Using threshold messages to promote physical activity: implications for public perceptions of health effects

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Background: The promotion of physical activity (PA) guidelines to the general public is an important issue that lacks empirical investigation. PA campaigns often feature participation thresholds that cite PA guidelines verbatim (e.g. 150 min/week moderate-to-vigorous physical activity (MVPA)). Some campaigns instead prefer to use generic PA messages (e.g. do as much MVPA as possible). ‘Thresholds’ may disrupt understanding of the health benefits of MVPA. This study examined the perception of health benefits of PA after exposure to PA messages that did and did not contain a duration threshold.

Methods: Brief structured interviews were conducted with a convenience sample of adults (n = 1100). Participants received a threshold message (150 min/week MVPA), a message that presented the threshold as a minimum; a generic message or no message. Participants rated perceived health effects of seven PA durations. One-way analyses of variance with post hoc tests for group differences were used to assess raw perception ratings for each duration of PA.

Results: Recipients of all three messages held more positive perceptions of >150 min/week MVPA relative to those not receiving any message. For MVPA durations <150 min/week, the generic PA message group perceived the greatest health benefits. Those receiving the threshold message tended to have the least positive perceptions of durations <150 min/week. Conclusion: Threshold messages were associated with lower perceived health benefits for modest PA durations. Campaigns based on threshold messages may be limited when promoting small PA increases at a population level.

Introduction

Physical activity (PA) reduces risk of morbidity and mortality from chronic diseases.1,2 Approximately 65% of Western adults self-report insufficient levels of PA.3,4 Studies using objective measurements show lower compliance with PA guidelines, at ~5% in adults.1,4 Increasing population PA therefore is a public health priority.1,2 Mass-media campaigns reach large sections of the population.5 To optimize effects, researchers have examined how message characteristics influence their persuasive appeal. Investigators have explored descriptive versus injunctive norms,6 fear appeals,7 tailoring,8 gain/loss framing,8,9 source credibility9 and specificity.10 One issue yet to be examined in the PA messaging field is the impact of ‘threshold’ information.

In behavioural domains, threshold messages implore individuals to attain a specified volume of behaviour (e.g. five fruit/vegetable portions a day). Many PA campaigns feature thresholds. For instance, the UK’s ‘Change4Life’ campaign11 and Singapore’s ‘Physical Activity Programme’12 encourage 150 min of moderate-to-vigorous physical activity (MVPA) per week. Similarly, earlier campaigns promoted 30 min of MVPA per day, e.g. ‘Get Active America’ (US)13, ‘Get a Life, Get Active’ (Northern Ireland)14 and ‘Find Your Thirty’ (Australia).15 Essentially, these campaigns directly cited PA guidelines of the day (e.g. ‘Swap 4 wheels for my own 2 feet to get me going for 150 minutes a week’ (Change4Life); ‘30 min of regular activity a day is good for your health’ (Get a Life, Get Active)).

Guidelines provide essential information on the minimum level of PA needed for health benefits. Consequently, they are invaluable for surveillance, planning interventions and policy. However, PA guidelines were not made to motivate individuals to adhere to being active. Brawley and Latimer16 discuss the importance of...
packaging the guidelines into messages that (i) offer specific content, (ii) are based on scientific recommendations and (iii) encourage specific targeted groups to meet the guidelines. The current popular approach of presenting the 150-min threshold in mass media campaigns achieves these first two aims. Promoting 150 min/week of PA is instructive and optimally beneficial to health. However, it could also be argued that messages encouraging lower levels of PA also meet these criteria. Scientific evidence, based on a simple dose–response curve, suggests that participation in <150 min/week of PA also carries health benefits, but likely at lower levels of potency.17 This is especially true for those who are very inactive.18 Uncertainty surrounds the success of messages that contain a threshold in motivating improved PA behaviour. Goal Theory proposes that for a goal to be motivational it must be specific, measurable, attainable, realistic and time-managed.19 With the average adult engaging in just 42–77 min/week of MVPA,1,4 an increase to 150 min/week is likely to be considered unrealistic for many.20 Goal Theory suggests that a goal closer to 90 min/week would, in this context, be more beneficial from a motivation perspective. Brawley and Latimer16 state in their final principle for message development that the message should help the individual strive towards the recommendations. An increase from, for instance, 42 to 90 min/week still represents a move towards the recommendations and is more attainable than the 150 min often cited verbatim from the guidelines. The guidelines are clearly important for PA promotion, but perhaps a more gradual messaging strategy may be beneficial in moving individuals towards this optimum level. At present, the association between threshold (with regard to PA duration) messages and perceptions of health benefits associated with PA has not been studied.

The aim of the present study, therefore, is to examine the association between different types of PA messages (two different threshold messages and a generic PA message) and perceptions of the health benefits of seven different durations of PA, relative to a no-message ‘control’ group.

Method

From October 2011 to December 2011, a convenience sample of pedestrians were approached in a UK town centre and asked to participate in a short interview. In total, 1100 interviews were completed after gaining written consent. No individual was interviewed more than once. The length of the interview was dictated by the participant and was usually 5–10 min. The study was approved by the host university’s ethics committee.

Data were collected in the following order:

Participants were asked to recount current PA guidelines. Marks out of 10 were awarded for accuracy, with the same points awarded for synonymous answers (i.e. ‘150 min/week’ and ‘30 min, 5 days/week’). To differentiate between individuals with some knowledge regarding PA and individuals with no knowledge, participants were awarded points if they were within a set range of the correct response. Eight points were awarded for answers amounting to 150 min/week. Six and four points, respectively, were awarded for answers within a 30- and 60-min range of this. In addition, two points were awarded for the answer ‘moderate-to-vigorous’ and one point for separate answers of ‘moderate’ or ‘vigorou’.

Participants were equally divided between four groups (n = 275). Individuals were assigned to groups in blocks of 20 (i.e. the first 20 participants interviewed were assigned to group 1, the next 20 were assigned to group 2 and so on, until 275 participants were in each group). Group 1 (threshold message group; THR) received a message based on current campaigns: ‘Regular physical activity, such as brisk walking, protects your health. Each week adults should accumulate 150 minutes of physical activity’.11 Group 2 (threshold presented as a minimum; THRm) received a slightly altered message: ‘Regular physical activity, like brisk walking, protects your health. Each week adults should accumulate at least 150 minutes of physical activity’. This message sought to examine if framing the threshold as a minimum differentially influenced perceived health benefits of accruing <150 min/week. The phraseology corresponds with existing campaigns (e.g. ‘Get a Life, Get Active’). Group 3 (generic message group; GEN) received a comparison message containing no threshold: ‘Regular physical activity, like brisk walking, protects your health. Each week adults should engage in physical activity as regularly as possible’. Efforts were made to match messages in length and complexity. All participants were shown the message while it was read aloud to them. The interview continued after participants provided verbal confirmation that they understood their message. Group 4 (no message control group; CON) received no message, providing a control condition.

Participants were then asked: ‘Think of a typical (female), using the scale provided, what effect do you think 10 minutes/week of physical activity, such as brisk walking, would have on their health? The 15-point scale was anchored by ‘strong negative effect’ (−7) and ‘strong positive effect’ (+7) to accommodate varied beliefs and avoid the assumption that appraisals would be universally positive.21 Reference to a hypothetical scenario helped reduce confounding effects of individual-level factors (e.g. fitness level,22 attitudes towards exercise,23,24 optimistic bias24 and current health status25) and has been used previously when assessing responses to health messages.26 For instance, if asked about personal effects, individuals with arthritis may provide negative assessments, despite holding positive general attitudes about PA. Brisk walking was specified to clarify what constitutes PA. This question was piloted for readability with 15 adults before data collection. With each participant, the question was repeated for six other PA durations: 70, 130, 150, 170, 230 and 290 min/week. Seven durations were used to match the 15-point belief scale (above) and enable participants to place each duration incrementally on either a negative or positive arm. This was to reduce the cognitive load on participants and was based on research suggesting that a 15-point scale provides the optimal balance between time effort and participant engagement with the scale.26 Twenty-four different interview schedules were used to present durations in counterbalanced order.

Motivational readiness22 may influence perceptions of PA. Consequently, participants’ stage of change was identified using a validated item.27 Stages are: pre-contemplation (not considering change), contemplation (considering change), preparation (planning for change), action (engaging in PA for <6 months) or maintenance (engaging in PA for 6 months or more). Previous experience of a behaviour has been shown to influence risk/benefit judgements.25 Stages of change identifies those who are currently active; however, it cannot separate those who have never been active from those who have previously been highly active but have recently stopped. Thus, participants were asked to estimate the number of life years in which they had been regularly active to identify individuals who had been previously active from those who had never been active. Trust in a message can also moderate perceptions of behaviour.25 Thus, participants rated their trust in the given message, from +1 (complete distrust) to +7 (complete trust). This item was adapted from items widely used in research examining messages.28,39

Finally, the investigator visually coded gender, weight status and broad age category (<65 or >65 years) from extensively used10,30,31 and validated10,31 protocols. A second investigator simultaneously coded a subsample (n = 100), generating Kappa scores for gender (1.00), weight status (0.76) and age (0.86).

Analysis

Statistical analysis was performed using SPSS 19.0 for Windows with alpha set at 0.05. One-way analyses of variance with post hoc
analysed group differences in knowledge of guidelines, stage of change, PA experience, trust and demographics. Analysis was performed using one-way analysis of covariance with the independent variable of group (GEN, THR, THRm and CON), dependent variable of perceived health effects and the covariates gender, knowledge, trust, age and multiple-deprivation index. Post hoc tests assessed group differences in raw perception ratings of each PA duration. Sidak correction was used to control the error resulting from conducting multiple comparisons.

**Results**

The sample was 50% female, 28% aged >65 years and 41% overweight. Median results for additional variables were: knowledge, 0 (range = 0–10); estimated life years of PA, 5 years (range = 0–60 years) and trust, 6 (range = 1–7). The most frequently reported stage of change was 'maintenance' (412/1100). There was no significant difference in any demographic variables (age, gender or weight status) between groups. Knowledge of PA guidelines was the only additional variable to differ between groups ($P < 0.005$). Post hoc tests revealed that THR ($\bar{x} = 2.5$, SD = 2.9) had higher knowledge than THRm ($\bar{x} = 1.7$, SD = 2.6). No other pairwise comparisons were significant, suggesting knowledge was similar between all other groups and comparisons. There was also a significant between-group difference in trust ($P < 0.001$). THRm ($\bar{x} = 4.6$, SD = 1.7) expressed lower trust in their message than THR ($\bar{x} = 5.1$, SD = 1.5, $P < 0.05$) and GEN ($\bar{x} = 5.2$, SD = 1.4, $P < 0.005$). All other pairwise comparisons were non-significant.

Analysis of covariance revealed significantly different ratings of perceived health benefits between the four groups at 10 ($P < 0.005$), 70 ($P < 0.01$), 130 ($P < 0.001$), 150 ($P < 0.001$), 170 ($P < 0.01$) and 230 ($P < 0.05$) min. Between-group differences are shown in table 1. Post hoc tests identified lower perceptions of health benefits in THR relative to GEN at 10 ($P < 0.001$), 70 ($P < 0.001$) and 130 ($P < 0.01$) min. This indicates that GEN had more positive perceptions of the health benefits of modest durations of PA than THR recipients. Importantly, for durations more than the 150-min threshold, there were no significant differences between these two groups. When we compare message groups with those not receiving any message, significant differences only emerge after the 150-min threshold [THR v CON at 150 ($P < 0.005$) and 170 min ($P < 0.05$), THRm v CON at 150 ($P < 0.005$), 170 ($P < 0.005$) and 230 min ($P < 0.05$) and GEN v CON at 230 min ($P < 0.05$)].

**Table 1** The average perception rating provided by group for each of the seven durations of PA and the overall univariate statistic adjusted for age, gender, Multiple Deprivation Index (MDI), trust and knowledge of PA guidelines

<table>
<thead>
<tr>
<th>Group</th>
<th>Duration (mins)</th>
<th>GEN</th>
<th>THR</th>
<th>THRm</th>
<th>CON</th>
<th>F-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>-0.09&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-0.91&lt;sup&gt;a&lt;/sup&gt;</td>
<td>-0.47</td>
<td>-0.41</td>
<td>4.55</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>2.53&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.69&lt;sup&gt;b&lt;/sup&gt;</td>
<td>2.04</td>
<td>2.15</td>
<td>5.85</td>
<td></td>
</tr>
<tr>
<td>130</td>
<td>3.76&lt;sup&gt;c&lt;/sup&gt;</td>
<td>3.22&lt;sup&gt;b&lt;/sup&gt;</td>
<td>3.49</td>
<td>3.28</td>
<td>7.60</td>
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<td>4.32&lt;sup&gt;b&lt;/sup&gt;</td>
<td>4.33&lt;sup&gt;c&lt;/sup&gt;</td>
<td>3.69&lt;sup&gt;c&lt;/sup&gt;</td>
<td>8.51</td>
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<td>170</td>
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<td>4.62&lt;sup&gt;b&lt;/sup&gt;</td>
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<td>5.18</td>
<td>5.21</td>
<td>4.72</td>
<td>1.33</td>
<td></td>
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</tbody>
</table>

Significant F-statistic ($P < 0.05$) bolded.

- a: Post hoc significant between GEN and THR.
- b: Post hoc significant between THR and CON.
- c: Post hoc significant between THRm and CON.
- d: Post hoc significant between GEN and CON.

**Discussion**

This study examined the association between different threshold PA messages and individuals’ perceptions of the health benefits of different durations of PA. Worryingly, at durations lower than the 150-min threshold, the message representative of those most often used by current mass-media campaigns (THR) tended to be associated with more negative perceptions (significantly more negative relative to GEN). Messages were only associated with more positive perceptions of PA relative to CON when the duration of PA was relatively long (>150 min). The GEN message showed a similar relationship with health benefits to the THR and THRm messages. Thus, the absence of a stated threshold does not appear detrimental to individuals’ understanding that longer regimens bestow the most benefit. Essentially, the findings indicate that messages currently prevalent in mass-media campaigns may be ineffective in informing individuals’ understanding that ‘even a little is good, but more is better’. There is some evidence to support a greater focus on non-threshold/generic messages used by campaigns such as ‘Move More’ (UK) and ‘Do-Groove’ (US), e.g. ‘groove your body every day’.

These findings could have implications for efforts to change behaviour. The Theory of Planned Behaviour<sup>34</sup> posits that behaviour is typically preceded by an intention to act, with intentions most strongly predicted by our attitudes toward the target behaviour.<sup>35</sup> Mass-media campaigns target the belief (instrumental) component of our attitudes. In the current study, those receiving the generic message believed that modest durations of PA would result in greater health benefits than recipients of the threshold PA message. These individuals are therefore likely to form a positive attitude towards small, but meaningful, changes. Consequently, these individuals may be more likely to form intentions for small behavioural adjustments, which could serve as useful ‘stepping stones’ towards attainment of 150 min/week of MVPA. Primary guidance documents recognize that facilitating participation in ‘suboptimal’ levels of PA is better than nothing.<sup>2,36</sup> Mass-media campaigns should reflect this in their messages. It is also interesting that the results were not influenced by differences in previous PA behaviour or motivational readiness. Thus, the messages themselves appeared to be the main influence on perceptions of the health benefits of different durations of PA. However, these factors are still likely to influence future motivation.

Despite obvious challenges in realizing universal compliance with the 150 min/week threshold, it remains the optimal outcome for health benefits. Arguably, campaigns must continue to be driven towards this target. The findings from this study do not suggest that threshold messages are problematic per se; only that a high threshold may be off-putting for individuals with low levels of PA. Thresholds may still have a role to play in PA promotion, but thresholds that are likely to be perceived as high may not be optimal for those who are engaging in low levels of PA. Indeed, according to Goal Setting Theory, having a ‘specific’ and ‘measurable’ goal, that is a threshold, should be motivational.<sup>19</sup> However, goals must be ‘attainable’. Goal research in the context of PA generally targets 40% improvement in either maximum difficulty but attainable conditions or unattainable conditions.<sup>37,38</sup> For the average adult in the US<sup>3</sup> and UK<sup>1</sup>, the 150 min/week message translates to an increase of 100–400%. Such messages may need to be augmented with additional information to motivate compliance, such as encouraging small steps towards the final goal. It is also possible that more generic messages enable individuals to set personalized goals appropriate to their current status. Qualitative research approaches could help explore potential mechanisms.

Only THR showed suppressed perceptions of health benefits of PA durations less than 150 min/week. The effect was not prevalent for THRm. This finding appears counterintuitive, considering that THRm group’s message presented the threshold as a minimum (‘at least 150 min/week’). The findings may reflect a moderating...
effect of trust. In stressing 150 min/week as a minimum, it is possible that the THRm message was seen as more controlling. Miller et al. found that demanding messages were trusted less. Importantly, such messages did not impair attitudes towards PA, possibly because they were disregarded for being less trustworthy. THRm reported significantly lower trust in their message compared with the other message groups. Consequently, they may have been less compelled by the sentiment of their message, that PA totalling less than 150 min/week lacks value. The lack of association between perception data and other variables (e.g., experience of PA, stage of change, etc.) was also initially surprising. These findings could, however, be explained by a general lack of variance in these factors; consistently low knowledge of guidelines, high trust in the messages, little previous experience of PA and many individuals placing themselves in the ‘maintenance’ stage.

This article is a novel line of research, as no study has yet examined messages prevalent in major PA campaigns from a motivational perspective. Thus, the article has practical application for current and past promotional efforts. Strengths of this study include a large sample size and the inclusion of three PA message groups and one control group. The study responds to calls for more field research in social psychology and health-related fields. The aim of this research was to investigate the influence of media messages in their simplest form; however, the practical nature of the study precluded a detailed measurement of constructs, such as motivation. Furthermore, this limited the collection of demographic information, and the subjective reporting of age and gender may have introduced error. Some measures such as trust and PA experience are yet to be validated. Weaknesses in these measures could therefore have contributed to the lack of influence of these variables on our results. The study was conducted in a busy town centre. Individuals were only judged as refusing to participate if they engaged with the researcher but declined to provide consent. This occurred with <1% of individuals, thus no real inference can be made regarding characteristics between those who did and did not participate. In addition, it is possible that self-reported responses were subject to social desirability bias. However, given that knowledge of PA guidelines was low and durations of PA were presented in a counterbalanced order, we believe that social desirability did not have an impact on our results, as individuals cannot give desirable answers when they do not know what answer is expected.

Conclusions

The 150 min/week threshold is an expert-derived guideline for the volume of PA required for optimal health. Evidence-based ‘position stands’ like this are vital for researchers and practitioners. Nonetheless, the current findings raise questions about citing these guidelines verbatim as the central tenet of promotional campaigns. A non-threshold alternative was similarly effective in evoking high perceived benefits of longer PA durations and more effective in promoting shorter PA durations, which could be beneficial for selected health outcomes. Future research should investigate the use of generic PA messages and of messages using lower thresholds that may be more motivationally beneficial.

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Conflicts of interest: None declared.

Key points

- Messages used by campaigns to promote PA guidelines to the general public influence their perceptions of the health benefits associated with different durations of PA.
- Meeting PA guidelines should be encouraged.
- However, generic messages that focus on encouraging individuals to increase their PA may offer a better strategy than messaging the guidelines verbatim.
- Few adults meet PA guidelines, thus the achievability of promotional messages used by campaigns needs to be reviewed.

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Educational inequalities in leisure-time physical activity in 15 European countries

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Background: The aim of this study was to assess the patterns of socio-economic inequalities in leisure-time physical activity (LTPA) in the different member states of the European Union. Methods: Comparable data on subjects aged 16–64 years derived from national health interview surveys from 15 European countries were used for the analysis. We used log-binominal regression to assess prevalence rate ratios (PRRs). The PRR measured the risk of showing a low level of LTPA for a given educational level, relative to the highest educational group. Results: Within Europe, large cross-national differences in the overall prevalence of a low level of LTPA were observed. However, a low level of LTPA was always more common among those of lower educational attainment. The educational inequalities in a low level of LTPA were more pronounced in men. For the lowest compared with the highest educational level, the PRR was 1.53 (95% CI: 1.49–1.57) in males and 1.36 (95% CI: 1.33–1.39) in females. There was no consistent relationship between the absolute level of prevalence rate, as measured by the rate for the highly educated, and the magnitude of these inequalities. Conclusions: Throughout Europe, physical activity during leisure time is less common among the lower educational groups compared with the higher educational groups. Programs to promote LTPA should consider strategies that target people of lower educational attainment.

Introduction

Physical activity has many positive effects on both physical and mental health.¹ Yet, practising physical activity is not equally distributed among the different socio-economic groups within society, although evidence for socio-economic inequalities in physical activity turns out to depend on the type of physical activity measured.