

Title: 150 minutes per week or 30 minutes on 5 days? The effect of brief advice about physical activity recommendations on moderate-to-vigorous activity of inactive adults

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Abstract

UK physical activity guidelines are now expressed as a weekly total of 150-minutes rather than the previously used guideline of 30-minutes on most days. This study compares the amount, intensity and pattern of physical activity undertaken by inactive adults following brief advice based upon either the weekly or daily guideline. 62 inactive individuals wore an accelerometer for 7 days prior to and following an advice session. While moderate-to-vigorous physical activity increased significantly for the entire group ($n=62$, $P<0.05$) there were no statistical between group differences. Both weekly and daily guidelines are equally effective in eliciting short-term increases in physical activity.

Keywords: exercise; public health; guideline

Introduction

It is widely accepted that physical activity can elicit a wide range of physiological benefits including reduced rates of all-cause mortality, coronary heart disease, high blood pressure, stroke, metabolic syndrome, breast and colon cancer, and type 2 diabetes (Lee et al., 2012). Physical activity also has a positive effect on health related quality of life through improving subjective well-being (Rejeski et al., 2001). Despite this evidence, a third of adults worldwide are physically inactive, with proportions ranging from 17% in southeast Asia to about 43% in the Americas and the eastern Mediterranean (Hallal et al., 2012). In the UK, self-report measures suggest that only 33-43% of males and 23-32% of females currently achieve government guidelines (Northern Ireland Health and Social Wellbeing Survey 2005-2006; Welsh Health Survey 2009; Scottish Health Survey, 2009).

Physical activity for health guidelines were first published in 1995 (Pate et al., 1995) and suggested that every adult should accumulate 30 minutes or more of moderate intensity physical activity on most, preferably all, days of the week (Pate et al. 1995). Recently, several national guidelines including those for the United Kingdom and United States have been updated with the volume of physical activity required for health benefit being expressed as a weekly goal of 150 minutes of moderate intensity physical activity rather than a daily goal of 30 minutes on most days of the week (Department of Health, 2011; U.S. Department of Health and Human Services, 2008). The change to recommend an overall volume per week rather than an amount per day occurred as the scientific review concluded that although the volume of physical activity was clear there was insufficient scientific evidence to support any particular prescription with confidence (Physical Activity Guidelines Advisory Committee, 2008).

Expressing physical activity guidelines in terms of a weekly goal, instead of the previously used daily goal, affects the percentage of adults considered compliant. A study of 2,832 Canadian adults aged 20 – 79 years utilising accelerometry demonstrated that 15.4% of Canadian adults accumulate 150 or more minutes of moderate-to-vigorous physical activity (MVPA) per week, however just 4.8% do so at least 30 minutes on at least 5 days (Colley et al., 2011). In 350 Flemish adults, who wore a multi-senor body monitor, it was found that that 87.2% of men and 68.1% of women achieved 150 minutes MVPA per week, but only 57.6% and 37.3% accumulated this amount as at least 30 on 5 days (Scheers et al., 2013). Although not directly comparable due to different cohorts and methodologies used, two studies in the US using accelerometry data from NHANES provide further relevant information. Using a sample of 4773 adults aged ≥ 20 years from NHANES 2005 -2006, Tucker and colleagues found that 9.6% of adults achieved the 2008 US recommendations (U.S. Department of Health and Human Services, 2008) of obtaining at least 150 minutes MVPA per week (Tucker et al., 2011). However, an earlier study utilising NHANES 2003 – 2004 reported that only 2.4% (if aged >60 years) to 3.5% (if aged 20 –59 years) of adults met previous recommendations defined as accumulating at least 30 min of moderate intensity activity on 5 days (Troiano et al., 2008). Thus despite the different activity levels of subjects reported in the above studies, analysis of compliance rates suggests that it is easier for adults to reach physical activity guidelines when applying the 150 minute per week recommendation than 30 minutes on 5 days per week.

Despite the strong scientific base for a weekly physical activity guideline of 150 minutes, and the cross-sectional evidence which suggests that it is easier for adults to reach this weekly guideline than the previous recommendation of 30 minutes moderate intensity on 5 days, there is a paucity of data considering how inactive adults interpret and enact this new

physical activity message. Specifically, there is no data published which examines how inactive individuals respond to the 150 minutes per week message compared to the previous 30 minutes per day message in promoting participation in physical activity. The aim of this study was to compare the amount, intensity and pattern of physical activity undertaken between inactive adults during one week following either the 150 minutes per week or the 30 minutes on 5 days physical activity guideline.

Methods

Participants

303 participants were recruited via an email distributed to staff and students employed at four higher education institutions. Following completion of an online survey to assess current knowledge and participation in physical activity, seventy nine participants who were unaware of and not achieving current PA guidelines (<600 MET-min/week as determined by the International Physical Activity Questionnaire – Short Form) (Craig et al., 2003) were eligible to proceed with the study. Ethical approval was granted by the relevant institutional review boards.

Procedures

Participants wore a GT3X tri-axial accelerometer (Actigraph, GT3X California, AM 7164-2.2 by MTI Health Services, Fort Walton Beach, FL 32548, USA) for a period of 7 days prior to and following brief physical activity advice, as detailed below. Accelerometers were secured with a belt at the waist and were worn at all times except when bathing to provide an objective assessment of physical activity (Melanson & Freedson, 1995).

Physical activity advice

Following collection of baseline accelerometer data, participants were randomly assigned to researcher led physical activity advice sessions in which they received either the '150 minutes per week' or the '30 minutes per day on 5 days per week' physical activity guidelines. Participants were advised to accumulate physical activity in bouts lasting at least 10 minutes. Randomisation was performed using consecutively numbered sealed envelopes. The face-to-face advice session comprised of a discussion regarding either the weekly or daily guideline, an explanation of the long term health benefits of participating in regular physical activity and an exploration of possible methods to achieve the guideline. The researcher delivering the advice session worked from the pre-prepared script and slide presentation.

Accelerometer analysis

Bouts of activity from accelerometer data were identified using a custom developed C# .NET software application that stored raw and summary data in a Microsoft SQL Server database (Barclay et al., 2000). Data were aggregated into one-minute epoch values which are standard for an adult population (Hagströmer et al., 2010). Any instances with ten or more constant non-zero values were treated as spurious data to be removed (Masse et al., 2005). Episodes of non-wear time were identified where there were 60 consecutive minutes of zero counts per minute, with 2 minutes of grace between 0-100 counts allowed (Troiano, et al., 2008). Participants with a minimum of 7 consecutive valid days (having at least 8 hours of wear time)(Steele et al., 2003), 5 weekday and 2 weekend days, pre and post intervention were selected for statistical analysis. Lifestyle-light and lifestyle-moderate PA was defined using cut-off points of 100 counts per minute (cpm) and 760cpm respectively (Matthews, 2005). Actigraph-defined MVPA bouts of activity were then identified as being of at least 10 minutes in duration and at least 1,952 cpm, with 2 minutes of grace allowed below this

threshold (Freedson et al., 1998). Thereafter, activity was calculated as daily and weekly mean values.

Statistical analysis

Data for 62 participants were included in the analysis; 32 who received the ‘150 minutes message’ and 30 who received the ‘30 minutes per day on 5 days per week’ message. The volume and pattern of moderate to vigorous intensity physical activity was compared using a two way [A x B] mixed factor analysis of variance which incorporated one within subjects factor (time) and one between groups factor (group) using the Greenhouse-Geisser post-hoc test to determine significance $P < 0.05$.

Results

62 participants ($n=62$, 51 females, 11 males, mean age 39 ± 12 years) completed the study (see figure 1 for progression of participants through the study).

INSERT FIGURE 1 HERE

Volume, frequency and duration of MVPA

Following physical activity advice: total volume, frequency and duration of MVPA increased significantly ($P < 0.05$) for the entire group ($n= 62$). Total volume of MVPA increased from 43.5 minutes (CI: 31.0-56.0) to 103.5 mins per week (CI: 83.5-123.4), with 18 participants achieving ≥ 150 minutes of MVPA over a week compared to 3 at baseline. Frequency of MVPA bouts increased from 2.9 (CI: 2.1-3.8) to 5.4 per week (CI: 4.4-6.5) and when completed, duration of the bout increased from 10.7 (CI: 8.9-12.6) minutes to 18.3 (CI: 16.1-20.5) minutes.

150 minutes per week vs. 30 x 5 minutes post intervention

There were no intergroup differences in minutes of MVPA completed. Participants in the 150 minutes per week message group completed 61 minutes of additional MVPA (CI: 33-89) similar to 59 additional minutes (CI: 28-90) for those in the 30 x 5 minutes group ($P > 0.05$).

Number and duration of bouts

Post intervention there were no differences between groups with regards to the number of additional bouts of MVPA participants engaged in. Those in the 150 minutes group completed an average of 2.8 (CI: 1.4-4.2) bouts of MVPA per week compared to 2.2 (0.5-3.8) bouts per week in the 30 x 5 minutes group ($P = 0.53$). Furthermore, there were no intergroup differences with regards to the duration of bouts of MVPA completed, 6.8 (CI: 2.6-11.10 minutes) for the 150 minutes group vs. 8.3 (CI: 4.7-12.0) minutes for the 5 x 30 minutes group ($P = 0.59$).

Lifestyle-light and sedentary PA

Compared to baseline, there were no intergroup differences between the amount of lifestyle-light and sedentary PA completed. Participants in the 150 minutes per week group completed 19 minutes less lifestyle-light PA after the intervention (CI:47-85), and even though those in the 5 x 30 minutes group completed 61 minutes more of lifestyle-light PA, there was a wide confidence interval (CI:-46-170]). With respect to sedentary time, those in the 150 minutes per week group had 94 minutes less sedentary time (CI:-68-256]), which is similar to those in the 5 x 30 minutes group who completed 91 minutes less sedentary time (CI:-54-234).

Discussion

This is the first study to compare the effect of prescribing a daily physical activity guideline (5 days x 30 minutes) and a weekly guideline (150 minutes per week) on objectively measured MVPA in inactive adults. Our major finding is that a brief information session based on either daily or weekly physical activity guidelines are equally effective in increasing total volume, frequency and duration of MVPA in previously inactive individuals in the short term. Despite these positive changes in physical activity behaviour, for the majority of participants, total volume of MVPA still failed to reach the target of 150 minutes per week post intervention. However, we fully recognise that changing behaviour to achieve these guidelines in the short term is an unrealistic goal and that any increase should be seen as a positive step in the right direction. A progressive, graded protocol to increase physical activity over several months is advisable for inactive individuals (for example see Baker et al., 2008).

The authors recognise that the short duration of intervention in this study (7 days) limits the degree to which it can be applied to public health promotion where more permanent changes in physical activity behaviour are the objective. However we were seeking to test the interpretation of the two versions of the current guidelines. The findings do provide support for the recent changes in public health recommendation from a daily to a weekly physical activity target indicating that both messages are equally effective in initiating a change in physical activity behaviour. Future studies of this nature completed over a prolonged period comparing volume, intensity and patterns of physical activity, would help to determine whether any short term increase in MVPA is sustained. In addition, qualitative data is needed to aid understanding on how inactive individuals respond to the physical activity messages.

Previous cross-sectional studies using large datasets have compared compliance with physical activity guidelines based on daily and weekly goals (Colley, et al., 2011; Rafferty et al., 2002; Scheers, et al., 2013; Troiano, et al., 2008; Tucker, et al., 2011). Collectively these studies indicate that more adults are deemed to reach physical activity guidelines when applying the weekly calculation rather than the daily target. While initially our findings may seem to contrast with the aforementioned research, it is worth noting that unlike the subjects mentioned in these studies our participants were inactive at baseline. Thus it would appear that for inactive adults embarking on adopting physical activity participation, both the weekly or daily guidelines results in similar improvement in physical activity in the short term.

Our findings augment the limited body evidence demonstrating that brief advice can encourage people to be more physically active in the short to mid-term (Norris et al., 2000; Purath et al., 2004). This approach of using researcher/professionally-led physical activity advice in community settings, including individuals' place of study or work (as in this study) should be considered in future health promotion strategies. Though overall the evidence is equivocal (Ogilvie et al., 2007) and more research is needed to establish which methods of exercise promotion work best in the long-term to encourage specific groups of people to be more physically active (Foster et al., 2009).

Approximately half of the subjects who completed the online survey were unaware of current or previous physical activity guidelines (data not shown). While awareness of health risk, even among those diagnosed with a chronic illness, does not always translate into a change in lifestyle (Newson et al., 2012), knowledge of health messages has been linked to positive health behaviours (Roth & Stamatakis, 2010). Using data from the 2007 Health Survey for England concerning 1,954 children aged 11–15, it was found that for girls, knowledge of

physical activity guidelines was associated with meeting them (Roth & Stamatakis, 2010). As the adults in the present study were unaware of any physical activity guidelines at baseline, simply being educated on the appropriate amount and intensity of physical activity required for good health may have played a key role in their adoption of increased MVPA.

Study limitations and strengths

Limitations of the study include the short-duration of follow-up and the large number of subjects excluded following completion of the eligibility questionnaire. Participants were deemed ineligible if they reported > 600 MET-min/week on the IPAQ-short form, the volume of activity classified as “inactive” by the IPAQ scoring protocol (International Physical Activity Questionnaire) and often used as the cut-point for determining inactivity in research studies (Rosemann et al., 2008; Taylor et al., 2010). 150 minutes of moderate intensity activity per week could be regarded as (roughly) equivalent to 500 MET-minutes per week (U.S. Department of Health and Human Services, 2008). Therefore individuals who were not yet meeting physical activity guidelines may have been excluded by our protocol. This lower cut-point of 500 MET-minutes per week should be considered when determining criteria for inactivity in future studies. Finally, volunteers were recruited and the intervention may be less effective in non-volunteer populations, for example, from primary care settings (Foster, et al., 2009). Strengths include the random allocation of participants to groups and the use of an objective measure of physical activity.

Conclusion

Providing daily or weekly physical activity targets are equally effective in increasing total volume, frequency and duration of MVPA in inactive individuals for a period of seven days following brief physical activity advice. Participation in physical activity at a national and

international level remains low therefore further research using physical activity advice in inactive populations is required to monitor long-term changes in behaviour.

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Declaration of conflicting interests

The authors declare that there are no conflicts of interest.

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Figure 1: Progression of participants through the study

