



**Lack of Knowledge of Physical Activity Guidelines: Can Physical Activity Promotion Campaigns Do Better?**

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3 Objectives: To identify the prevalence of knowledge of the current UK physical activity  
4 guidelines which were introduced in 2010 and prior physical activity guidelines (30 minutes  
5 on 5 days each week) within two large samples of UK adult's. To investigate whether  
6 knowledge of physical activity guidelines differs according to demographics such as ethnicity,  
7 age, education and employment status.  
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14 Design: Descriptive cross-sectional study comparing two distinctive adult samples.  
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17 Setting: National survey and online-administered survey conducted in England.  
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20 Participants: The 2007 Health Survey for England provides data on knowledge of physical  
21 activity guidelines from 2,860 UK adults (56% female, 89% white, 63% under 45 years old).  
22 In 2013 an online survey was disseminated and collected data from 1,797 UK adults on  
23 knowledge of the most recent physical activity guidelines. The 2013 sample was 70% female,  
24 92% white, 57% under 45 years old. All adults in both samples were >18 years old and  
25 without illnesses/disorders likely to restrict physical activity.  
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34 Main Outcomes: Knowledge of physical activity guidelines in 2007 and 2013. Demographic  
35 influences on knowledge of physical activity guidelines.  
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40 Results: 18% of the 2013 sample accurately recalled current physical activity guidelines  
41 relative to 11% of the 2007 sample who accurately recalled the previous guidelines.  
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44 Differences in knowledge of physical activity guidelines existed for marital status, gender,  
45 age, education and employment status within both 2007 and 2013 samples ( $p < .05$ ). Males  
46 with lower education and employment status and older adults were less likely to know  
47 physical activity guidelines ( $p < .05$ ). Knowledge of physical activity guidelines remained  
48 higher in the 2013 sample after controlling for demographic differences ( $p < .05$ ).  
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3 Conclusions: Disadvantaged population groups are less knowledgeable about physical  
4 activity guidelines. Although knowledge of physical activity guidelines appears to have  
5 increased in recent years demographic disparities are still evident. Efforts are needed to  
6 promote health information amongst these groups.  
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### 11 12 13 14 15 16 **Article Summary**

#### 17 18 **Article Focus**

- 19 - What was the prevalence of knowledge of physical activity guidelines in 2007?
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- 21 - How did knowledge of physical activity guidelines change after being updated in 2010?
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- 23 - Which demographic factors (gender, age, employment status, education and health) appear
- 24 to influence knowledge of physical activity guidelines?
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#### 33 **Key Messages**

- 34 - The Department of Health has invested large amounts of money into the promotion of
- 35 physical activity guidelines since the introduction of new guidelines in 2010.
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- 37 - Knowledge of current physical activity guidelines within the UK adult population is not
- 38 known.
- 39
- 40 - It is important to gauge current knowledge and demographic influences on knowledge in
- 41 order to improve promotion of physical activity guidelines by informational campaigns.
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#### 52 **Strengths and Limitations**

- 53 - The present study is limited because of differences between the two surveys. HSE 2007 was
- 54 delivered via face-to-face interviews whereas the 2013 survey was delivered online.
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3 Furthermore, convenience sampling was used for the 2013 survey with an over-representation  
4 of females and employed adults. However, other demographic variables, including ethnicity  
5 and age, were similar between the surveys, whilst employment status and age were  
6 statistically controlled for. We therefore believe that comparisons between both surveys are  
7 valid. In addition, the large sample size strengthens the present research.  
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18 This research received no specific grant from any funding agency in the public, commercial  
19 or not-for-profit sectors.  
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## 24 25 26 **Competing Interests**

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29 None declared  
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## 35 36 **Background**

37  
38 Physical activity (PA) reduces the risk of morbidity and mortality from chronic  
39 diseases [1]. Increasing evidence of the importance of PA to health has led to the promotion  
40 of a 'PA is Medicine' agenda and calls for global PA policies [2, 3].  
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46 In 1975 the first form of PA recommendations for adults were released in the United  
47 States (US) by the American College of Sports Medicine [4]. By 1995, American adults were  
48 being advised to accumulate at least 30 minutes of moderate-to-vigorous PA (MVPA), on  
49 preferably all days, each week [5]. In 1996 in England, the Department of Health followed  
50 similar guidelines from the ACSM and recommended 30 minutes of MVPA on at least 5 days  
51 a week [6]. Over the past few years, there has been a shift within the UK and globally  
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3 towards more uniform guidelines. In 2008, the first PA guidelines for Americans to be issued  
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5 by Federal government were published following a comprehensive review of the scientific  
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7 data by experts in the field. These guidelines were the first to state recommendations  
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9 specifically as 150 minutes a week of MVPA [7]. Previously, guidelines in the UK had been  
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11 disseminated separately by health agencies within each home country. In 2010 the four UK  
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13 Chief Medical Officers published the first UK-wide PA guidelines [8]. This document  
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15 followed the lead of the US guidelines and reported the new adult guidelines of 150 minutes a  
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17 week of MVPA. This format was also used in global PA guidelines issued by the World  
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19 Health Organisation [9].  
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24 Changes in the guidelines have also been reflected in the messages of the various  
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26 coinciding campaigns e.g. *'Every small step is... a way to get 30 minutes'* (Get A Life, Get  
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28 Active launched in Northern Ireland in 1999 [10]) and *'Get going for 150 minutes a week'*  
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30 (Change4Life launched across the UK in 2009 [11]). The purpose of these campaigns is to  
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32 encourage adults to reach or exceed PA guidelines.  
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36 In 2008, only ~5% of UK and US adults engaged in enough MVPA to meet  
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38 recommendations [12, 13]. Theories such as the Precaution Adoption Process model (PAPM)  
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40 and Protection Motivation Theory suggest that individuals must be accurately aware of their  
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42 current actions [14-16], such as through self-monitoring [17], in light of alternative and  
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44 desired actions to be able to initiate change i.e. *I do* this much MVPA but this much MVPA is  
45  
46 *recommended*. In addition, the Department of Health strategic framework 'Ambitions for  
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48 Health' details a strategy to embed informative social marketing campaigns within health  
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50 behaviour change campaigns [18]. It would therefore be beneficial to investigate **knowledge**  
51  
52 of MVPA guidelines within the broad UK adult population before and after the long-standing  
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54 guidelines of 30 minutes on 5 days a week were updated with 150 minutes a week, in 2010.  
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56 Chaudhury and Shelton found that only 5% of UK adults aged 60-64 (N=561) accurately  
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3 recalled the general MVPA guideline in 2007 [19]. Less than 1% of adults (N=4,281)  
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5 selected the correct guideline from a list of six options in a recent US survey [20]. Those with  
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7 a lower educational level also demonstrated lesser knowledge of guidelines. This research,  
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9 however, does not give an indication of unprompted knowledge which may be a more  
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11 powerful influence on behaviour change [21].  
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15 The objectives for this study are 1) to compare knowledge of current UK MVPA  
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17 guidelines for adults (3 years after their introduction in 2010) with knowledge of prior MVPA  
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19 guidelines (2004 up until 2010) in two large samples of adults, 2) to identify whether  
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21 demographic characteristics such as, gender, age and SES, influence knowledge of PA  
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23 guidelines at either time-point.  
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## 26 27 28 29 30 **Methods**

### 31 32 **Survey and analytical sample.**

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35 Data were analysed from the 2007 Health Survey for England (HSE) and an online survey  
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37 disseminated in 2013.  
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### 40 41 42 43 **2007 Data (before dissemination of current physical activity guidelines)**

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47 The HSE is an annual survey of non-institutionalised UK individuals [22]. A stratified, two-  
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49 stage, random sample representative of the socio-demographic profile of the English  
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51 population was recruited using a Postcode Address File. 14,385 adults participated in the  
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53 2007 HSE. The present research excluded individuals aged <18 years and adults with health  
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3 conditions which restricted physical activity. This resulted in 4,491 eligible adults from  
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5 which 2,860 had valid data for knowledge of contemporary (2004) PA guidelines.  
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### 10 11 **2013 Data (after dissemination of current physical activity guidelines)** 12

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14 The 2013 survey was developed using an online survey software and questionnaire tool  
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16 (www.surveymonkey.com). Staff from academic institutions, professional organisations  
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18 (NHS, teaching bodies, trade unions etc.), and those attached to independent businesses were  
19  
20 invited to complete the survey. Of the 2,332 respondents to the 2013 survey; 1,797 provided  
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22 data for unprompted knowledge of current MVPA guidelines. Approval for the study was  
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24 received from the host university ethics committee.  
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### 28 **Measures** 29

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31 The following measures were included on both the 2007 HSE and 2013 survey:  
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34 *Demographic characteristics.* Gender, age, ethnic background, marital status (single,  
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36 married/civil partnership, divorced/separated, widowed), education (highest level),  
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38 employment status (employed, unemployed, retired, student/other economically inactive) and  
39  
40 self-reported health status were assessed.  
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44 The following measures were included on the 2007 HSE:  
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47 *Knowledge.* Participants were asked ‘How many days a week do you think people of  
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49 your age should do physical activity? Include all moderate physical activity, including  
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51 physical activity as part of a job. By week we mean the whole week including weekends.’  
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53 Followed by, ‘On each of the days someone of your age does moderate physical activity, how  
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55 many minutes a day should they do it for it to be good for their health?’ Those who gave an  
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3 answer consistent with contemporary PA guidelines of 30 minutes/day and 5 days/week were  
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5 considered correct [6].  
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8 The following measures were included in the 2013 survey:  
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11 *Knowledge.* In line with previous research participants were first asked '*are you*  
12 *aware that there are physical activity guidelines available for adults [23]?*' Those who  
13 indicated that they were aware were then asked the open-ended question, '*What are the*  
14 *physical activity guidelines?*' To enable comparison to HSE data, only information regarding  
15 duration of PA was included in analysis. Those who gave an answer consistent with current  
16 guidelines of 150 minutes/week were considered correct [8].  
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#### 24 25 **Statistical analysis.** 26

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28 Prevalence rates for UK adults with correct knowledge of MVPA guidelines in 2007 and in  
29 2013 were calculated. Influences of gender, age, ethnicity, marital status, education,  
30 employment status and self-reported health were assessed using chi-squared analysis and  
31 standardised residuals adjusted for multiple comparisons (Bonferroni). Stepwise multiple  
32 logistic regression was used to investigate differences in knowledge between the 2007 HSE  
33 sample and the 2013 survey sample. Variables were selected based on chi-squared analysis,  
34 with significant demographic factors included in the model. IBM SPSS Statistics 19 was used  
35 with alpha set at 0.05.  
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#### 50 **Results** 51

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53 The 2007 HSE sample was: 56% female, 89% white and 63% under 45 years old. 11%  
54 accurately recalled the MVPA recommendation, 46% overestimated and 43% underestimated.  
55 Differences were identified for marital status ( $p < .05$ ), gender ( $p < .005$ ), age ( $p < .001$ ),  
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3 education ( $p<.05$ ) and employment status ( $p<.05$ ) but not for ethnicity ( $p=.21$ ) or self-  
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5 reported health ( $p=.32$ ). Standardised residuals suggested that younger (18-24), unmarried  
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7 adults were more likely to overestimate. Adults with no economic activity (e.g.  
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9 students/retired) and males were less likely to be accurate whereas those with a higher  
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11 education (degree/equivalent) were more likely to have accurate knowledge of PA guidelines.  
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15 The 2013 survey sample was 70% female, 92% white and 57% under 45 years old.  
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17 Without prompting, 18% accurately recalled the current PA recommendation. 82% did not  
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19 know the guideline with 12% overestimating and 14% underestimating. Differences in  
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21 unprompted knowledge were identified for gender ( $p<.001$ ), age ( $p<.05$ ), marital status  
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23 ( $p<.05$ ), employment status ( $p<.05$ ), education ( $p=0.05$ ) and health status ( $p<.005$ ), but not  
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25 for ethnicity ( $p=0.3$ ). Standardised residuals suggested that older males with a lower  
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27 education were more likely to report incorrectly. Younger adults (18-24), students and single  
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29 adults were more likely to recount old guidelines (30 minutes 5 days/week). Knowledge of  
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31 guidelines according to demographic characteristics is shown in table one. Only 66% of  
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33 individuals who recalled MVPA guidelines accurately recalled the intensity of PA that is  
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35 recommended. Of these, the most common descriptor was moderate or moderate-vigorous  
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37 (40%). Inclusion of physiological parameters such as an elevated heart rate was the second  
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39 most commonly used descriptor (23%). The remaining 3% referred to intensity necessary to  
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41 increase fitness, effort/exertion or used walking as an exemplar.  
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47 As gender was found to be an important moderator of knowledge of guidelines and differed  
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49 between groups, a multiple logistic regression model was created to identify whether the  
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51 gender difference accounted for differences in knowledge between 2007 and 2013 samples.  
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53 In this model, adults from the 2007 HSE sample were significantly less likely to accurately  
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55 recall MVPA guidelines ( $p<.001$ , OR=.58). Females were significantly more likely to be  
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57 knowledgeable ( $p<.05$ , OR=1.38). Education and employment status were then added to the  
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3 model. The difference between samples remained significant ( $p < .005$  OR=.72). Only gender  
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5 ( $p < .001$ ) and education ( $p < .001$ ) moderated the relationship between samples (2007 and 2013)  
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7 and knowledge, accounting for 38% of the variance in knowledge of guidelines. In this model  
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9 males (OR=.70) and those with the lowest education (OR=.57) were less likely to  
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11 demonstrate accurate knowledge of guidelines.  
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## 14 **Discussion**

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17 Results indicate that knowledge of PA guidelines has improved (11% to 18%) since  
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19 guidelines were updated in 2010. However, in 2013, still only 18% of adult's accurately  
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21 recounted recommendations (when only duration was considered). This drops to 11% when  
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23 only the adults who provided an appropriate description of intensity are considered. This is  
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25 disappointing as improved knowledge of PA guidelines within the adult population would  
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27 represent an initial step towards positive behaviour change. While knowledge alone is  
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29 unlikely to stimulate behaviour change, awareness of the required behaviour is a determinant  
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31 of behaviour change [24]. The PAPM suggests that individuals are unlikely to change their  
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33 behaviour unless they become aware that their behaviour is not optimal [14]. Compared with  
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35 2007, adults in 2013 do not appear to be better educated regarding MVPA recommendations.  
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38 Mass-media campaigns are currently used to improve the provision of health information to  
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40 the general public. The release of the most recent guidelines in 2010 was promoted by the  
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42 Department of Health campaign Change4Life. Change4Life had a £75 million budget for  
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44 social marketing to promote five key health behaviours, one of which was physical activity  
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46 [25]. Early publications from this campaign suggest it achieved high visibility and recall of  
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48 its messages within target populations [25, 26]. While knowledge does appear to be moving  
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50 in the right direction (at least for duration of MVPA), better results were expected in light of  
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52 the promotional efforts which have supported current guidelines. Inconsistency of messaging  
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3 from Change4Life and other campaigns may create confusion and lead to inaccurate  
4 responses. Pigin has previously identified contradictory messages presented by different  
5 Change4Life informational materials [27]. Indeed, a search of PA campaign messages  
6 released since 2010 uncover various messages which could be perceived as inconsistent. For  
7 example, a Change4Life newsletter released in November 2011 stated '*Get going every day*  
8 *for 10, 20 or 30 minutes*' while an advert released only a few months previously for  
9 MacMillan's Move More campaign suggested, '*Just a short walk can help...*' For World  
10 Physical Activity Day 2011 a Coca Cola sponsored advert reads '*all this* [health benefits]  
11 *with just 30 minutes of physical activity every day.*' Some campaigns have also failed to  
12 update their messages in line with the update in recommendations. The Get A Life, Get  
13 Active campaign website homepage has not updated its message since 2009 and still states  
14 '30 minutes on most days for adults'. Indeed, 9% of adults from the 2013 sample reported the  
15 old guideline (2004-2010) when asked to recall the current guideline (2010). While the  
16 aforementioned messages are not necessarily incorrect if the aim is to promote PA generally,  
17 campaigns need to become more coherent if the strategy is to improve knowledge of  
18 guidelines. Indeed, the unification of US, UK and global PA guidelines will be undermined if  
19 the messages which follow are isolated and random [7-9]. The failure of PA campaigns to  
20 disseminate consistent messages, both between each other and between various arms within  
21 their own campaigns, may have led to misinformation and confusion for many adults.  
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46 In addition to the continuing lack of education pertaining to the guidelines, the present  
47 research highlights two areas of concern. Firstly, disparities in health knowledge continue to  
48 be evident. In both the 2007 and 2013 samples those with lower education, lower  
49 employment status and older adults were less likely to know PA guidelines. The Chief  
50 Medical Officers voiced concerns regarding the disproportionately low involvement in PA of  
51 disadvantaged groups in society [28]. Improved provision of information and opportunities  
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3 for these groups to engage in PA was a target of the government backed campaigns  
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5 Change4Life and HealthyPeople [29, 30]. Despite these pledges, PA campaigns appear to  
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7 have been less successful in reaching these groups. Strategies to educate and reach  
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9 disadvantaged groups within society, especially those with a low education or SES, are  
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11 urgently required. Secondly, adults generally consider only the duration component of PA  
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13 recommendations. While the 2007 HSE sample were asked specifically for the recommended  
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15 duration of PA, the 2013 survey sample was asked an open question which allowed them to  
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17 include any aspects of the guidelines of which they were aware. Despite this, only 11% of  
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19 adults included an appropriate descriptor of intensity. Even when adults were prompted to  
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21 provide a descriptor of intensity, only 13% did so. Only 2% provided a physiological  
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23 parameter which could be practically used to monitor intensity. In recent years there has been  
24  
25 a rise in the number of campaigns promoting lifestyle activities, especially walking, as a  
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27 proxy for MVPA. While walking is undoubtedly an accessible and appropriate form of PA,  
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29 the intensity of walking varies greatly within the population. Brisk walking is promoted by  
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31 many PA campaigns as an example of MVPA, but in actuality, the walking performed by  
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33 many is less than brisk [31, 32]. While such campaigns may increase the perceived  
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35 accessibility of PA and cater to adults' PA preferences [33], they often fail to educate  
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37 individuals about the necessity for PA to be effortful in order to induce health benefits. It is  
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39 possible that a lack of knowledge regarding intensity requirements may result in adults  
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41 engaging in more PA of low intensity but not sufficient PA to meet guidelines. In addition,  
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43 adults may struggle to see the difference between their own current behaviours and the  
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45 behaviour being promoted. The PAPM suggests that individuals need to be aware that their  
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47 actual behaviour is different from the desired behaviour and that this may put their health at  
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49 risk [14]. Awareness of personal risk behaviour is especially important to proceed from pre-  
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51 contemplation to contemplating behaviour change. Based on the PAPM, it can be expected  
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3 that people may only proceed to contemplation when they become aware that they engage in  
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5 too little physical activity or that their PA is not of a sufficient intensity. With the emergence  
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7 of alternative strategies to improve health, for example, by breaking up sedentary time or  
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9 increasing light activity, the difference between actual and desired behaviour becomes less  
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11 obvious. The benefits of engaging in more light activity and of reducing or breaking up  
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13 sedentary time are evident [34-36]. Guidelines regarding sedentary behaviour have already  
14  
15 been developed in Canada and Australia and current UK PA guidelines recommend  
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17 developing sedentary behaviour guidelines as a priority [8, 37, 38]. The various discourses  
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19 surrounding PA and health may cloud directives to the lay population (i.e. 'is desirable  
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21 behaviour to be less sedentary, or to be more active, or to do more MVPA?'). While research  
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23 across the intensity continuum of PA is rapidly increasing, transmitting such knowledge to  
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25 the general population may require more complex messages but an understanding of how to  
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27 effectively develop such messages lags behind.  
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33 Knowledge of guidelines was low in the present study (i.e. 325 of 1,797 adults knew  
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35 the duration component of MVPA guidelines); however, this is more than reported for  
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37 American adults, where less than 1% knew PA guidelines when surveyed in 2009 (N=4,281)  
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39 [20]. There are two possible reasons why knowledge was higher in the present study. Firstly,  
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41 in this study, the PA guideline had been consistent for at least three years prior to both  
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43 samples completing their respective surveys. In the American study, only 10 months  
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45 separated dissemination of a changed guideline and completion of the survey. Indeed, 33.3%  
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47 of American adults selected the old 30 minute 5 days per week guideline relative to 9% in the  
48  
49 present study [20]. In addition, the American survey employed a closed question with six  
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51 response options. Two of these were correct according to old guidelines. Prompting from  
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53 these response options may have triggered more incorrect responses.  
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## Conclusions

The present study identified knowledge of PA recommendations in two large UK adult samples from 2007 and 2013. Results indicate that knowledge of guidelines has slightly improved. This study has implications for future promotional campaigns. Messages need to be developed to target individuals with lower education and employment status. In addition, further research is needed to develop an effective strategy for promoting more comprehensive educational messages related to PA guidelines. Campaigns need to straddle the thin line between messages which capture awareness, and are informational and motivational. In the present study, only 2% of adults acknowledged that PA should be effortful. Intensity is an important aspect of health-enhancing PA and should not be neglected by PA campaigns. Increasing understanding of the intensity continuum will likely result in a broader range of PA being included in PA media campaigns. Messages from these campaigns need to work in synergy to ensure effective communication of the benefits of the various forms of accumulating PA.

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None

**Competing Interests**

None

**Contributorship**

EK initiated the study, designed the data collection tools (2013 survey), monitored data collection for the 2013 sample, planned the statistical analysis, cleaned and analysed the data for the whole study and drafted and revised the paper. She is guarantor.

DE revised the draft paper

SB revised the draft paper

LS revised the data collection tools (2013 survey) and revised the draft paper

**Data sharing**

HSE 2007 data is available open-access from the ESDS website at:

<http://www.esds.ac.uk/findingData/hseTitles.asp>



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35 Table one. Proportions of adults who were aware of guidelines and had accurate knowledge of  
36 guidelines in the HSE 2007 and 2013 Survey, stratified according to demographic group  
37

	HSE 2007		Survey 2013	
	Accurate Knowledge of guidelines		Accurate Knowledge of guidelines	
	%	N	%	N
<b>Total</b>	11%	2860	18%	1797
<b>Gender</b>				
male	9.3%	1239	15.2%	540
female	12.2%*	1621	19.4%*	1250
<b>Ethnicity</b>				
White	10.7%	2550	18.6%	1670
Mixed	16.7%	42	14.8%	27
Asian/Asian British	13.1%	153	18.2%	44
Black/Black British	13.8%	80	5.9%	17
Chinese/Other ethnic group	5.9%	34	5.1%	39
<b>Age</b>				
18-24	11.5%	349	21.2%	203
25-34	13.6%	633	17.6%	393
35-44	11%	789	20.7%	421

<b>45-54</b>	9.9%	616	17.5%	452
<b>55+</b>	8.2%	473	14%	322
<b>Employment Status</b>				
<b>employed</b>	11.9%*	2210	17.7%	1483
<b>unemployed</b>	9.5%	137	11.5%	26
<b>retired</b>	8.1%	136	14.3%	14
<b>other economically inactive</b>	6.9%	376	22.1%	244
<b>Highest Education Level</b>				
<b>degree</b>	13.2%*	893	19.1%*	1569
<b>vocational/ technical</b>	9.5%	359	7.4%	94
<b>some college/sixth form</b>	11.7%	497	13.3%	98
<b>finished secondary school</b>	9.1%	776	12.5%	18
<b>some secondary school</b>	9.3%	332	50%	2
<b>Marital Status</b>				
<b>single</b>	11.6%	925	17.6%	665
<b>married/civil partnership</b>	10.5%	1590	18.5%	932
<b>divorced/separated</b>	12.3%	302	14.7%	143
<b>widowed</b>	4.7%	43	34.8%	23
<b>Self-rated health</b>				
<b>good</b>	11.1%	1284	20.3%	576
<b>rather good</b>	10.5%	1251	20.0%	544
<b>average</b>	11.2%	303	14.5%	530
<b>rather poor</b>	27.8%	18	11.4%	123
<b>poor</b>	100%	2	33.3%	24

\* standardised residual indicates greater probability of accurate awareness or knowledge of guidelines within this category.



**Lack of Knowledge of Physical Activity Guidelines: Can Physical Activity Promotion Campaigns Do Better?**

Journal:	<i>BMJ Open</i>
Manuscript ID:	bmjopen-2013-003633.R1
Article Type:	Research
Date Submitted by the Author:	04-Oct-2013
Complete List of Authors:	Knox, Emily; Loughborough University, Eslinger, Dale; Loughborough University, Sport, Exercise and Health Sciences; NIHR, Diet Lifestyle and Physical Activity Biomedical Research Unit Biddle, Stuart; Loughborough University, Sport, Exercise and Health Sciences; NIHR, Diet Lifestyle and Physical Activity Biomedical Research Unit Sherar, Lauren; Loughborough University, Sport, Exercise and Health Sciences
<b>Primary Subject Heading</b>:	Public health
Secondary Subject Heading:	Health informatics
Keywords:	Protocols & guidelines < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, PREVENTIVE MEDICINE, PUBLIC HEALTH

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56 Word Count: 2,909896  
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3 Objectives: To identify the prevalence of knowledge of the current UK physical activity  
4 guidelines which were introduced in 2010 and prior physical activity guidelines (30 minutes  
5 on 5 days each week) within two large samples of UK adult's. To investigate whether  
6 knowledge of physical activity guidelines differs according to demographics such as ethnicity,  
7 age, education and employment status.  
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14 Design: Descriptive cross-sectional study comparing two distinctive adult samples.  
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17 Setting: National survey and online-administered survey conducted in England.  
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20 Participants: The 2007 Health Survey for England provides data on knowledge of physical  
21 activity guidelines from 2,860 UK adults (56% female, 89% white, 63% under 45 years old).  
22 In 2013 an online survey was disseminated and collected data from 1,797 UK adults on  
23 knowledge of the most recent physical activity guidelines. The 2013 sample was 70% female,  
24 92% white, 57% under 45 years old. All adults in both samples were >18 years old and  
25 without illnesses/disorders likely to restrict physical activity.  
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34 Main Outcomes: Knowledge of physical activity guidelines in 2007 and 2013. Demographic  
35 influences on knowledge of physical activity guidelines.  
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40 Results: 18% of the 2013 sample accurately recalled current physical activity guidelines  
41 relative to 11% of the 2007 sample who accurately recalled the previous guidelines.  
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43 Differences in knowledge of physical activity guidelines existed for marital status, gender,  
44 age, education and employment status within both 2007 and 2013 samples ( $p < .05$ ). Males  
45 with lower education and employment status and older adults were less likely to know  
46 physical activity guidelines ( $p < .05$ ). Knowledge of physical activity guidelines remained  
47 higher in the 2013 sample after controlling for demographic differences ( $p < .05$ ).  
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3 Conclusions: Disadvantaged population groups are less knowledgeable about physical  
4 activity guidelines. Although knowledge of physical activity guidelines appears to have  
5 increased in recent years demographic disparities are still evident. Efforts are needed to  
6 promote health information amongst these groups.  
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## 11 12 13 14 15 16 **Article Summary**

### 17 18 **Article Focus**

- 19 - What was the prevalence of knowledge of physical activity guidelines in 2007?
- 20
- 21 - How did knowledge of physical activity guidelines change after being updated in 2010?
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- 23 - Which demographic factors (gender, age, employment status, education and health) appear
- 24 to influence knowledge of physical activity guidelines?
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### 32 33 **Key Messages**

- 34 - The Department of Health has invested large amounts of money into the promotion of
- 35 physical activity guidelines since the introduction of new guidelines in 2010.
- 36  
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38 - Knowledge of current physical activity guidelines within the UK adult population is not
- 39 known.
- 40  
41 - It is important to gauge current knowledge and demographic influences on knowledge in
- 42 order to improve promotion of physical activity guidelines by informational campaigns.
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### 51 52 **Strengths and Limitations**

- 53 - The present study is limited because of differences between the two surveys. HSE 2007 was
- 54 delivered via face-to-face interviews whereas the 2013 survey was delivered online.
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3 Furthermore, convenience sampling was used for the 2013 survey with an over-representation  
4 of females and employed adults. However, other demographic variables, including ethnicity  
5 and age, were similar between the surveys, whilst employment status and age were  
6  
7 statistically controlled for and did not influence our outcomes. We therefore believe that  
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9 comparisons between both surveys are valid. In addition, the large sample size strengthens  
10  
11 the present research.  
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20 This research received no specific grant from any funding agency in the public, commercial  
21 or not-for-profit sectors.  
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### 28 **Competing Interests**

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31 None declared  
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### 37 **Background**

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40 Physical activity (PA) reduces the risk of morbidity and mortality from chronic  
41 diseases [1]. Increasing evidence of the importance of PA to health has led to the promotion  
42 of a 'PA is Medicine' agenda and calls for global PA policies [2, 3].  
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48 In 1975 the first form of PA recommendations for adults were released in the United  
49 States (US) by the American College of Sports Medicine [4]. By 1995, American adults were  
50 being advised to accumulate at least 30 minutes of moderate-to-vigorous PA (MVPA), on  
51 preferably all days, each week [5]. In 1996 in England, the Department of Health followed  
52 similar guidelines from the ACSM and recommended 30 minutes of MVPA on at least 5 days  
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3 a week [6]. Over the past few years, there has been a shift within the UK and globally  
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5 towards more uniform guidelines. In 2008, the first PA guidelines for Americans to be issued  
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7 by Federal government were published following a comprehensive review of the scientific  
8  
9 data by experts in the field. These guidelines were the first to state recommendations  
10  
11 specifically as 150 minutes a week of MVPA [7]. Previously, guidelines in the UK had been  
12  
13 disseminated separately by health agencies within each home country. In 2010 the four UK  
14  
15 Chief Medical Officers published the first UK-wide PA guidelines [8]. This document  
16  
17 followed the lead of the US guidelines and reported the new adult guidelines of 150 minutes a  
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19 week of MVPA. This format was also used in global PA guidelines issued by the World  
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21 Health Organisation [9].  
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26 Changes in the guidelines have also been reflected in the messages of the various  
27  
28 coinciding campaigns e.g. *'Every small step is... a way to get 30 minutes'* (Get A Life, Get  
29  
30 Active launched in Northern Ireland in 1999 [10]) and *'Get going for 150 minutes a week'*  
31  
32 (Change4Life launched across the UK in 2009 [11]). The purpose of these campaigns is to  
33  
34 encourage adults to reach or exceed most current PA guidelines.  
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38 In 2008, only ~5% of UK and US adults engaged in enough MVPA to meet  
39  
40 recommendations [12, 13]. Theories such as the Precaution Adoption Process model (PAPM)  
41  
42 and Protection Motivation Theory suggest that individuals must be accurately aware of their  
43  
44 current actions [14-16], such as through self-monitoring [17], in light of alternative and  
45  
46 desired actions to be able to initiate change i.e. I *do* this much MVPA but this much MVPA is  
47  
48 *recommended*. In addition, the Department of Health strategic framework 'Ambitions for  
49  
50 Health' details a strategy to embed informative social marketing campaigns within health  
51  
52 behaviour change campaigns [18]. It would therefore be beneficial to investigate **knowledge**  
53  
54 of MVPA guidelines within the broad UK adult population before and after the long-standing  
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56 guidelines of 30 minutes on 5 days a week were updated with 150 minutes a week, in 2010.  
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3 Chaudhury and Shelton found that only 5% of UK adults aged 60-64 (N=561) accurately  
4 recalled the general MVPA guideline in 2007 [19]. Less than 1% of adults (N=4,281)  
5  
6 selected the correct guideline from a list of six options in a recent US survey [20]. Those with  
7  
8 a lower educational level also demonstrated lesser knowledge of guidelines. This research,  
9  
10 however, does not give an indication of unprompted knowledge which may be a more  
11  
12 powerful influence on behaviour change [21].  
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17 The objectives for this study weare 1) to compare knowledge of current UK MVPA  
18 guidelines for adults (3 years after their introduction in 2010) with knowledge of prior MVPA  
19 guidelines (2004 up until 2010) in two large samples of adults, 2) to identify whether  
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21 demographic characteristics such as, gender, age and SES, influence knowledge of PA  
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23 guidelines at either time-point.  
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## 32 **Methods**

### 33 **Survey and analytical sample.**

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35 Data were analysed from the 2007 Health Survey for England (HSE) and an online survey  
36  
37 disseminated in 2013.  
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### 46 **2007 Data (before dissemination of current physical activity guidelines)**

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48 The HSE is an annual survey of non-institutionalised UK individuals [22]. A stratified, two-  
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50 stage, random sample representative of the socio-demographic profile of the English  
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52 population was recruited using a Postcode Address File. 14,385 adults participated in the  
53  
54 2007 HSE. The present research excluded individuals aged <18 years and adults with health  
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3 conditions which restricted physical activity. This resulted in 4,491 eligible adults from  
4  
5 which 2,860 had valid data for knowledge of contemporary (2004) PA guidelines.  
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### 10 11 **2013 Data (after dissemination of current physical activity guidelines)** 12

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14 The 2013 survey was developed using an online survey software and questionnaire tool  
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16 (www.surveymonkey.com). Staff from academic institutions, professional organisations ([the](#)  
17  
18 [UK National Health Service \[NHS\]](#), teaching bodies, trade unions etc.), and those attached to  
19  
20 independent businesses were invited to complete the survey. Of the 2,332 respondents to the  
21  
22 2013 survey; 1,797 provided data for unprompted knowledge of current MVPA guidelines.  
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24 Approval for the study was received from the host university ethics committee.  
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### 27 28 **Measures** 29

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31 The following measures were included on both the 2007 HSE and 2013 survey:  
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34 *Demographic characteristics.* Gender, age, ethnic background, marital status (single,  
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36 married/civil partnership, divorced/separated, widowed), education (highest level),  
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38 employment status (employed, unemployed, retired, student/other economically inactive) and  
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40 self-reported health status were assessed.  
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44 The following measures were included on the 2007 HSE:  
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47 *Knowledge.* Participants were asked ‘*How many days a week do you think people of*  
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49 *your age should do physical activity? Include all moderate physical activity, including*  
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51 *physical activity as part of a job. By week we mean the whole week including weekends.*’  
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54 Followed by, ‘*On each of the days someone of your age does moderate physical activity, how*  
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56 *many minutes a day should they do it for it to be good for their health?*’ Those who gave an  
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3 answer consistent with contemporary PA guidelines of 30 minutes/day and 5 days/week were  
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5 considered correct [6].  
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8 The following measures were included in the 2013 survey:  
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10  
11 *Knowledge.* In line with previous research participants were first asked '*are you*  
12 *aware that there are physical activity guidelines available for adults [23]?*' Those who  
13 indicated that they were aware were then asked the open-ended question, '*What are the*  
14 *physical activity guidelines?*' To enable comparison to HSE data, only information regarding  
15 duration of PA was included in analysis. Those who gave an answer consistent with current  
16 guidelines of 150 minutes/week were considered correct [8].  
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#### 24 25 **Statistical analysis.** 26

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28 Prevalence rates for UK adults with correct knowledge of MVPA guidelines in 2007 and in  
29 2013 were calculated. Influences of gender, age, ethnicity, marital status, education,  
30 employment status and self-reported health were assessed using chi-squared analysis and  
31 standardised residuals adjusted for multiple comparisons (Bonferroni). Stepwise multiple  
32 logistic regression was used to investigate differences in knowledge between the 2007 HSE  
33 sample and the 2013 survey sample. Variables were selected based on chi-squared analysis,  
34 with significant demographic factors included in the model. IBM SPSS Statistics 19 was used  
35 with alpha set at 0.05.  
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#### 50 **Results** 51

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53 The 2007 HSE sample was: 56% female, 89% white and 63% under 45 years old. 11%  
54 accurately recalled the MVPA recommendation, 46% overestimated and 43% underestimated.  
55 Differences were identified for marital status ( $p < .05$ ), gender ( $p < .005$ ), age ( $p < .001$ ),  
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3 education ( $p<.05$ ) and employment status ( $p<.05$ ) but not for ethnicity ( $p=.21$ ) or self-  
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5 reported health ( $p=.32$ ). Standardised residuals suggested that younger (18-24), unmarried  
6  
7 adults were more likely to overestimate. Adults with no economic activity (e.g.  
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9 students/retired) and males were less likely to be accurate whereas those with a higher  
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11 education (degree/equivalent) were more likely to have accurate knowledge of PA guidelines.  
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15 The 2013 survey sample was 70% female, 92% white and 57% under 45 years old.  
16  
17 Without prompting, 18% accurately recalled the current PA recommendation. 82% did not  
18  
19 know the guideline with 12% overestimating and 14% underestimating. Differences in  
20  
21 unprompted knowledge were identified for gender ( $p<.001$ ), age ( $p<.05$ ), marital status  
22  
23 ( $p<.05$ ), employment status ( $p<.05$ ), education ( $p=0.05$ ) and health status ( $p<.005$ ), but not  
24  
25 for ethnicity ( $p=0.3$ ). Standardised residuals suggested that older males with a lower  
26  
27 education were more likely to report incorrectly. Younger adults (18-24), students and single  
28  
29 adults were more likely to recount old guidelines (30 minutes 5 days/week). Knowledge of  
30  
31 guidelines according to demographic characteristics is shown in table one. Only 66% of  
32  
33 individuals who recalled MVPA guidelines accurately recalled the intensity of PA that is  
34  
35 recommended. Of these, the most common descriptor was moderate or moderate-vigorous  
36  
37 (40%). Inclusion of physiological parameters such as an elevated heart rate was the second  
38  
39 most commonly used descriptor (23%). The remaining 3% referred to intensity necessary to  
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41 increase fitness, effort/exertion or used walking as an exemplar.  
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47 As gender was found to be an important moderator of knowledge of guidelines and differed  
48  
49 between groups, a multiple logistic regression model was created to identify whether the  
50  
51 gender difference accounted for differences in knowledge between 2007 and 2013 samples.  
52  
53 In this model, adults from the 2007 HSE sample were significantly less likely to accurately  
54  
55 recall MVPA guidelines ( $p<.001$ , OR=.58). Females were significantly more likely to be  
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57 knowledgeable ( $p<.05$ , OR=1.38). Education and employment status were then added to the  
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3 model. The difference between samples remained significant ( $p < .005$  OR=.72). Only gender  
4  
5 ( $p < .001$ ) and education ( $p < .001$ ) moderated the relationship between samples (2007 and 2013)  
6  
7 and knowledge, accounting for 38% of the variance in knowledge of guidelines. In this model  
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9 males (OR=.70) and those with the lowest education (OR=.57) were less likely to  
10  
11 demonstrate accurate knowledge of guidelines.  
12

### 13 14 15 **Discussion**

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18 Results indicate that knowledge of PA guidelines has improved (11% to 18%) since  
19  
20 guidelines were updated in 2010. However, in 2013, still only 18% of adult's accurately  
21  
22 recounted recommendations (when only duration was considered). This drops to 11% when  
23  
24 only the adults who provided an appropriate description of intensity are considered. This is  
25  
26 disappointing as improved knowledge of PA guidelines within the adult population would  
27  
28 represent an initial step towards positive behaviour change. While knowledge alone is  
29  
30 unlikely to stimulate behaviour change, awareness of the required behaviour is a determinant  
31  
32 of behaviour change [24]. The PAPM suggests that individuals are unlikely to change their  
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34 behaviour unless they become aware that their behaviour is not optimal [14]. Compared with  
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36 2007, adults in 2013 do not appear to be better educated regarding MVPA recommendations.  
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40 Mass-media campaigns are currently used to improve the provision of health information to  
41  
42 the general public. The release of the most recent guidelines in 2010 was promoted by the  
43  
44 Department of Health campaign Change4Life. Change4Life had a £75 million budget for  
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46 social marketing to promote five key health behaviours, one of which was physical activity  
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48 [25]. Early publications from this campaign suggest it achieved high visibility and recall of  
49  
50 its messages within target populations [25, 26]. While knowledge does appear to be moving  
51  
52 in the right direction (at least for duration of MVPA), better results were expected in light of  
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54 the promotional efforts which have supported current guidelines. Inconsistency of messaging  
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3 from Change4Life and other campaigns may create confusion and lead to inaccurate  
4 responses. Piggan has previously identified contradictory messages presented by different  
5 Change4Life informational materials [27]. Indeed, a search of PA campaign messages  
6 released since 2010 uncover various messages which could be perceived as inconsistent. For  
7 example, a Change4Life newsletter released in November 2011 stated '*Get going every day*  
8 *for 10, 20 or 30 minutes*' while an advert released only a few months previously for  
9 MacMillan's Move More campaign suggested, '*Just a short walk can help...*' For World  
10 Physical Activity Day 2011 a Coca Cola sponsored advert reads '*all this* [health benefits]  
11 *with just 30 minutes of physical activity every day.*' Some campaigns have also failed to  
12 update their messages in line with the update in recommendations. The Get A Life, Get  
13 Active campaign website homepage has not updated its message since 2009 and still states  
14 '30 minutes on most days for adults'. Indeed, 9% of adults from the 2013 sample reported the  
15 old guideline (2004-2010) when asked to recall the current guideline (2010). While the  
16 aforementioned messages are not necessarily incorrect if the aim is to promote PA generally,  
17 campaigns need to become more coherent if the strategy is to improve knowledge of  
18 guidelines. Indeed, the unification of US, UK and global PA guidelines will be undermined if  
19 the messages which follow are isolated and random [7-9]. The failure of PA campaigns to  
20 disseminate consistent messages, both between each other and between various arms within  
21 their own campaigns, may have led to misinformation and confusion for many adults.  
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46 In addition to the continuing lack of education pertaining to the guidelines, the present  
47 research highlights two areas of concern. Firstly, disparities in health knowledge continue to  
48 be evident. In both the 2007 and 2013 samples those with lower education, lower  
49 employment status and older adults were less likely to know PA guidelines. The Chief  
50 Medical Officers voiced concerns regarding the disproportionately low involvement in PA of  
51 disadvantaged groups in society [28]. Improved provision of information and opportunities  
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3 for these groups to engage in PA was a target of the government backed campaigns  
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5 Change4Life and HealthyPeople [29, 30]. Despite these pledges, PA campaigns appear to  
6  
7 have been less successful in reaching these groups. Strategies to educate and reach  
8  
9 disadvantaged groups within society, especially those with a low education or SES, are  
10  
11 urgently required. Secondly, adults generally consider only the duration component of PA  
12  
13 recommendations. While the 2007 HSE sample were asked specifically for the recommended  
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15 duration of PA, the 2013 survey sample was asked an open question which allowed them to  
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17 include any aspects of the guidelines of which they were aware. Despite this, only 11% of  
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19 adults included an appropriate descriptor of intensity. Even when adults were prompted to  
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21 provide a descriptor of intensity, only 13% did so. Only 2% provided a physiological  
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23 parameter which could be practically used to monitor intensity.  
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28        In recent years there has been a rise in the number of campaigns promoting lifestyle  
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30 activities, especially walking, as a proxy for MVPA. While walking is undoubtedly an  
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32 accessible and appropriate form of PA, the intensity of walking varies greatly within the  
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34 population. Brisk walking is promoted by many PA campaigns as an example of MVPA, but  
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36 in actuality, the walking performed by many is less than brisk [31, 32]. While such  
37  
38 campaigns may increase the perceived accessibility of PA and cater to adults' PA preferences  
39  
40 [33], they often fail to educate individuals about the necessity for PA to be effortful in order  
41  
42 to induce health benefits. It is possible that a lack of knowledge regarding intensity  
43  
44 requirements may result in adults engaging in more PA of low intensity but not sufficient PA  
45  
46 to meet guidelines. In addition, adults may struggle to see the difference between their own  
47  
48 current behaviours and the behaviour being promoted. The PAPM suggests that individuals  
49  
50 need to be aware that their actual behaviour is different from the desired behaviour and that  
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52 this may put their health at risk [14]. Awareness of personal risk behaviour is especially  
53  
54 important to proceed from pre-contemplation to contemplating behaviour change. Based on  
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3 the PAPM, it can be expected that people may only proceed to contemplation when they  
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5 become aware that they engage in too little physical activity or that their PA is not of a  
6  
7 sufficient intensity. With the emergence of alternative strategies to improve health, for  
8  
9 example, by breaking up sedentary time or increasing light activity, the difference between  
10  
11 actual and desired behaviour becomes less obvious. The benefits of engaging in more light  
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13 activity and of reducing or breaking up sedentary time are evident [34-36]. Guidelines  
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15 regarding sedentary behaviour have already been developed in Canada and Australia and  
16  
17 current UK PA guidelines recommend developing sedentary behaviour guidelines as a  
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19 priority [8, 37, 38]. The various discourses surrounding PA and health may cloud directives  
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21 to the lay population (i.e. ‘is desirable behaviour to be less sedentary, or to be more active, or  
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23 to do more MVPA?’). While research across the intensity continuum of PA is rapidly  
24  
25 increasing, transmitting such knowledge to the general population may require more complex  
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27 messages but an understanding of how to effectively develop such messages lags behind.  
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33 Knowledge of guidelines was low in the present study (i.e. 325 of 1,797 adults knew  
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35 the duration component of MVPA guidelines); however, this is more than reported for  
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37 American adults, where less than 1% knew PA guidelines when surveyed in 2009 (N=4,281)  
38  
39 [20]. There are two possible reasons why knowledge was higher in the present study. Firstly,  
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41 in this study, the PA guideline had been consistent for at least three years prior to both  
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43 samples completing their respective surveys. In the American study, only 10 months  
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45 separated dissemination of a changed guideline and completion of the survey. Indeed, 33.3%  
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47 of American adults selected the old 30 minute 5 days per week guideline relative to 9% in the  
48  
49 present study [20]. In addition, the American survey employed a closed question with six  
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51 response options. Two of these were correct according to old guidelines. Prompting from  
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53 these response options may have triggered more incorrect responses.  
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## Conclusions

The present study identified knowledge of PA recommendations in two large UK adult samples from 2007 and 2013. Results indicate that knowledge of guidelines has slightly improved. This study has implications for future promotional campaigns. Messages need to be developed to target individuals with lower education and employment status. In addition, further research is needed to develop an effective strategy for promoting more comprehensive educational messages related to PA guidelines. Campaigns need to straddle the thin line between messages which capture awareness, and are informational and motivational. In the present study, only 2% of adults acknowledged that PA should be effortful. Intensity is an important aspect of health-enhancing PA and should not be neglected by PA campaigns. Increasing understanding of the intensity continuum will likely result in a broader range of PA being included in PA media campaigns. Messages from these campaigns need to work in synergy to ensure effective communication of the benefits of the various forms of accumulating PA.

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Table one. Proportions of adults who were aware of guidelines and had accurate knowledge of guidelines in the HSE 2007 and 2013 Survey, stratified according to demographic group

	HSE 2007		Survey 2013	
	Accurate Knowledge of guidelines		Accurate Knowledge of guidelines	
	%	N	%	N
<b>Total</b>	11%	2860	18%	1797
<b>Gender</b>				
male	9.3%	1239	15.2%	540
female	12.2%*	1621	19.4%*	1250
<b>Ethnicity</b>				
White	10.7%	2550	18.6%	1670
Mixed	16.7%	42	14.8%	27
Asian/Asian British	13.1%	153	18.2%	44
Black/Black British	13.8%	80	5.9%	17
Chinese/Other ethnic group	5.9%	34	5.1%	39
<b>Age (years)</b>				
18-24	11.5%	349	21.2%	203
25-34	13.6%	633	17.6%	393
35-44	11%	789	20.7%	421
45-54	9.9%	616	17.5%	452
55+	8.2%	473	14%	322
<b>Employment Status</b>				
employed	11.9%*	2210	17.7%	1483
unemployed	9.5%	137	11.5%	26
retired	8.1%	136	14.3%	14
other economically inactive	6.9%	376	22.1%	244
<b>Highest Education Level</b>				
degree	13.2%*	893	19.1%*	1569
vocational/ technical	9.5%	359	7.4%	94
some college/sixth form	11.7%	497	13.3%	98
finished secondary school	9.1%	776	12.5%	18
some secondary school	9.3%	332	50%	2
<b>Marital Status</b>				
single	11.6%	925	17.6%	665
married/civil partnership	10.5%	1590	18.5%	932
divorced/separated	12.3%	302	14.7%	143
widowed	4.7%	43	34.8%	23
<b>Self-rated health</b>				
good	11.1%	1284	20.3%	576
rather good	10.5%	1251	20.0%	544
average	11.2%	303	14.5%	530
rather poor	27.8%	18	11.4%	123
poor	100%	2	33.3%	24

\* standardised residual indicates greater probability of accurate awareness or knowledge of guidelines within this category.

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For peer review only

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3 **Lack of Knowledge of Physical Activity Guidelines: Can Physical Activity**  
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5 **Promotion Campaigns Do Better?**  
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53 Keywords: physical activity, guidelines, knowledge, health, demographic disparities  
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3 Word Count: 2,906  
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6 Objectives: To identify the prevalence of knowledge of the current UK physical activity  
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8 guidelines which were introduced in 2011 and prior physical activity guidelines (30 minutes  
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10 on 5 days each week) within two large samples of UK adult's. To investigate whether  
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12 knowledge of physical activity guidelines differs according to demographics such as ethnicity,  
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14 age, education and employment status.  
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17 Design: Descriptive cross-sectional study comparing two distinctive adult samples.  
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20 Setting: National survey and online-administered survey conducted in England.  
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23 Participants: The 2007 Health Survey for England provides data on knowledge of physical  
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25 activity guidelines from 2,860 UK adults (56% female, 89% white, 63% under 45 years old).  
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28 In 2013 an online survey was disseminated and collected data from 1,797 UK adults on  
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30 knowledge of the most recent physical activity guidelines. The 2013 sample was 70% female,  
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32 92% white, 57% under 45 years old. All adults in both samples were >18 years old and  
33  
34 without illnesses/disorders likely to restrict physical activity.  
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36  
37 Main Outcomes: Knowledge of physical activity guidelines in 2007 and 2013. Demographic  
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39 correlates of knowledge of physical activity guidelines.  
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42 Results: 18% of the 2013 sample accurately recalled current physical activity guidelines  
43  
44 compared to 11% of the 2007 sample who accurately recalled the previous guidelines.  
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47 Differences in knowledge of physical activity guidelines existed for marital status, gender,  
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49 age, education and employment status within both 2007 and 2013 samples ( $p<.05$ ). Males  
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51 with lower education and employment status (unemployed including student and retired) and  
52  
53 older adults were less likely to know physical activity guidelines ( $p<.05$ ). Knowledge of  
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3 physical activity guidelines remained higher in the 2013 sample after controlling for  
4  
5 demographic differences ( $p < .05$ ).  
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8 Conclusions: Disadvantaged population groups are less knowledgeable about physical  
9  
10 activity guidelines. Although knowledge of physical activity guidelines appears to have  
11  
12 increased in recent years demographic disparities are still evident. Efforts are needed to  
13  
14 promote health information among these groups.  
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### 17 18 19 20 21 **Article Summary**

#### 22 23 24 **Article Focus**

- 25  
26  
27 - What was the prevalence of knowledge of physical activity guidelines in 2007?
- 28  
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30 - How did knowledge of physical activity guidelines change after being updated in 2011?
- 31  
32  
33 - Which demographic factors (i.e. gender, age, employment status, education and health)  
34  
35 appear to influence knowledge of physical activity guidelines?  
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#### 38 39 40 **Key Messages**

- 41  
42  
43 - The Department of Health has invested large amounts of money into the promotion of  
44  
45 physical activity guidelines since the introduction of new guidelines in 2011.
- 46  
47  
48 - Knowledge of current physical activity guidelines within the UK adult population is not  
49  
50 known.
- 51  
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53 - It is important to gauge current knowledge and demographic associations with knowledge in  
54  
55 order to improve promotion of physical activity guidelines by informational campaigns.  
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#### 57 58 59 60 **Strengths and Limitations**

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3 - The present study is limited because of differences between the two surveys. HSE 2007 was  
4 delivered via face-to-face interviews whereas the 2013 survey was delivered online.  
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7 Furthermore, convenience sampling was used for the 2013 survey with an over-representation  
8 of females and employed adults. However, other demographic variables, including ethnicity  
9 and age, were similar between the surveys, whilst employment status and age were  
10 statistically controlled for and did not influence our outcomes. We therefore believe that  
11 comparisons between both surveys are valid. In addition, the large sample size strengthens  
12 the present research.  
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23  
24 This research received no specific grant from any funding agency in the public, commercial  
25 or not-for-profit sectors.  
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## 36 **Background**

37  
38 Physical activity (PA) reduces the risk of morbidity and mortality from chronic  
39 diseases [1]. Increasing evidence of the importance of PA to health has led to the promotion  
40 of a 'PA is Medicine' agenda and calls for global PA policies [2, 3].  
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46 In 1975 the first form of PA recommendations for adults were released in the United  
47 States (US) by the American College of Sports Medicine [4]. By 1995, American adults were  
48 being advised to accumulate at least 30 minutes of moderate-to-vigorous PA (MVPA), on  
49 preferably all days, each week [5]. In 1996 in England, the Department of Health followed  
50 similar guidelines from the ACSM and recommended 30 minutes of MVPA on at least 5 days  
51 per week [6]. Over the past few years, there has been a shift within the UK and globally  
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3 towards more uniform guidelines. In 2008, the first PA guidelines for Americans to be issued  
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5 by the Federal government were published following a comprehensive expert's review of  
6  
7 scientific data. These guidelines were the first to state recommendations specifically as 150  
8  
9 minutes per week of MVPA [7]. Previously, guidelines in the UK had been disseminated  
10  
11 separately by health agencies within each home country. In 2011 the four UK Chief Medical  
12  
13 Officers published the first UK-wide PA guidelines [8]. This document followed the lead of  
14  
15 the US guidelines and reported the new adult guidelines of 150 minutes a week of MVPA.  
16  
17 This format was also used in global PA guidelines issued by the World Health Organisation  
18  
19 [9].  
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24 Changes in the guidelines have also been reflected in the messages of the various  
25  
26 coinciding campaigns e.g. *'Every small step is... a way to get 30 minutes'* (Get A Life, Get  
27  
28 Active launched in Northern Ireland in 1999 [10]) and *'Get going for 150 minutes a week'*  
29  
30 (Change4Life launched across the UK in 2009 [11]). The purpose of these campaigns is to  
31  
32 encourage adults to reach or exceed current PA guidelines.  
33  
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36 In 2008, only ~5% of UK and US adults engaged in enough MVPA to meet  
37  
38 recommendations [12, 13]. Theories such as the Precaution Adoption Process model (PAPM)  
39  
40 and Protection Motivation Theory suggest that individuals must be accurately aware of their  
41  
42 current actions [14-16], such as through self-monitoring [17], in light of alternative and  
43  
44 desired actions to be able to initiate change i.e. *I do* this much MVPA but this much MVPA is  
45  
46 *recommended*. In addition, the Department of Health strategic framework 'Ambitions for  
47  
48 Health' details a strategy to embed informative social marketing campaigns within health  
49  
50 behaviour change campaigns [18]. It would therefore be beneficial to investigate **knowledge**  
51  
52 of MVPA guidelines within the broad UK adult population before and after the long-standing  
53  
54 guidelines of 30 minutes on 5 days per week were updated with 150 minutes per week in  
55  
56 2011. Chaudhury and Shelton found that only 5% of UK adults aged 60-64 (N=561)  
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2  
3 accurately recalled the general MVPA guideline in 2007 [19]. Less than 1% of adults  
4  
5 (N=4,281) selected the correct guideline from a list of six options in a recent US survey [20].  
6  
7 Those with a lower educational level also demonstrated lesser knowledge of guidelines. This  
8  
9 research, however, does not give an indication of unprompted knowledge which may be a  
10  
11 stronger correlate with behaviour change [21].  
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15 The objectives for this study were 1) to compare knowledge of current UK MVPA  
16  
17 guidelines for adults (3 years after their introduction in 2011) with knowledge of prior MVPA  
18  
19 guidelines (2004 up until 2010) in two large samples of adults, 2) to identify whether  
20  
21 demographic characteristics such as, gender, age and SES, are associated with knowledge of  
22  
23 PA guidelines at either time-point.  
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## 30 **Methods**

### 31 32 **Survey and analytical sample.**

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35 Data were analysed from the 2007 Health Survey for England (HSE) and an online survey  
36  
37 disseminated in 2013.  
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### 44 **2007 Data (before dissemination of current physical activity guidelines)**

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47 The HSE is an annual survey of non-institutionalised UK individuals [22]. A stratified, two-  
48  
49 stage, random sample representative of the socio-demographic profile of the English  
50  
51 population was recruited using a Postcode Address File. 14,385 adults participated in the  
52  
53 2007 HSE. The present research excluded individuals aged <18 years and adults with health  
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3 conditions which restricted physical activity. This resulted in 4,491 eligible adults from  
4  
5 which 2,860 had valid data for knowledge of contemporary (2004) PA guidelines.  
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### 11 **2013 Data (after dissemination of current physical activity guidelines)**

14 The 2013 survey was developed using an online survey software and questionnaire tool  
15 (www.surveymonkey.com). Staff from UK academic institutions, professional organisations  
16 (the National Health Service [NHS], teaching bodies, trade unions etc.), and those attached to  
17 independent businesses were invited to complete the survey. Of the 2,332 respondents to the  
18 2013 survey; 1,797 provided data for unprompted knowledge of current MVPA guidelines.  
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20 Approval for the study was received from the host university ethics committee.  
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### 28 **Measures**

31 The following measures were included on both the 2007 HSE and 2013 survey:

34 *Demographic characteristics.* Gender, age, ethnic background, marital status (single,  
35 married/civil partnership, divorced/separated, widowed), education (highest level),  
36 employment status (employed, unemployed, retired, student/other economically inactive) and  
37 self-reported health status were assessed.  
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44 The following measures were included in the 2007 HSE:

47 *Knowledge.* Participants were asked ‘How many days a week do you think people of  
48 your age should do physical activity? Include all moderate physical activity, including  
49 physical activity as part of a job. By week we mean the whole week including weekends.’  
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54 Followed by, ‘On each of the days someone of your age does moderate physical activity, how  
55 many minutes a day should they do it for it to be good for their health?’ Those who gave an  
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3 answer consistent with contemporary PA guidelines of 30 minutes/day and 5 days/week were  
4  
5 considered correct [6].  
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7

8 The following measures were included in the 2013 survey:  
9

10  
11 *Knowledge.* In line with previous research participants were first asked '*are you*  
12 *aware that there are physical activity guidelines available for adults [23]?*' Those who  
13 indicated that they were aware were then asked the open-ended question, '*What are the*  
14 *physical activity guidelines?*' To enable comparison to HSE data, only information regarding  
15 duration of PA was included in analysis. Those who gave an answer consistent with current  
16 guidelines of 150 minutes/week were considered correct [8].  
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#### 24 25 **Statistical analysis.** 26

27  
28 Prevalence rates for UK adults with correct knowledge of MVPA guidelines in 2007  
29 and in 2013 were calculated. Associations with gender, age, ethnicity, marital status,  
30 education, employment status and self-reported health were assessed using chi-squared  
31 analysis and standardised residuals adjusted for multiple comparisons (Bonferroni). Stepwise  
32 multiple logistic regression was used to investigate differences in knowledge between the  
33 2007 HSE sample and the 2013 survey sample. Variables were selected based on chi-squared  
34 analysis, with significant demographic factors included in the model. IBM SPSS Statistics 19  
35 was used with alpha set at 0.05.  
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#### 50 **Results** 51

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53 The 2007 HSE sample was: 56% female, 89% white and 63% under 45 years. 11%  
54 accurately recalled the MVPA recommendation, 46% overestimated and 43% underestimated.  
55 Differences were identified for marital status ( $p < .05$ ), gender ( $p < .005$ ), age ( $p < .001$ ),  
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3 education ( $p<.05$ ) and employment status ( $p<.05$ ) but not for ethnicity ( $p=.21$ ) or self-  
4  
5 reported health ( $p=.32$ ). Standardised residuals suggested that younger (18-24 years),  
6  
7 unmarried adults were more likely to overestimate. Adults with no economic activity (e.g.  
8  
9 students/retired) and males were less likely to be accurate whereas those with a higher  
10  
11 education (degree/equivalent) were more likely to have accurate knowledge of PA guidelines.  
12  
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14  
15 The 2013 survey sample was 70% female, 92% white and 57% under 45 years.  
16  
17 Without prompting, 18% accurately recalled the current PA recommendation. 82% did not  
18  
19 know the guideline with 12% overestimating and 14% underestimating. Differences in  
20  
21 unprompted knowledge were identified for gender ( $p<.001$ ), age ( $p<.05$ ), marital status  
22  
23 ( $p<.05$ ), employment status ( $p<.05$ ), education ( $p=0.05$ ) and health status ( $p<.005$ ), but not  
24  
25 for ethnicity ( $p=0.3$ ). Standardised residuals suggested that older males with a lower  
26  
27 education were more likely to report incorrectly. Younger adults (18-24 years), students and  
28  
29 single adults were more likely to recount old guidelines (30 minutes 5 days/week).  
30  
31 Knowledge of guidelines according to demographic characteristics is shown in table one.  
32  
33 Only 66% of individuals who recalled MVPA guidelines accurately recalled the intensity of  
34  
35 PA that is recommended. Of these, the most common descriptor was moderate or moderate-  
36  
37 vigorous (40%). Inclusion of physiological parameters such as an elevated heart rate was the  
38  
39 second most commonly used descriptor (23%). The remaining 3% referred to intensity  
40  
41 necessary to increase fitness, effort/exertion or used walking as an exemplar.  
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46  
47 As gender was found to be an important moderator of knowledge of guidelines and  
48  
49 differed between groups, a multiple logistic regression model was created to identify whether  
50  
51 the gender difference accounted for differences in knowledge between 2007 and 2013  
52  
53 samples. In this model, adults from the 2007 HSE sample were significantly less likely to  
54  
55 accurately recall MVPA guidelines ( $p<.001$ , OR=.58). Females were significantly more  
56  
57 likely to be knowledgeable ( $p<.05$ , OR=1.38). When education and employment status were  
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3 added to the model, the difference between samples remained significant ( $p < .005$  OR=.72).  
4  
5 Only gender ( $p < .001$ ) and education ( $p < .001$ ) moderated the relationship between samples  
6  
7 (2007 and 2013) and knowledge, accounting for 38% of the variance in knowledge of  
8  
9 guidelines. In this model, males (OR=.70) and those with the lowest education (OR=.57)  
10  
11 were less likely to demonstrate accurate knowledge of guidelines.  
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## 14 **Discussion**

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18 Results indicate that knowledge of PA guidelines has improved (11% to 18%) since  
19  
20 guidelines were updated in 2011. However, in 2013, still only 18% of adult's accurately  
21  
22 recounted recommendations (when only duration was considered). This drops to 11% when  
23  
24 only the adults who provided an appropriate description of intensity are considered. This is  
25  
26 disappointing as improved knowledge of PA guidelines within the adult population would  
27  
28 represent an initial step towards positive behaviour change. While knowledge alone is  
29  
30 unlikely to stimulate behaviour change, awareness of the required behaviour is a determinant  
31  
32 of behaviour change [24]. The PAPM suggests that individuals are unlikely to change their  
33  
34 behaviour unless they become aware that their behaviour is not optimal [14]. Compared with  
35  
36 2007, adults in 2013 do not appear to be better educated regarding MVPA recommendations.  
37  
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40  
41 Mass-media campaigns are currently used to improve the provision of health  
42  
43 information to the general public. The release of the most recent guidelines in 2011 was  
44  
45 promoted by the Department of Health campaign 'Change4Life'. Change4Life had a £75  
46  
47 million budget for social marketing to promote five key health behaviours, one of which was  
48  
49 physical activity [25]. Early publications from this campaign suggest it achieved high  
50  
51 visibility and recall of its messages within target populations [25, 26]. While knowledge does  
52  
53 appear to be moving in the right direction (at least for duration of MVPA), better results were  
54  
55 expected in light of the promotional efforts which have supported current guidelines.  
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3 Inconsistency of messaging from Change4Life and other campaigns may create confusion  
4  
5 and lead to inaccurate responses. Piggan has previously identified contradictory messages  
6  
7 presented by different Change4Life informational materials [27]. Indeed, a search of PA  
8  
9 campaign messages released since 2011 uncover various messages which could be perceived  
10  
11 as inconsistent. For example, a Change4Life newsletter released in November 2011 stated  
12  
13 *'Get going every day for 10, 20 or 30 minutes'* while an advert released only a few months  
14  
15 previously for MacMillan's Move More campaign suggested, *'Just a short walk can help...'*  
16  
17 For World Physical Activity Day 2011, a Coca Cola sponsored advert reads *'all this [health*  
18  
19 *benefits] with just 30 minutes of physical activity every day.'* Some campaigns have also  
20  
21 failed to update their messages in line with the update in recommendations. The Get A Life,  
22  
23 Get Active campaign website homepage has not updated its message since 2009 and still  
24  
25 states *'30 minutes on most days for adults'*. Indeed, 9% of adults from the 2013 sample  
26  
27 reported the old guideline (2004-2010) when asked to recall the current guideline (2011).  
28  
29 While the aforementioned messages are not necessarily incorrect, campaigns need to become  
30  
31 more coherent if the strategy is to improve knowledge of guidelines. Indeed, the unification  
32  
33 of US, UK and global PA guidelines will be undermined if the messages which follow are  
34  
35 isolated and random [7-9]. The failure of PA campaigns to disseminate consistent messages,  
36  
37 both between each other and between various arms within their own campaigns, may have  
38  
39 led to misinformation and confusion for many adults.  
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46 In addition to the continuing lack of education pertaining to the guidelines, the present  
47  
48 research highlights two areas of concern. Firstly, disparities in health knowledge continue to  
49  
50 be evident. In both the 2007 and 2013 samples those with lower education, lower  
51  
52 employment status and older adults were less likely to know PA guidelines. The Chief  
53  
54 Medical Officers voiced concerns regarding the disproportionately low involvement in PA of  
55  
56 disadvantaged groups in society [8]. Improved provision of information and opportunities for  
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3 these groups to engage in PA was a target of the government backed campaigns  
4  
5 'Change4Life' and 'HealthyPeople' [28, 29]. Despite these pledges, PA campaigns appear to  
6  
7 have been less successful in reaching these groups. Strategies to educate and reach  
8  
9 disadvantaged groups within society, especially those with a low education or SES, are  
10  
11 urgently required. Secondly, adults generally consider only the duration component of PA  
12  
13 recommendations. While the 2007 HSE sample were asked specifically for the recommended  
14  
15 duration of PA, the 2013 survey sample was asked an open question which allowed them to  
16  
17 include any aspects of the guidelines of which they were aware. Despite this, only 11% of  
18  
19 adults included an appropriate descriptor of intensity. Even when adults were prompted to  
20  
21 provide a descriptor of intensity, only 13% did so. Only 2% provided a physiological  
22  
23 parameter which could be practically used to monitor intensity.  
24  
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28  
29 In recent years there has been a rise in the number of campaigns promoting lifestyle  
30  
31 activities, especially walking, as a proxy for MVPA. While walking is undoubtedly an  
32  
33 accessible and appropriate form of PA, the intensity of walking varies greatly within the  
34  
35 population. Brisk walking is promoted by many PA campaigns as an example of MVPA, but  
36  
37 in actuality, the walking performed by many is less than brisk [30, 31]. While such  
38  
39 campaigns may increase the perceived accessibility of PA and cater to adults' PA preferences  
40  
41 [32], they often fail to educate individuals about the necessity for PA to be effortful in order  
42  
43 to induce health benefits. It is possible that a lack of knowledge regarding intensity  
44  
45 requirements may result in adults engaging in more PA of low intensity but not sufficient PA  
46  
47 to meet guidelines. In addition, adults may struggle to see the difference between their own  
48  
49 current behaviours and the behaviours being promoted. The PAPM suggests that individuals  
50  
51 need to be aware that their actual behaviour is different from the desired behaviour and that  
52  
53 this may put their health at risk [14]. Awareness of personal risk behaviour is especially  
54  
55 important to proceed from pre-contemplation to contemplating behaviour change. Based on  
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3 the PAPM, it can be expected that people may only proceed to contemplation when they  
4  
5 become aware that they engage in too little physical activity or that their PA is not of a  
6  
7 sufficient intensity. With the emergence of alternative strategies to improve health, such as by  
8  
9 breaking up sedentary time or increasing light activity, the difference between actual and  
10  
11 desired behaviour becomes less obvious. The benefits of engaging in more light activity and  
12  
13 of reducing or breaking up sedentary time are evident [33-35]. Guidelines regarding  
14  
15 sedentary behaviour have already been developed in Canada and Australia and current UK  
16  
17 PA guidelines recommend developing sedentary behaviour guidelines as a priority [8, 36, 37].  
18  
19 The various discourses surrounding PA and health may cloud directives to the lay population  
20  
21 (i.e. 'is desirable behaviour to be less sedentary, or to be more active, or to do more  
22  
23 MVPA?'). While research across the intensity continuum of PA is rapidly increasing,  
24  
25 transmitting such knowledge to the general population may require more complex messages  
26  
27 but understanding of how to effectively develop such messages lags behind.  
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32  
33 Knowledge of guidelines was low in the present study (i.e. only 18% adults knew the  
34  
35 duration component of MVPA guidelines); however, this is more than reported for American  
36  
37 adults, where less than 1% knew PA guidelines when surveyed in 2009 (N=4,281) [20].  
38  
39 There are two possible reasons why knowledge was higher in the present study. Firstly, in  
40  
41 this study, the PA guideline had been consistent for at least three years prior to both samples  
42  
43 completing their respective surveys. In the American study, only 10 months separated  
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45 dissemination of a changed guideline and completion of the survey. Indeed, 33.3% of  
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47 American adults selected the old 30 minute 5 days per week guideline relative to 9% in the  
48  
49 present study [20]. In addition, the American survey employed a closed question with six  
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51 response options. Two of these were correct according to old guidelines. Prompting from  
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53 these response options may have triggered more incorrect responses.  
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## Conclusions

The present study identified knowledge of PA recommendations in two large UK adult samples from 2007 and 2013. Results indicate that knowledge of guidelines has slightly improved. This study has implications for future promotional campaigns. Messages need to be developed to target individuals with lower education and employment status. In addition, further research is needed to develop an effective strategy for promoting more comprehensive educational messages related to PA guidelines. Campaigns need to straddle the thin line between messages which capture awareness, and are informational and motivational. In the present study, only 2% of adults acknowledged that PA should be effortful. Intensity is an important aspect of health-enhancing PA and should not be neglected by PA campaigns. Increasing understanding of the intensity continuum will likely result in a broader range of PA being included in media campaigns. Messages from these campaigns need to work in synergy to ensure effective communication of the benefits of the various forms of accumulating PA.

**Competing Interests**

None declared

**Contributorship**

EK initiated the study, designed the data collection tools (2013 survey), monitored data collection for the 2013 sample, planned the statistical analysis, cleaned and analysed the data for the whole study and drafted and revised the paper. She is guarantor.

DE revised the draft paper

SB revised the draft paper

LS revised the data collection tools (2013 survey) and revised the draft paper

**Data sharing**

HSE 2007 data is available open-access from the ESDS website at:

<http://www.esds.ac.uk/findingData/hseTitles.asp>

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Table one. Proportions of adults who were aware of guidelines and had accurate knowledge of guidelines in the HSE 2007 and 2013 Survey, stratified according to demographic group

	HSE 2007		Survey 2013	
	Accurate Knowledge of guidelines		Accurate Knowledge of guidelines	
	%	N	%	N
<b>Total</b>	11%	2860	18%	1797
<b>Gender</b>				
male	9.3%	1239	15.2%	540
female	12.2%*	1621	19.4%*	1250
<b>Ethnicity</b>				
White	10.7%	2550	18.6%	1670
Mixed	16.7%	42	14.8%	27
Asian/Asian British	13.1%	153	18.2%	44
Black/Black British	13.8%	80	5.9%	17
Chinese/Other ethnic group	5.9%	34	5.1%	39
<b>Age (years)</b>				
18-24	11.5%	349	21.2%	203
25-34	13.6%	633	17.6%	393
35-44	11%	789	20.7%	421
45-54	9.9%	616	17.5%	452
55+	8.2%	473	14%	322
<b>Employment Status</b>				
employed	11.9%*	2210	17.7%	1483
unemployed	9.5%	137	11.5%	26
retired	8.1%	136	14.3%	14
other economically inactive	6.9%	376	22.1%	244
<b>Highest Education Level</b>				
degree	13.2%*	893	19.1%*	1569
vocational/ technical	9.5%	359	7.4%	94
some college/sixth form	11.7%	497	13.3%	98
finished secondary school	9.1%	776	12.5%	18
some secondary school	9.3%	332	50%	2
<b>Marital Status</b>				
single	11.6%	925	17.6%	665
married/civil partnership	10.5%	1590	18.5%	932
divorced/separated	12.3%	302	14.7%	143
widowed	4.7%	43	34.8%	23
<b>Self-rated health</b>				
good	11.1%	1284	20.3%	576
rather good	10.5%	1251	20.0%	544

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<b>average</b>	11.2%	303	14.5%	530
<b>rather poor</b>	27.8%	18	11.4%	123
<b>poor</b>	100%	2	33.3%	24

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\* standardised residual indicates greater probability of accurate awareness or knowledge of guidelines within this category.

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