# The Use of Physical Activity Trackers in Portuguese Adolescents and Adults

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## 1 OBJECTIVES

The pandemic of physical inactivity is associated with a range of chronic diseases and early deaths (Ding et al., 2016). Estimates from 2012 indicated that not meeting physical activity recommendations is responsible for more than 5 million deaths globally each year (Lee et al., 2012). Nowadays, sedentary behaviours are highly prevalent, and data from adults in high-income countries suggest the majority of time awake is spent being sedentary (Matthews et al., 2008).

Physical activity can be promoted in different ways, including delivery of advice, provision of written materials, referral to an exercise programme, etc. Wearable monitors (physical activity trackers) that provide feedback to users have also been used in longitudinal interventions to motivate research participants and to assess their compliance with program goals (David, 2012). Physical activity trackers, as pedometers, accelerometers, smartphone applications and heart rate monitors, could be an important complement that enable people to modified their sedentary behaviour and to monitor their physical activity and exercise (Wen et al., 2017).

Despite the potential and the wide range of wearables available, little is known about the interest, usage, preferences (Alley et al., 2016), even the efficacy for using wearables in physical activity levels.

This study aimed to investigate the use of physical activity trackers in Portugal, in particular how often people use it and how they use it to monitor exercise/physical activity.

## 2 METHODS

### 2.1 Participants

Participants were N = 1498, of both sexes (N = 841 females) with ages between 14 and 85 years.

Inclusion criteria were being 14 years old or more and residing in Portugal. Participants were recruited from schools, universities, clubs, work sites, and communities' settings. Participants residing in different regions of Portugal mainland (North, Centre, Lisbon, Alentejo and Algarve), Madeira islands, and Azores islands.

Questionnaire was distributed and answered in paper format and online. In both cases, participants gave their informed consent. The participants that answered online were invited by email, explaining the objectives of the study and including a link to the online questionnaire. In order to select a large sample we requested that the email be forwarded to acquaintances and friends.

Participants were categorized by age into adolescents (ages 14-18 years), young adults (ages 19-40 years), middle-aged adults (ages 41-65 years), and older adults (aged older than 65 years). Besides, sex and age, sociodemographic factors included education level (no tertiary education, tertiary education less than master level, and master and doctoral level), and occupation. The occupation of the participants was defined according to the Occupation Portuguese Classification nomenclature (Instituto Nacional de Estatística, 2010), and was subsequently classified into 3 levels: white collar (that includes the classes 0-4), blue collar (that include the classes 5-9) and without job (students and retired subjects) (Table 1).

### 2.2 Interest, Use and Preferences for Activity Trackers

Interest, use and preferences for activity trackers were measured troughs 11 multiple-choice questions.

First, participants were asked if they do, or they did in the past, or if they not do exercise regularly. The ones that answers they or they did exercise regularly were asked how many times in a week. Tracker use was assessed in the participants that do or did exercise regularly by asking if they had ever used wearable devices (yes/no). Participants who use

wearables devices were further asked what type of wearable they use, if thy acquired the tracker before or after they start exercise regularly, what parameters they register (time length of the exercise, speed, distance, hearth rate, calories, accumulated climb, power, VO2), how often they used the tracker (only during exercise, during waking hours, only at night, always all day and all night). A question about the parameter that they think trackers should register was also included.

Participants were also asked about their perception of the possible influence of activity trackers on the motivation for physical activity / exercise (yes/no), and if they increased the amount of physical activity/exercise after starting using it (yes/no), and how much.

Participants who had not used a physical activity tracker were asked if they would be interested in using one (yes/no).

## 2.3 Statistical Analysis

Frequencies and Qui-squared were calculated with IBM SPSS Statistics for Windows, Version 22.0 (Armonk, NY: IBM Corp)

## 3 RESULTS

More than a half of participants (57.1%) practiced physical activity/exercise regularly (30.6% of these

were female), and 36.1% practiced in the past. Only 4.4% of the adolescents answer that they not practiced and 17.8% of the older adults, 6.1 and 8.5% respectively of young adults and middle-age adults do not regularly do physical activity/exercise. Only 0.9% practiced occasionally and 3.6% once a week. Three times a week was the most frequent frequency of practice (24.9%), 7.4% do it every day. Table 2 shows the week frequency of practice by sex and age.

Table 1: Descriptive characteristics of participants.

| Demographic factors | n (%) |
|---|---|
| Sex | |
| Males | 841 (56.1) |
| Females | 657 (43.9) |
| Age (years) | |
| 14-18 years | 79 (5.3) |
| 19-40 years | 1047 (69.9) |
| 41-65 years | 242 (16.2) |
| Over 65 years | 45 (3.0) |
| Education | |
| No tertiary education | 671(44.8 |
| Tertiary education < master level | 481(32.1) |
| Master / doctoral level | 346(23.1) |
| Occupation | |
| White Collar | 623 (41.6) |
| Blue Collar | 814 (54.3) |
| Not employed | 61 (4.1) |

Table 2: Frequency of the week practice by sex and age.

| Age | Occasionally | $1 \cdot week^{-1}$ | $2 \cdot week^{-1}$ | $3 \cdot week^{-1}$ | $4 \cdot week^{-1}$ | $5 \cdot week^{-1}$ | $6 \cdot week^{-1}$ | $7 \cdot week^{-1}$ |
|---|---|---|---|---|---|---|---|---|
| Females | | | | | | | | |
| Adolescents | 1.4% | 4.1% | 11.0% | 28.8% | 24.7% | 12.3% | 12.3% | 5.5% |
| Young adults | 1.1% | 4.3% | 23.2% | 22.6% | 19.3% | 15.0% | 7.1% | 7.5% |
| Middle-aged adults | 0.8% | 1.6% | 27.6% | 24.4% | 21.3% | 12.6% | 4.7% | 7.1% |
| Older adults | | 7.1% | 7.1% | 57.1% | | 21.4% | 7.1% | |
| Total females | 1.0% | 3.9% | 22.5% | 24.1% | 19.7% | 14.5% | 7.2% | 7.1% |
| Males | | | | | | | | |
| Adolescents | | | 12.3% | 26.3% | 14.0% | 12.3% | 28.1% | 7.0% |
| Young adults | 1.0% | 2.9% | 18.6% | 24.2% | 19.3% | 16.2% | 11.1% | 6.8% |
| Middle-aged adults | | 6.0% | 21.4% | 29.1% | 12.8% | 16.2% | 5.1% | 9.4% |
| Older adults | | 4.2% | 20.8% | 41.7% | 8.3% | 8.3% | | 16.7% |
| Total males | 0.7% | 3.3% | 18.6% | 26.0% | 17.2% | 15.5% | 11.1% | 7.7% |
| Females and males | | | | | | | | |
| Adolescents | 0.8% | 2.3% | 11.5% | 27.7% | 20.0% | 12.3% | 19.2% | 6.2% |
| Young adults | 1.0% | 3.7% | 21.2% | 23.3% | 19.3% | 15.5% | 8.8% | 7.2% |
| Middle-aged adults | 0.4% | 3.7% | 24.6% | 26.6% | 17.2% | 14.3% | 4.9% | 8.2% |
| Older adults | | 5.3% | 15.8% | 47.4% | 5.3% | 13.2% | 2.6% | 10.5% |
| Grand total | 0.9% | 3.6% | 20.8% | 24.9% | 18.6% | 14.9% | 8.9% | 7.4% |

Table 3: Frequency of the parameters registered.

| Parameter | Frequency |
|---|---|
| Time length of the exercise | 28.0% |
| Speed | 19,8% |
| Distance | 25.6% |
| Hearth rate | 18.4% |
| Calories | 19.6% |
| Accumulated climb | 8.7% |
| Power | 4.8% |
| VO2 | 3.1% |

Of the participants who practice physical activity/exercise regularly, 59% do not use activity trackers, 27% were using, and 14% have used. The majority of the participants (80.1%) acquired the tracker after they started exercise regularly. The parameters most register was time length of the exercise (28%) and distance (25.6%) (Table 3).

The majority of the participants use the tracker only during exercise (73.9%), 14.4% use it during waking hours, 11.2% use it always, and only 0.4% use it only during the night.

The frequency of the parameters that participants think trackers should register are shown in Table 4. The most desired parameters were the time length of the activity (27.8%), heart rate (25.8%) and exercise intensity (25,7%).

Participant's perception about the possible influence of activity trackers on the motivation for physical activity/exercise was low, 5% answer 'yes', 1.5% answer 'no', and the majority (93.5%) did not answer the question.

Table 4: Frequency of the parameters that participants think trackers should register.

| Parameter | Frequency |
|---|---|
| Step count | 11.8% |
| Acceleration/movement of the body | 10.8% |
| Heart rate | 25.8% |
| Calories | 21.8% |
| GPS track | 17.7% |
| Sleeping pattern | 11.4% |
| Exercise intensity | 25.7% |
| Time length of the activity | 27.8% |

The most frequently used device was mobile applications (22.2%), 11.1% used heart rate monitors, and 11.4% used GPS. From the wearable device users, 9.7% think that it had allow them to increase

their physical activity, 3.2% at least 1 hour/weak, 3.7% at least 1-2 hours/weak, 1.8% at least 3-4 hours/weak, and 0.9% more than 4 hours/weak.

From the participants who had not used a physical activity tracker 72.4% would like to use one. Independent of the sex there was not significant differences between age groups in the desire to use a physical activity tracker (Table 5).

## 4 DISCUSSION

The main goal of this study was to find out how tracker monitors are being used in Portugal, in particular how often people use it and how they use it to monitor exercise/physical activity. The sample of this survey study, were no randomly selected, which is a limitations, is a convenience sample recruited with a kind of snowball sampling. Even though it is di culty drawing general conclusions about the general population, this study is unique in the way it were recruited a large sample from all over the country, which is hard to achieve.

Table 5: Frequency of participants that would like to use a physical activity tracker by sex and age.

| Age group | Yes | No |
|---|---|---|
| Females | | |
| Adolescents | 64.7% | 35.3% |
| Young adults | 70.6% | 29.4% |
| Middle-aged adults | 72.6% | 27.4% |
| Older adults | 90.0% | 10.0% |
| Total females | 70.8% | 29.2% |
| Males | | |
| Adolescents | 63.3% | 36.7% |
| Young adults | 77.8% | 22.2% |
| Middle-aged adults | 70.5% | 29.5% |
| Older adults | 53.8% | 46.2% |
| Total males | 74.7% | 25.3% |
| Females and Males | | |
| Adolescents | 64.2% | 35.8% |
| Young adults | 73.7% | 26.3% |
| Middle-aged adults | 71.8% | 28.2% |
| Older adults | 69.6% | 30.4% |
| Grand Total | 72,4% | 27,6% |

The majority of the participants do exercise regularly and about half of them use physical activity trackers during the practice, which demonstrate that participants have some interest in using physical activity trackers and monitoring the exercise.

The most used tracker was mobile application, maybe because everyone has a mobile phone and apps are cheaper (sometimes free of charge) than a physical tracker. The most popular function of the trackers was the 'time length of the exercise', 'speed', 'distance', following by 'hearth rate'. The participant's perception about influence of activity trackers on the motivation for physical activity/exercise was low. Anyway the majority of the participants that not have a physical activity tracker would like to have one.

In conclusion about half of the participants that exercise regularly use physical activity trackers during the practice, and the ones that do not have one would like to have.

## ACKNOWLEDGEMENTS

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