactive	34	0	11.265	3.423	0.978	0.704	4	19
	Inactive apps	**Active**	18	0	10.722	3.968	0.945	0.347	3	16
		Inactive	34	0	11.618	3.482	0.953	0.156	3	17
Willingness to install	Active apps	**Active**	18	0	10.667	4.839	0.959	0.591	3	20
		Inactive	34	0	10.471	3.126	0.968	0.409	4	17
	Inactive apps	**Active**	18	0	10.056	4.491	0.967	0.732	3	20
		Inactive	34	0	11.382	4.221	0.975	0.616	3	20
Expectation to use	Active apps	**Active**	18	0	8.167	3.746	0.930	0.196	3	14
		Inactive	34	0	8.088	3.370	0.932	**0.037***	3	14
	Inactive apps	**Active**	18	0	8.111	3.708	0.945	0.356	3	17
		Inactive	34	0	8.441	4.514	0.909	**0.008***	3	19
Rating	Active apps	**Active**	18	0	18.778	4.066	0.957	0.544	10	27
		Inactive	34	0	18.971	3.896	0.967	0.385	9	28
	Inactive apps	**Active**	18	0	19.306	3.730	0.935	0.233	11	24
		Inactive	34	0	19.971	4.152	0.971	0.503	10	29

[1] There are three apps per *AppType* (physically active or inactive apps). The maximum value for the dependent variables representing willingness to use/recommend/install and expectation to use is 21 (3x7). These variables were measured on a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). For the dependent variable rating the maximum value is 30 (3x10), participants were asked to give a rating between 1 and 10.

D. Hypothesis testing

After excluding data, a data sample of n=52 remained with which statistical testing is done.

To compare the means of the app-related dependent variables between both *ExperimentalConditionGroup* values, repeated measured ANOVA tests were performed. Besides the *ExperimentalConditionGroup*, *Gender* and *ExercisedToday* were included as factors in the analysis. *ExercisedToday* describes whether participants exercised on the same day prior to the experiment.

Dependent variable: Expectation

There are no statistically significant effects between the expectation to use physically active or inactive apps (*AppType*) regularly over the next two weeks in relation with the *ExperimentalConditionGroup* (F=0.192 and p=0.663). Likewise, no significant effect was found between expectation and *ExperimentalConditionGroup* on itself (F=0.010 and p=0.919).

As these results show there is no support to accept nor reject H_1

In addition, also no statistically significant results were found in the interaction relation between *AppType* (physically active and inactive) and *Gender* (F=0.230 and p=0.634) and *ExercisedToday* (F=2.769e -4 and p=0.987).

However, independent of the *AppType*, there is a statistically significant between-subjects effect in the expectation to use an exercise app between *ExperimentalConditionGroup* and *Gender* (F=6.807 and p=0.012). This implies an opposite influence of being physically active or inactive on the expectation to use the apps for females and males. Exercising for males decreases the expectation, while for females it increases the expectation to use

Figure 2 Descriptive plots about expectation to use the apps (physically active and inactive) regularly over the next two weeks split out by Gender and ExperimentalConditionGroup.

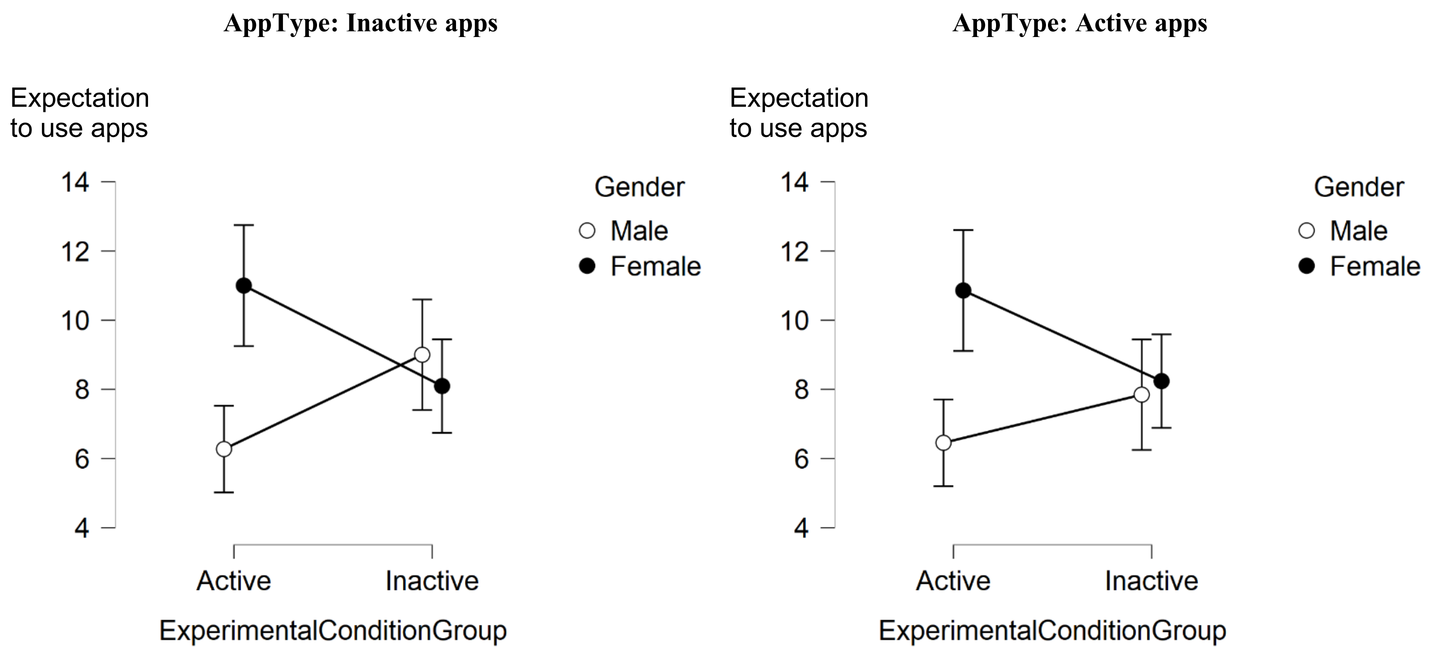


Table 4 Results from Repeated Measures ANOVA tests on the dependent variable expectation to use apps (physically active and inactive apps) regularly over the next 2 weeks. Significant outcomes are highlighted (*).

Factors	Sum of Squares	df	Mean Square	F	p
ExperimentalConditionGroup	0.232	1	0.232	0.010	0.919
Gender	99.456	1	99.456	4.479	**0.040***
ExercisedToday	0.006	1	0.006	2.685e -4	0.987
ExperimentalConditionGroup ✻ Gender	151.149	1	151.149	6.807	**0.012***
ExperimentalConditionGroup ✻ ExercisedToday	22.034	1	22.034	0.992	0.325
Gender ✻ ExercisedToday	5.050	1	5.050	0.227	0.636
ExperimentalConditionGroup ✻ Gender ✻ ExercisedToday	8.653	1	8.653	0.390	0.536
Residuals	977.052	44	22.206		

an app regularly over the next two weeks, as is shown in figure 2. For all the between subjects effects on expectation to use apps (physically active and inactive apps), see table 4.

Furthermore, regardless of the *ExperimentalConditionGroup* and *AppType*, *Gender* significantly affects expectation (F=4.479 and *p*=0.040). Females have an overall higher expectation to use the apps regularly over the next two weeks than males.

Other dependent variables

Besides expectation, statistically significant effects of *Gender* and the interaction between *Gender* and *ExperimentalConditionGroup* were also found on willingness to use/recommend/install and ratings of the apps, as shown in table 5. In all cases females classified apps higher after being physically active in comparison with physically inactive, whereas males classified lower after being physically active in comparison with physically inactive. Also, for all cases females graded overall significantly higher than males regardless of *AppType* and *ExperimentalConditionGroup*.

Only for the variable willingness to use an app a significant effect is evident of the interaction between *ExperimentalConditionGroup* and *ExerciseToday* (F=5.296 and *p*=0.026), as is visible in figure 3. Participants who exercised on the same day before they completed the questionnaire and were in the physically active *ExperimentalConditionGroup* were less willing to use apps than the physically inactive control group. A reverse effect is visible for participants who did not exercise on the same day, as they are more willing to use an app after being physically active.

Figure 3 Descriptive plots about willingness to use the apps (physically active and inactive) split out by ExperimentalConditionGroup and whether participants exercised on the same day prior to the experiment (ExercisedToday).

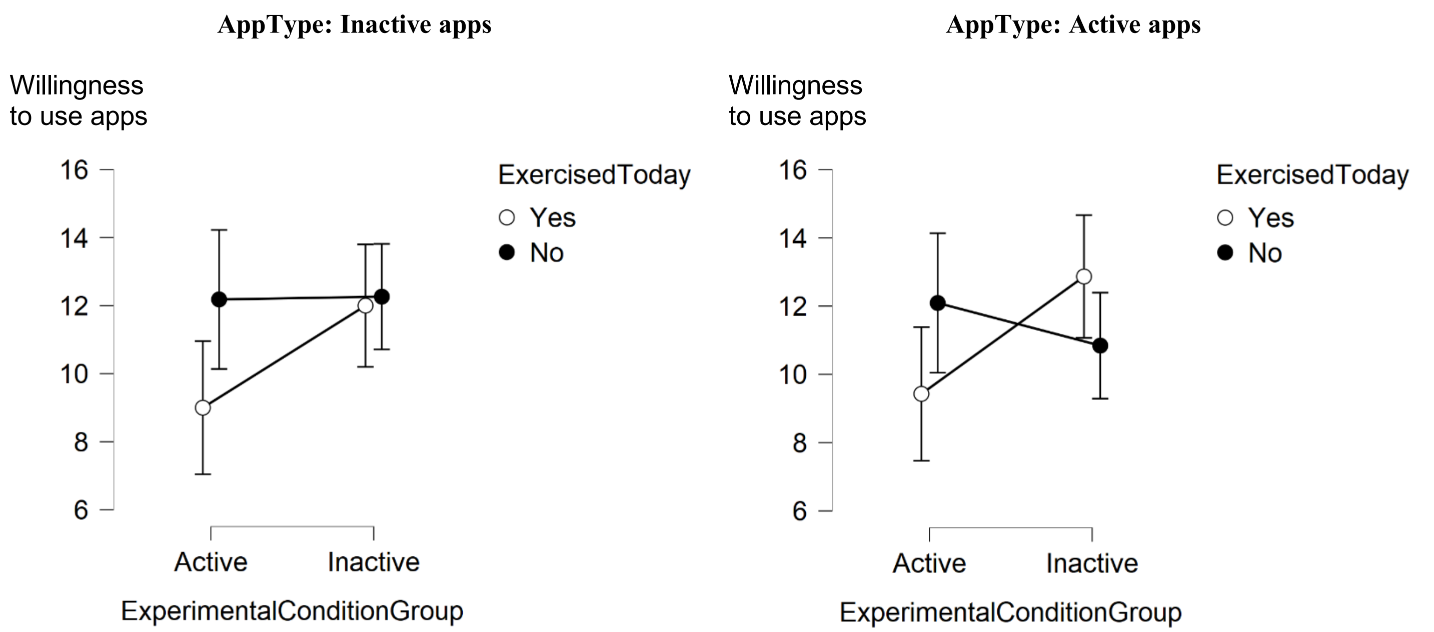


Table 5 Results from Repeated Measures ANOVA tests on different dependent variables. Shown are only the significant factors (*) and interactions. Non-significant factors and interactions were left out of the table.

Dependent variable	Factors	Sum of Squares	df	Mean Square	F	*p*
Willingness to use	Gender	149.687	1	149.687	8.734	**0.005***
	ExperimentalConditionGroup ✻ Gender	211.814	1	211.814	12.359	**0.001***
Willingness to recommend	Gender	263.661	1	263.661	17.009	**< .001***
	ExperimentalConditionGroup ✻ Gender	167.645	1	167.645	10.815	**0.002***
Willingness to install	Gender	106.754	1	106.754	5.122	**0.029***
	ExperimentalConditionGroup ✻ Gender	184.491	1	184.491	8.852	**0.005***
Expectation to use	Gender	99.456	1	99.456	4.479	**0.040***
	ExperimentalConditionGroup ✻ Gender	151.149	1	151.149	6.807	**0.012***
Rating	Gender	98.725	1	98.725	4.493	**0.040***
	ExperimentalConditionGroup ✻ Gender	118.831	1	118.831	5.408	**0.025***

VI. Discussion

A. Conclusion

Does exercising have short-term influence on the expectation to use a mobile exercise app? This unexplored research question has been investigated in this study. We used a questionnaire where we randomly divide participants in two groups, a physically active and inactive *ExperimentalConditionGroup*. We measured if the expectation, the familiarity with the app, the willingness to use and install the app, the willingness to recommend the app to friends and family, and the rating given to the app was higher for physical activity apps if the participant had been physically active before. Our research showed that exercising for 10 minutes, regardless of *Gender*, had no short-term effect on the expectation to use a mobile physical activity app (when compared to those who are in a sedentary position for 10 minutes). Furthermore, there are no significant differences between physically active and inactive apps. While the results give no support for the hypothesized effect, we still have some positive conclusions.

Based on our study, we can conclude that exercising at a moderate intensity level does influence expectation to use an app (regardless of *AppType*), but with an opposite effect for *Gender*. The same effect was found for willingness to use/recommend/install and rating of an app. Females have a higher willingness to use/recommend/install, expectation to use and rating after exercising for 10 minutes compared with being physically inactive. For males exercising has a reverse effect and result in a decreased assessment compared with being physically active.

Results show a significant effect on expectation to use (and willingness to use/recommend/install and rating) exercise apps of *Gender*. The overall assessment was higher for females than for males. This result can be caused by the selected apps, as they might be more appealing to females than males. This could be in line with existing literature, concluding that the exercise motive toning and weight loss are more present in females than males (Craft et al., 2014; McDonald & Thompson, 1992). Although apps with weight loss as their main goal were not included in this study, it could be that participants still associate the apps with weight loss. For males enjoyment is a present motive, this could mean that the chosen health apps are not enjoyable enough for men (Craft et al., 2014). Lastly, according to Craft et al. (2014) females exercise more frequently at a light or moderate intensity level than males, this could also explain the results of this study. Research including more apps is needed to verify these assumptions.

Moreover, an interesting observation is found in the interaction between *ExperimentalConditionGroup* and *ExercisedToday* in relation to the willingness to use apps (physically active and inactive). This implies that participants who were in the physically active condition group and exercised on the same day before filling in the questionnaire had a lower willingness to use apps than participants in the physically inactive condition group. The reverse effect is found for participants who did not exercise on the same day before filling in the questionnaire. This could mean that being very physically active or inactive has a negative effect on willingness to use apps.

In this study there is no evidence to assume a correlation between exercising, cognitive effort and the expectation to use apps. This can be caused by the moment of measuring expectation to use apps. In this study expectation was measured directly after the task, other results might occur when measuring during the task. Future research should be executed to investigate the differences between print and video in relation with exercise, cognitive effort and medium. This would also be interesting as video might increases expectation on average more than print. Walter et al. (2017) showed that participants exposed to an audio-visual narrative were more persuaded than participants exposed to a printed narrative. Cognitive and emotional engagement was more present in the audio-visual narrative (Walter et al., 2017). They also mentioned that individual differences of participants in the enjoyment of effortful cognitive activity, could change the most suitable medium of exposure. Reading could be more suitable for participants that enjoy a high cognitive effort activity. This is in line with the results of Green et al. (2008) and Green and Sestir (2017) indicating that a corresponding cognitive effort level in need for cognition and medium results in a persuasive effect in narratives.

B. Limitations and future research direction

Most participants in the sample are between 20 and 30 years old. The results are not representative for all age groups. As Markland and Hardy (1993) reported, motives for physical activity differ per age group. Mastering of exercises and connectedness are more important for older adults, whereas social acknowledgement and competition are more important for younger adults (Markland & Hardy, 1993). The influence of age should be considered when interpreting the results. Subsequent studies should investigate if age influences the expectation to use an exercise app after being physically active or inactive.

Another limitation of our research is that only six app overview pages were reviewed, three physically active and three physically inactive apps. One physically active and one physically inactive app included game elements. For more comprehensive results, about the difference between physically active and inactive apps and the role of mobile based exergames, more apps should be reviewed.

In total 108 participants responded to the questionnaire (48 active, 53 inactive and 7 not assigned), however a small sample size of n=52 remained after excluding participants for several reasons. The sample size contained 18 participants in the physically active experimental condition group (7 females and 11 males) and 34 participants in the physically inactive experimental condition group (21 females and 13 males). Since the small sample size of n=52 can affect the results, a replication of the study with a larger sample group is necessary. Besides the small sample size, the distribution between experimental condition groups is unbalanced as relatively more participants were excluded in the physically active condition relatively to the physically inactive experimental condition group.

Participants in Dennison et al. (2013) study, had no confidence in apps that used phone sensors to measure e.g., activity levels and mood levels, they expected wrong measurements. The low confidence might influence app's ratings, as the participant's expectation of the app is low. In future research this should be taken into account.

Another limitation is the hypothetical app use, by measuring expectation but not the actual use. The actual use of the apps (behaviour) needs further research, as the expectation-behaviour relationship was outside the scope of this study. In order to get a complete picture of the influence of activity level by using exercise apps, it would be interesting to investigate if the expectation in this study is related to actual behaviour.

The questionnaires were conducted directly after completing one of the exercising or sitting tasks. However, whether expectation to use exercise apps would remain over time, has not been investigated. It could be that expectation state during exercising as well as after a longer period of time differ. Further investigation is needed.

The categories of exercise intensity in this study are based on the standardized MET values provided by Ainsworth et al. (2000). However, there are some limitations when using standardized MET values. Individual factors are not considered, such as body fat percentage, body mass, age, gender, cardiorespiratory fitness, movement efficiency, surrounding and geographic conditions (Ainsworth et al., 2000). Using alternative measurement methods (e.g., heart rate) measuring the intensity level more precisely can solve this limitation. Because of the complexity and COVID-19 restrictions, using more sophisticated measurement methods bring a lot of difficulties, therefore we chose to use METs for this study. As exercise can be experienced differently based on individual factors, a self-reported question querying exhaustion was included in the questionnaire. Besides this, it would be interesting to investigate the differences between moderate and vigorous exercise intensity level on the expectation to use exercise apps.

The last limitation is the COVID-19 situation. Because physical appointments had to be avoided, the questionnaire has been set-up online. It was not possible to check if participants did the task right and long enough. To eliminate whether or not this is the case, the same research should be done in real life.

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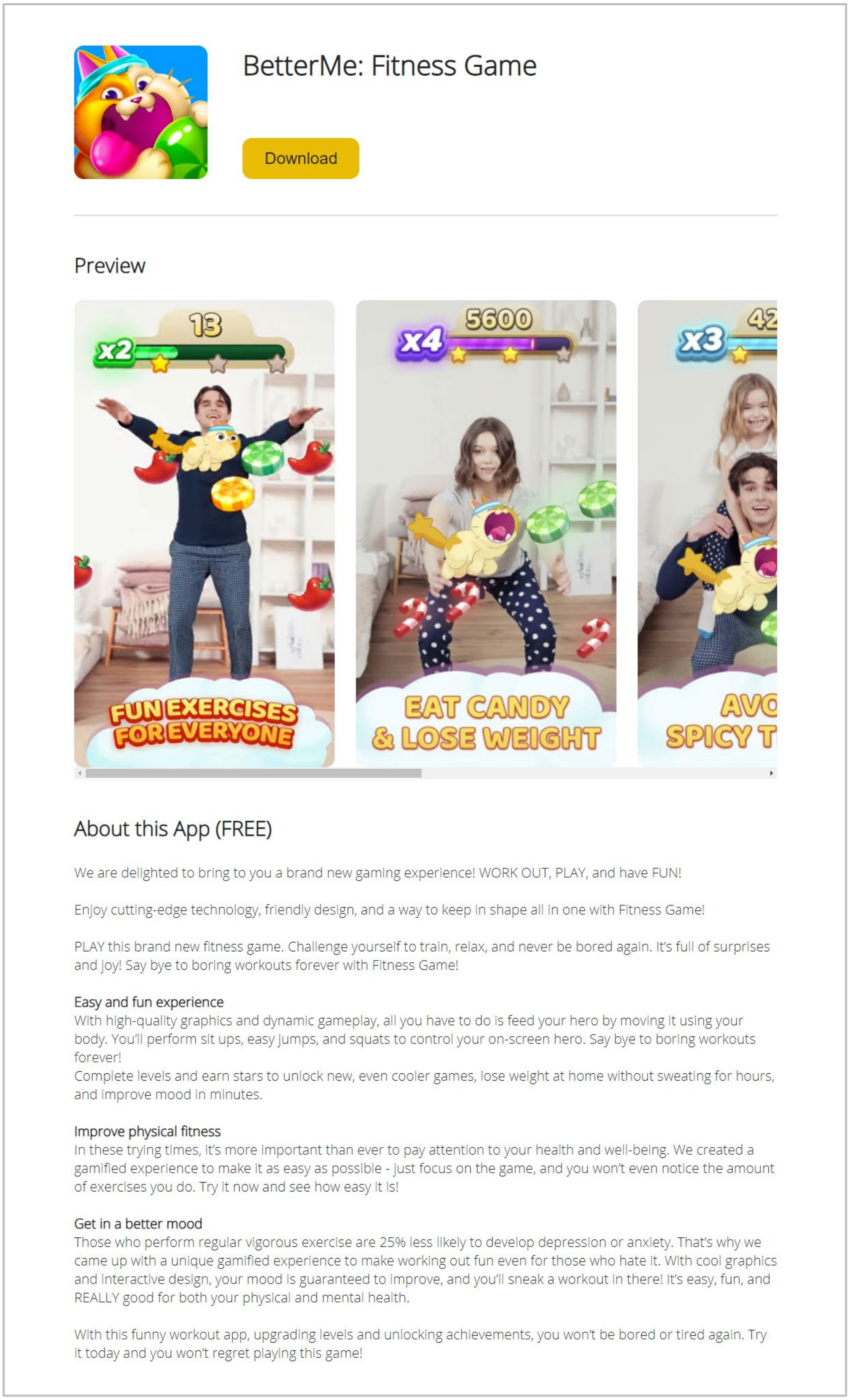
Appendix A: Overview of physically active and inactive apps



BetterMe: Fitness Game

Download

Preview

About this App (FREE)

We are delighted to bring to you a brand new gaming experience! WORK OUT, PLAY, and have FUN!

Enjoy cutting-edge technology, friendly design, and a way to keep in shape all in one with Fitness Game!

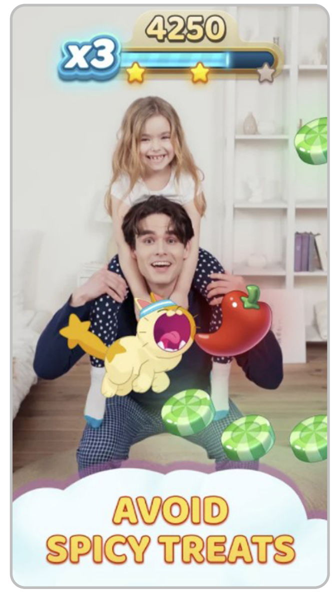
PLAY this brand new fitness game. Challenge yourself to train, relax, and never be bored again. It's full of surprises and joy! Say bye to boring workouts forever with Fitness Game!

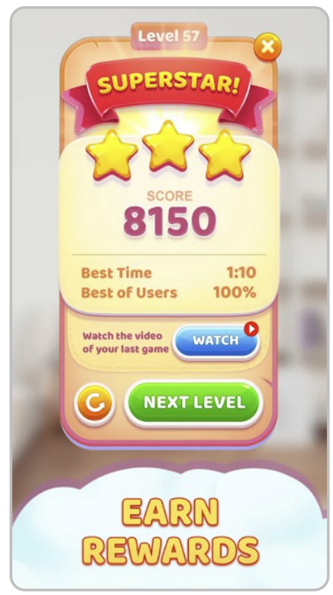
Easy and fun experience
With high-quality graphics and dynamic gameplay, all you have to do is feed your hero by moving it using your body. You'll perform sit ups, easy jumps, and squats to control your on-screen hero. Say bye to boring workouts forever!
Complete levels and earn stars to unlock new, even cooler games, lose weight at home without sweating for hours, and improve mood in minutes.

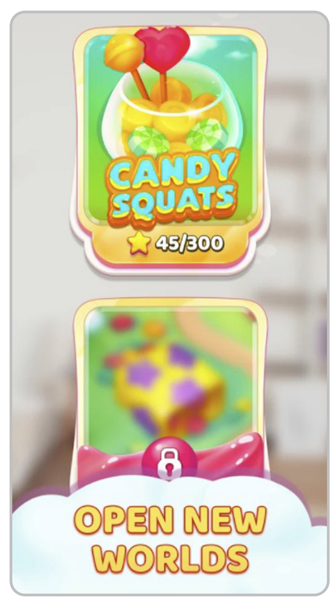
Improve physical fitness
In these trying times, it's more important than ever to pay attention to your health and well-being. We created a gamified experience to make it as easy as possible - just focus on the game, and you won't even notice the amount of exercises you do. Try it now and see how easy it is!

Get in a better mood
Those who perform regular vigorous exercise are 25% less likely to develop depression or anxiety. That's why we came up with a unique gamified experience to make working out fun even for those who hate it. With cool graphics and interactive design, your mood is guaranteed to improve, and you'll sneak a workout in there! It's easy, fun, and REALLY good for both your physical and mental health.

With this funny workout app, upgrading levels and unlocking achievements, you won't be bored or tired again. Try it today and you won't regret playing this game!





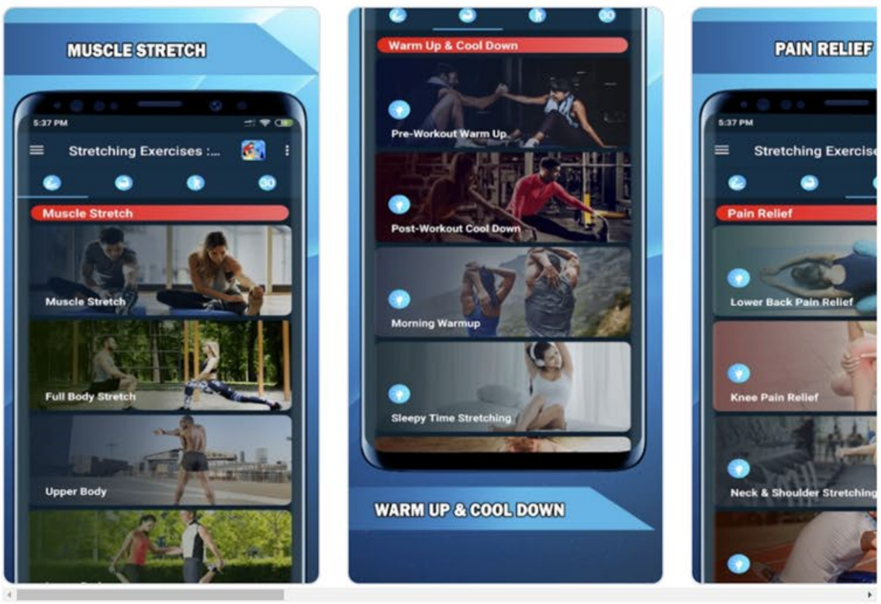


(BetterMe Limited, 2021)

Stretching Exercises Flexibility By Gym Fitness

Download

Preview



About this App (FREE)

Stretching is essential for daily life.

Stretching benefits

- Avoid injuries.
- It improves flexibility.
- Relieves muscle aches.
- Increase the flexibility of the muscles.
- It decreases the amount of lactic acid in the muscles.
- Reduces the probability of injuries.
- Improves the coordination of agonist-antagonist muscles.
- Prevents muscle tightening after exercise.
- It reduces muscle tension.
- It facilitates the movements.

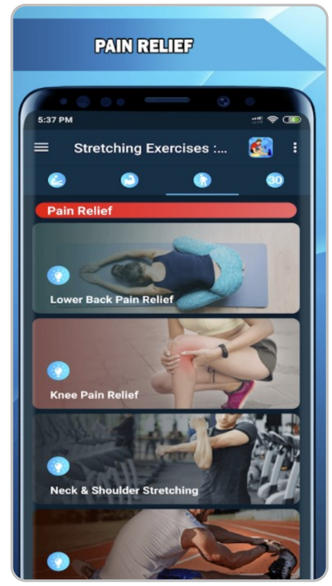
App Features

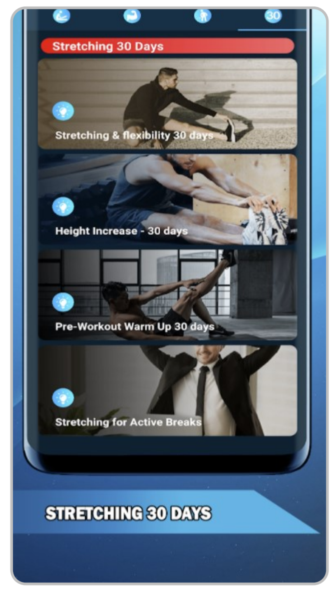
- More than 80 stretches.
- More than 300 stretching routines.
- Create your own routines.
- Tools to improve your body composition.

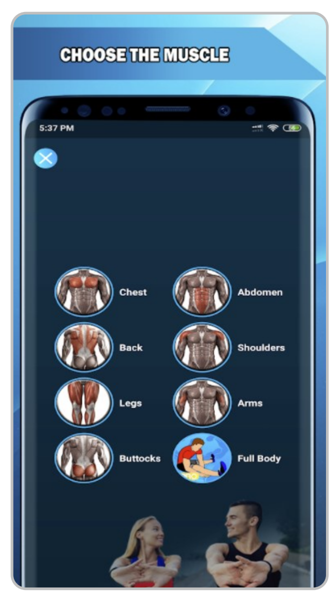
Stretching Routines:

Muscle Stretch

- Muscle Stretch (Back, Legs, Arms, Neck, Shoulders, Buttocks, Abdomen)
- Full body stretch
- Upper body
- Lower body







Warm Up & Cool Down

- Pre-Workout Warm Up
- Post-Workout Cool Down
- Morning Warm Up
- Sleepy Time Stretching
- Pre-Run Warm Up
- Post-Run Cool Down
- Pre-Playing Football Warm Up
- Post-Playing Football Cool Down

Pain Relief

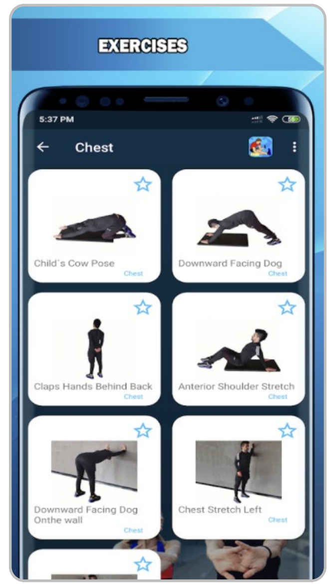
- Lower Back Pain Relief
- Knee Pain Relief
- Neck & Shoulder Stretching
- Legs Pain Relief

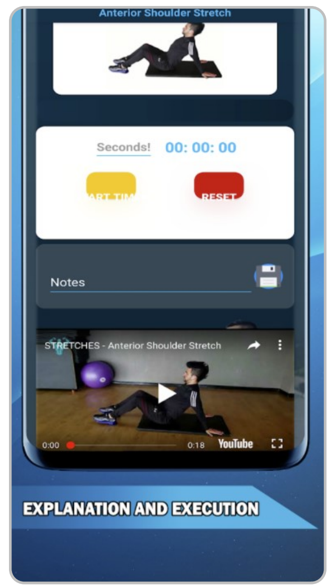
Stretching 30 Days

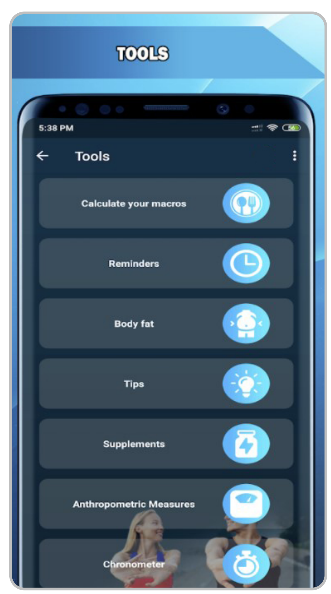
- Stretching & flexibility 30 days
- Height Increase - 30 days
- Pre-Workout Warm Up 30 days
- Stretching for Active Breaks

Do you want to reduce muscle tension and relieve pain? Do you want to improve your flexibility and range of motion? Download Now Stretching and flexibility exercises.

(World Gym Fitness JS, 2019)



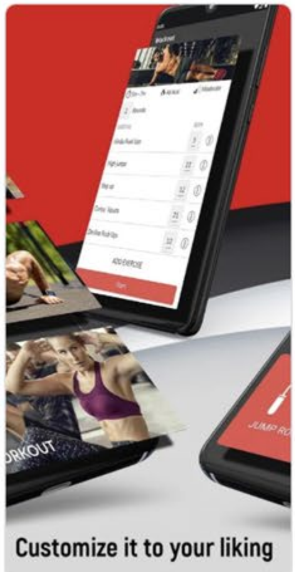


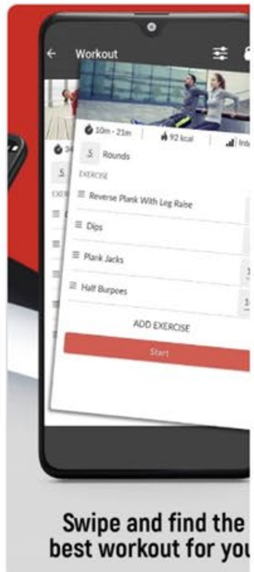


Hiit Workout Generator: Free Wod Tabata Workouts

Download

Preview





About this App (FREE)

HIIT (High intensity interval training) is a form of interval training with alternating short periods of intense anaerobic exercise. These intense workouts typically last under 30 minutes, depending on the intensity of the HIIT Workout sessions.

HIIT Workout Generator provides you random functional, quick and effective fitness HIIT workouts to lose fat in 30 days, build muscles in arms, in legs, and make your belly slim. Download our HIIT Workouts & Training app, work out and stay fit.

Features of HIIT Workout Generator:

Infinite HIIT / Tabata / WOD workouts
No limits, the generator will create infinite amazing workouts for you. No equipment, no gym, just exercise at home. Abs workout, chest workout, arm workout (upper body), leg workout, body weight workout & cardio workout. Both HIIT workouts for men & HIIT workouts for women.

300+ HIIT Exercises included
Choose your favourite HIIT exercises. The app includes over than 300 scientifically proven exercises to improve your health. Push ups, burpees, squats, sit ups, plank, crunch, wall sit, jumping jacks, triceps dips, lunges...

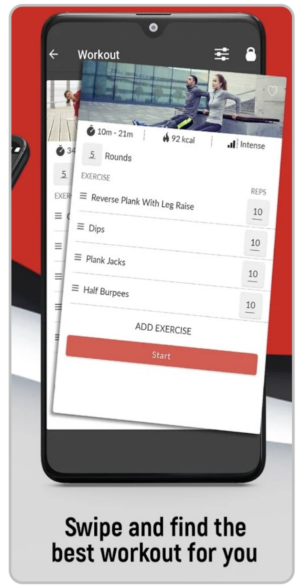
Track weight loss and burned calories
Keep a record of your weight and calories burnt and see for yourself how much you achieved, and stay motivated. Check your progress, records, achievements synced directly from Google Fit!

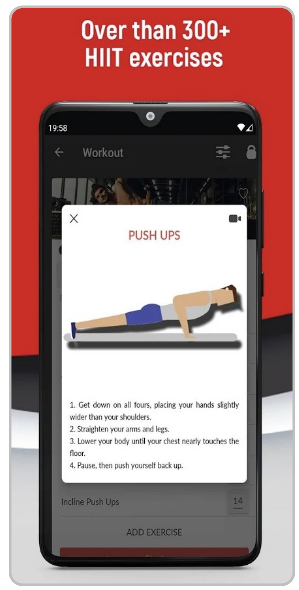
No equipment needed
Exercise at home without any equipment or add your own customised equipment to filter workouts according to your needs!

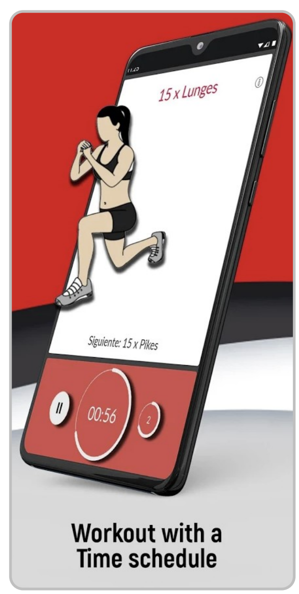
Bookmark favorite exercises
Bookmark your favorite HIIT workouts or Tabata exercises to do them anytime you want!

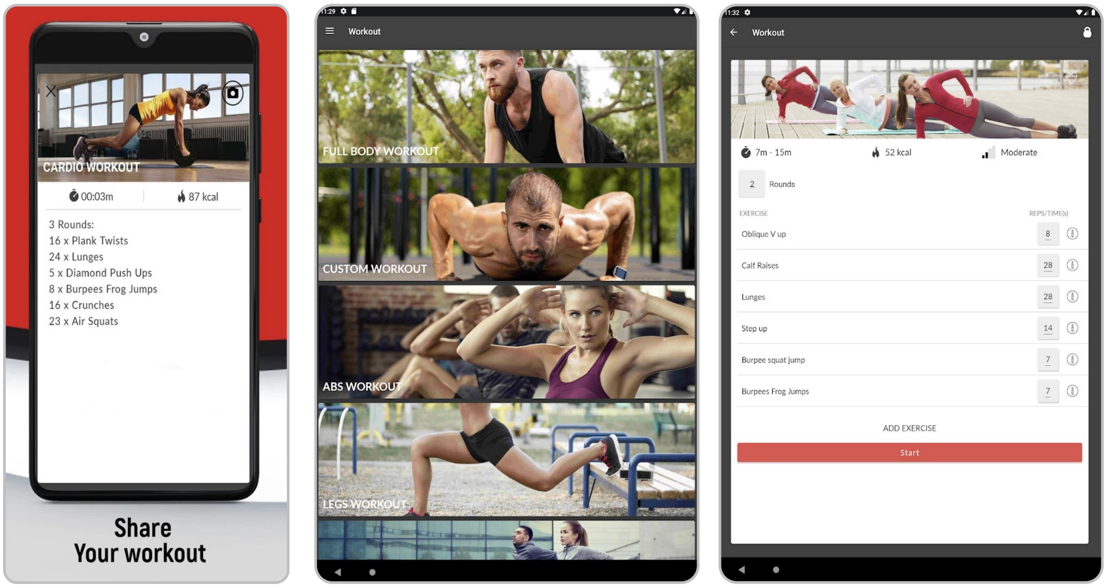
Works offline
The free HIIT workouts are available offline anywhere, anytime. Try HIIT workouts at home without any equipment.

Download HIIT Workout Generator – The best home workout app for both men and women to achieve your goals by simply working out at home with no equipment. The purpose of this fitness app is to create a stable habit of regular HIIT for endurance and to make muscles really strong and get in fit fast. Are you ready?

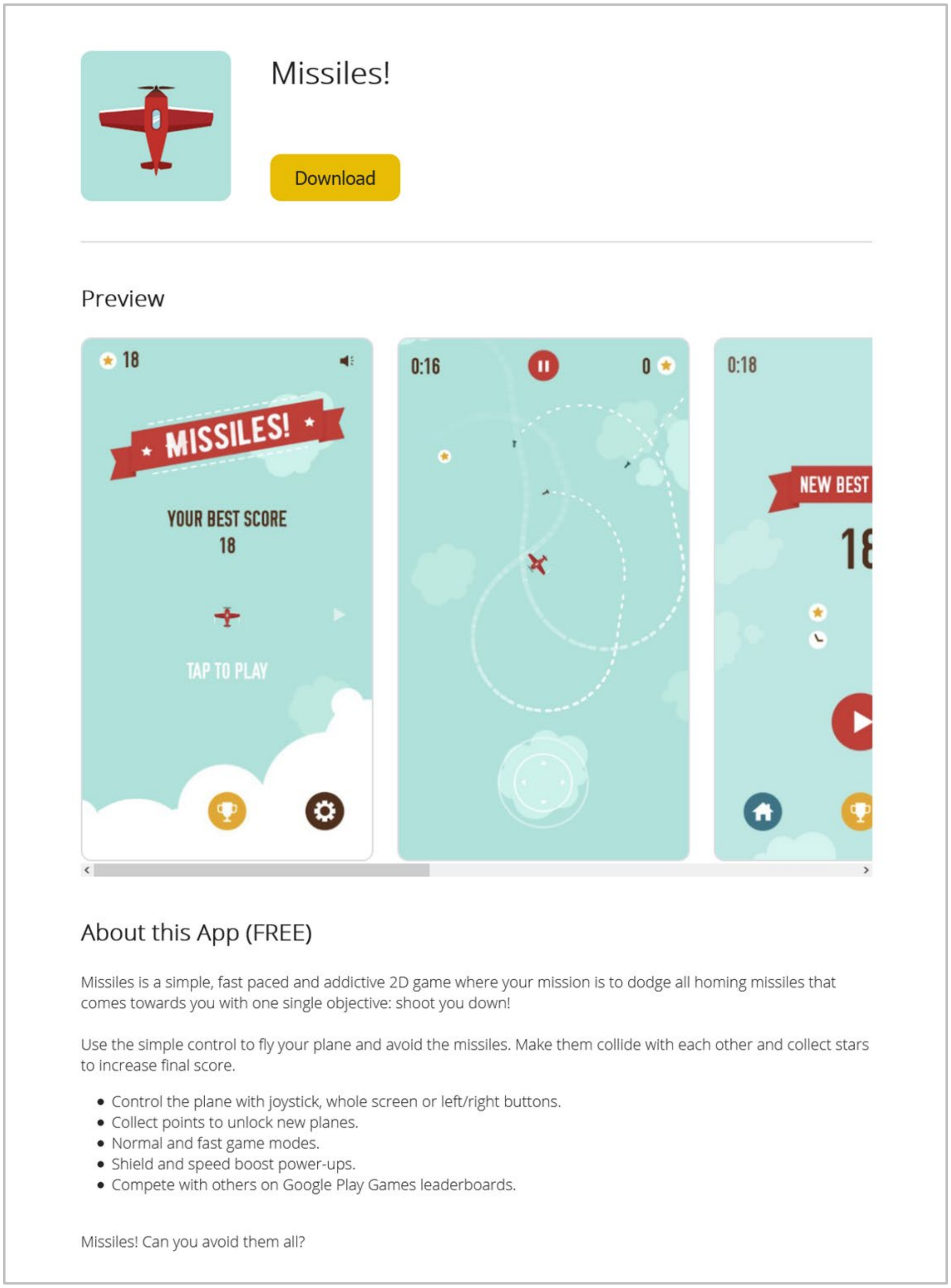







CARDIO WORKOUT
00:03m
87 kcal
3 Rounds:
16 x Plank Twists
24 x Lunges
5 x Diamond Push Ups
8 x Burpees Frog Jumps
16 x Crunches
23 x Air Squats
Share
Your workout
Workout
FULL BODY WORKOUT
CUSTOM WORKOUT
ABS WORKOUT
LEGS WORKOUT
Workout
7m - 15m
52 kcal
Moderate
2
Rounds
EXERCISE
REPS/TIME(S)
Oblique V up
8
Calf Raises
28
Lunges
28
Step up
14
Burpee squat jump
7
Burpees Frog Jumps
7
ADD EXERCISE
Start

(Qrcoy, 2021)



Missiles!

Download

Preview

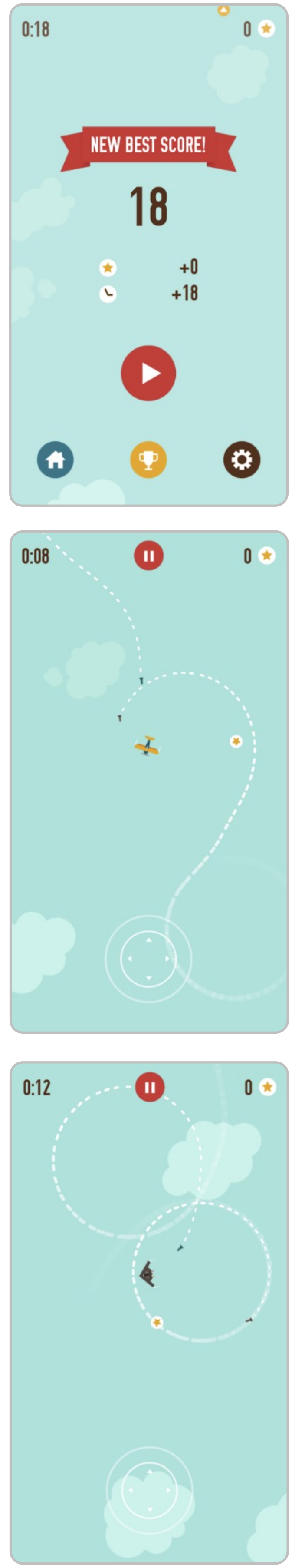
About this App (FREE)

Missiles is a simple, fast paced and addictive 2D game where your mission is to dodge all homing missiles that comes towards you with one single objective: shoot you down!

Use the simple control to fly your plane and avoid the missiles. Make them collide with each other and collect stars to increase final score.

- Control the plane with joystick, whole screen or left/right buttons.
- Collect points to unlock new planes.
- Normal and fast game modes.
- Shield and speed boost power-ups.
- Compete with others on Google Play Games leaderboards.

Missiles! Can you avoid them all?

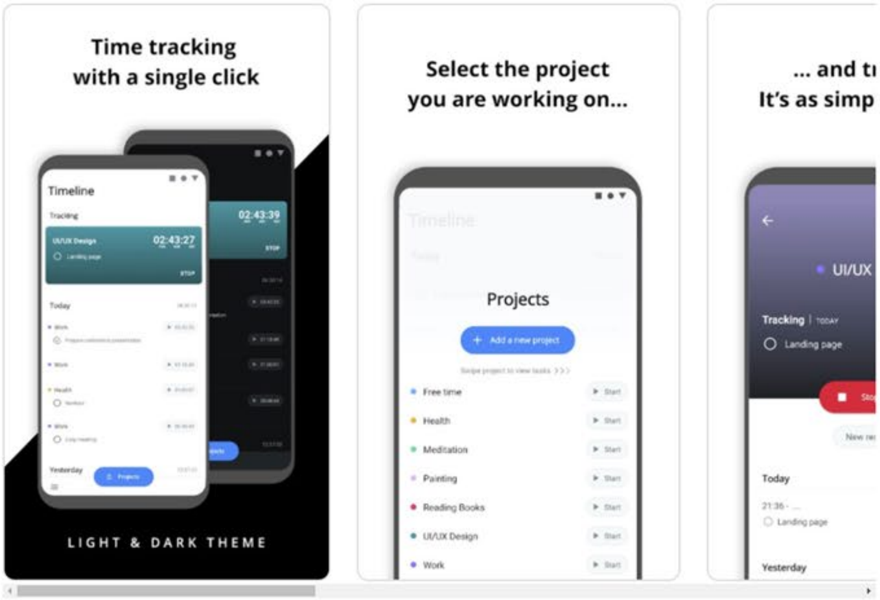


(2ndBoss, 2021; Macaque, 2019)

Boosted - Productivity & Time Tracker

Download

Preview



About this App (FREE)

Achieve more by improving your productivity with the Boosted - Productivity & Time Tracker app. Understand your habits with insightful reports and improve your productivity and time management with various productivity tools like the Pomodoro timer and simple time tracking.

Understanding is the first step to progress
Improving your habits is the shortest path to self-improvement. The most effective way to do this is to understand them first. By tracking your time, you'll be able to understand your current habits and you'll be able to use this knowledge to build better ones.

Time tracking should be as effortless as possible
To spend the day effectively, you need to invest your time wisely. By using the productivity and time management tools in Boosted, you can make better use of your time.

We are constantly striving to make Boosted as simple as possible so that it works for you and not the other way around. Effortless time tracking - that's our goal.

Let's start the change
We want to help you reach your goals and we believe Boosted is a great tool for that. That's why we are constantly improving the app so you can have an awesome experience on your journey of self-improvement.

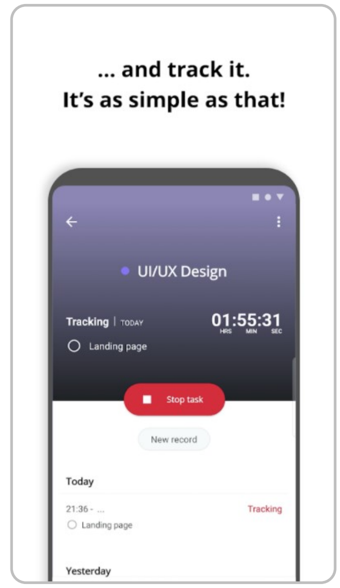
Here are some of the key features that Boosted gives you.

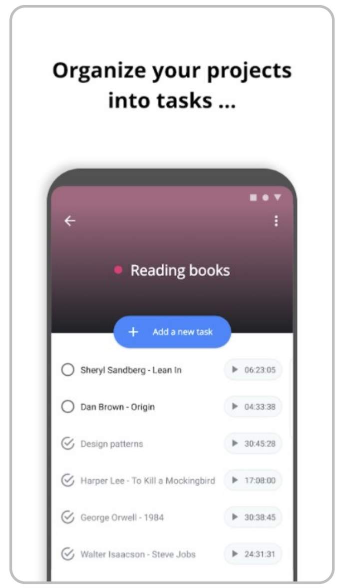
- Single click time tracking for all of your activities.
- Stay organized by splitting your projects into smaller tasks.
- Pomodoro timer, countdown timer, and many other productivity tools.
- Export your data to CSV.
- Control your time tracking quickly from the notification bar.
- Keep your data safe with Google Drive backups.
- View detailed reports and statistics of all your tracked time.
- View all of your tracked activities in a calendar.
- Stay productive even at night with the Dark mode.

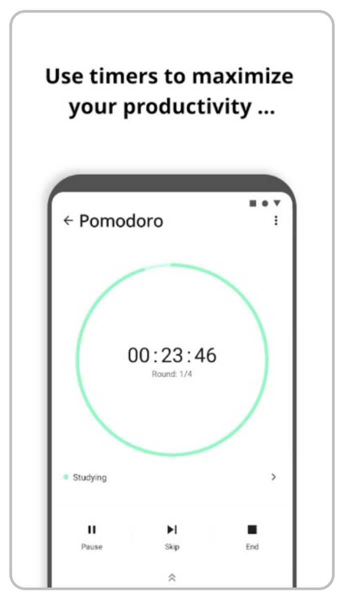
You can optionally backup your data to a private folder in your Google Drive. These backups will only be accessible by the Boosted app.

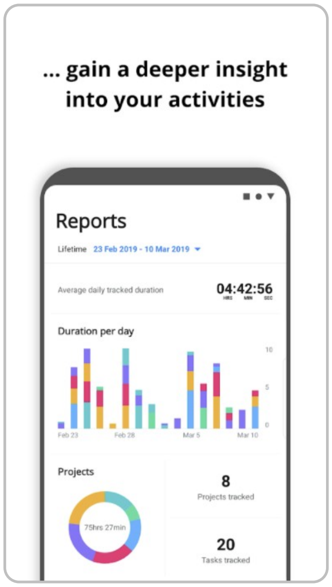
You can also export your data to a CSV file and you will have full control over where that will be stored.

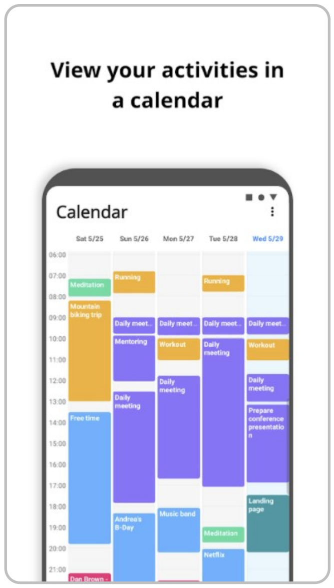
Take control of your time by installing Boosted for FREE!









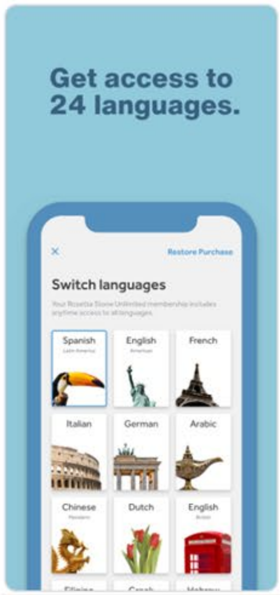


(Boosted Productivity, 2021)

Rosetta Stone: Learn Languages

Download

Preview



About this App (FREE)

Learning a language can be an experience that transforms your life. Over 25 years of language learning experience has taught Rosetta Stone one thing: everyone has the ability to learn to read, write, and speak a language with confidence. Try the Rosetta Stone app yourself for free.

Many online language learning apps will promise that you can learn a language in just a few minutes a day. However, there is a significant difference between memorizing vocabulary lists and speaking a language with confidence. Learning a language is about more than just the words. One of the mistakes new language learners make is treating language as an object or an end goal instead of as an experience.

Ditch the books, translator, and dictionary, and surround yourself with a language whenever, wherever with the Rosetta Stone mobile app.

Rosetta Stone has taught millions of people new languages, and you're next. From day one, you'll:

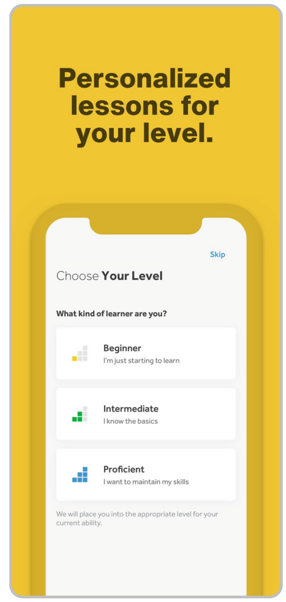
- stay focused with a personalized language learning plan based on your motivation;
- learn a language intuitively using our proven immersion method;
- perfect your pronunciation with instantaneous feedback;
- download lessons to do everything offline;
- access different kinds of exercises with our Extended Learning features;
- sync progress across all your devices.

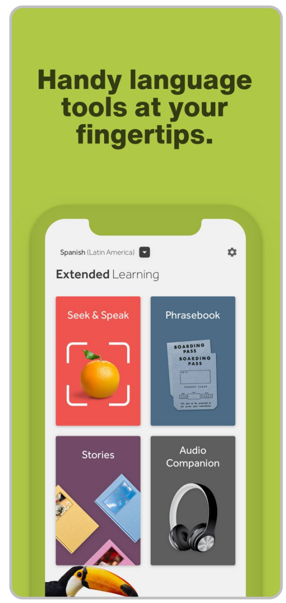
Flip between languages as often as you'd like and enjoy the freedom to get seriously curious.

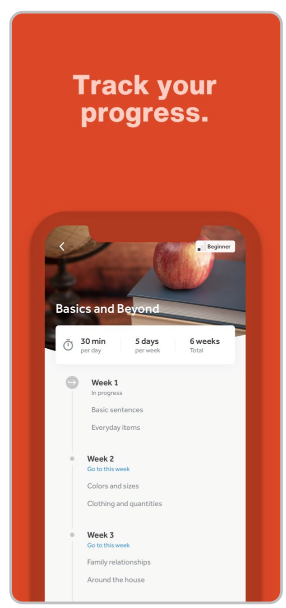
Choose from 24 languages:

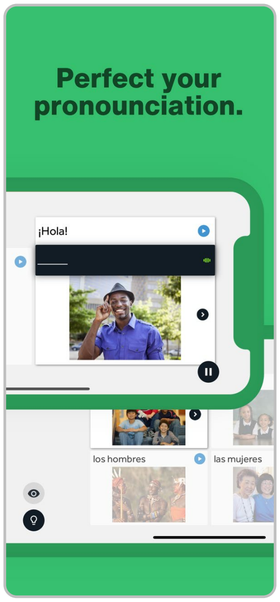
Arabic, Chinese (Mandarin), Dutch, English (American or British), Filipino (Tagalog), French, German, Greek, Hebrew, Hindi, Irish, Italian, Japanese, Korean, Persian (Farsi), Polish, Portuguese (Brazil), Russian, Spanish (Latin American or Spain), Swedish, Turkish or Vietnamese.

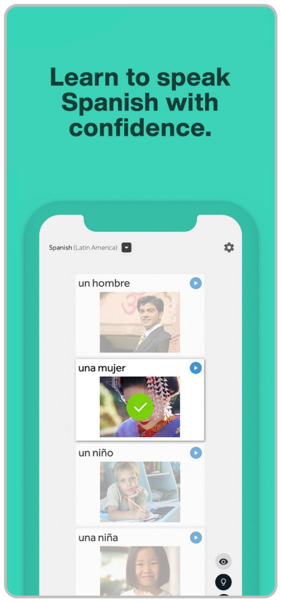
Learn a language today with Rosetta Stone.

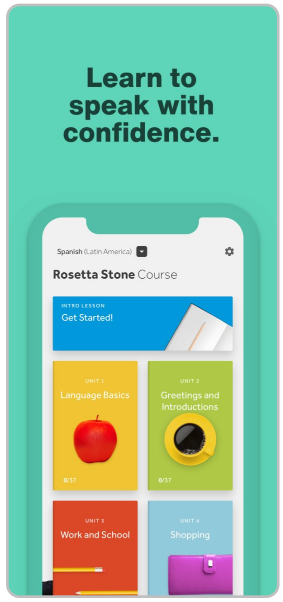












(Rosetta Stone, Ltd., 2021)