



Age-related comparisons by sex in the domains of aerobic physical activity for adults in Scotland

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ABSTRACT

Objective. To investigate the age-related differences in the contributions of the domains of physical activity (PA) for men and women in Scotland who met the current PA guidelines or who were insufficiently active.

Methods. We analysed data from the 2013 Scottish Health Survey (4885 adults (≥ 16 years)). Average weekly minutes of moderate or vigorous PA (MVPA) and the relative contributions to total MVPA were calculated for the domains of: walking, cycling, domestic, leisure, occupational, outdoor, non-team sport, team sport, and exercise & fitness. We performed linear regression analyses to assess differences by 10-year age group, stratified by sex and activity status (1–149 or ≥ 150 min of MVPA per week). These were repeated excluding occupational activity due to concerns with its measurement.

Results. For the 64.3% of the sample that met the guidelines, occupational activity was the most prevalent domain accounting for 18–26% of all MVPA for those under 65 years. When excluded, there was no age-related decline in total MVPA ($p > 0.05$). For the 18.6% of the sample that reported 1–149 min of MVPA per week, domestic activity was the most prevalent domain. Across both sexes and activity statuses, exercise & fitness declined with age and walking was most prevalent in the oldest age group.

Conclusion. The domains in which adults in Scotland undertake MVPA vary by age group. Policies designed to increase PA should take this into account. Our findings challenge current thinking on age-related changes in activity, with the exclusion of occupational activity mitigating any age-related decline in MVPA.

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1. Introduction

Increasing physical activity (PA) levels is a successful and sustained policy priority in Scotland (The Scottish Government, 2014b). Progress is primarily monitored by the proportion of the population meeting the aerobic component of the guidelines (150 min moderate activity, or 75 min of vigorous activity or equivalent combination per week) (Department of Health, 2011), as reported annually by the Scottish Health Survey (SHeS). In 2013, 64% of the adult population in Scotland met these guidelines, an increase of 2% on the previous year. The

current UK PA guidelines for adults also include statements on muscle strengthening and sedentary time, but specific indicators and policies for these modes are yet to be developed. This paper focusses solely on aerobic PA.

The SHeS records PA under the domains of domestic, occupational, sport and exercise, and walking. This information is important from a public health perspective as it provides the context in which PA is undertaken, potentially informing better intervention and policy design.

In England, Bélanger et al. (2011) found considerable age-related differences in the relative contributions of the domains of PA amongst adults who met the previous guidelines (30 min of moderate or vigorous PA (MVPA) on 5 days of the week). For example, the contribution of sports was negligible amongst older adults. Walking accounted for 26–42% of total MVPA in men and 37–45% in women and was the largest contributor for all age groups in both sexes, apart from in men aged 35–54 for whom occupational is. This highlights the need for

Abbreviations: PA, physical activity; MVPA, moderate and vigorous physical activity; SHeS, Scottish Health Survey; MET, Metabolic Equivalent of Task.

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interventions to be specific to the demographic characteristics of the target group. Whether the situation is the same in Scotland and with respect to the current PA guidelines is unknown.

This paper addresses this knowledge gap by providing Scottish-specific data on the age-related differences in the domain-specific contributions to total MVPA for men and women in Scotland. In addition, we provide a more in depth analysis than that of [Bélanger et al. \(2011\)](#) in four ways. Firstly, we present the absolute contributions, in addition to the relative contributions, of the domains of PA. This provides a fuller picture of where interventions are best targeted. Secondly, we performed the analyses on those who do not meet the current PA guidelines thus helping to identify potential domains to target and increase the proportion of adults meeting the PA guidelines. Thirdly, we ran our analyses both with and without the domain of occupational activity due to concerns that the measurement of this domain may distort the overall picture. Lastly, we performed statistical tests to assess whether the differences identified are statistically significant. Based on the results of [Bélanger et al. \(2011\)](#), we expected to see variations by age in the contributions of the domains of PA for men and women who met the guidelines. We were uncertain as to whether this would be the case for those who did not meet the guidelines.

2. Methods

2.1. Data source

We acquired the 2013 SHeS individual level dataset from the UK Data Archive ([ScotCen Social Research](#)) on 5th Feb 2015. The SHeS is designed to be nationally representative of the population living in private households in Scotland. The main survey consists of a computer aided personal interview during which PA data are collected. These are carried out over the whole year. Further information on the SHeS can be found in [Corbett et al. \(2014\)](#).

2.2. Questionnaire

The SHeS asks about PA in four domains in the 28 days prior to interview: (1) home-based activities (housework, gardening, building work and do-it-yourself home maintenance); (2) activity at work; (3) sports and exercise; and (4) walking. Further information can be found in the 2013 SHeS main and technical reports ([Corbett et al., 2014](#); [Hinchliffe, 2014](#)). There have been no assessments of the questionnaire's validity or reliability to date but it is used to as the main source of data to inform Scottish PA policy. The similar but not identical Health Survey for England questionnaire demonstrated moderate convergent validity in comparison to accelerometry ([Scholes et al., 2014](#)). Average weekly time spent in these domains was converted into sub-domains developed from [Bélanger et al. \(2011\)](#). Activities reported under sports and exercise were allocated to leisure pursuits, outdoor pursuits, cycling, non-team sport, team sport or exercise & fitness but with cycling as independent sub-domain (see Supplementary material).

We used the same method for assigning intensity to the reported activities as used to derive the population estimates for the proportion meeting the guidelines in the SHeS annual reports. Only activities that are of at least moderate intensity count towards the PA guidelines and therefore were included in these analyses. Briefly, this excluded light housework, slow or steady average paced walks, and certain sport and exercise activities considered of light intensity such as snooker or darts were excluded. Heavy housework, brisk or fast paced walks and any occupational activity were considered of moderate intensity. Other sport and exercise activities were either categorised as moderate or vigorous in all situations, or were dependent on the answer to a follow up question that asked whether the activity makes the participant breathe faster, feel warmer or

sweat to distinguish between the two intensity levels. These were based on the standardised Metabolic Equivalent of Task (MET) levels where light intensity is 1.6–2.9 METs, moderate is 3–5.9 METs and vigorous is ≥ 6 METs ([Ainsworth et al., 2011](#)). The duration of vigorous intensity activities was doubled to reflect the alternative ways of meeting the PA guidelines. A list of the intensity levels of the different sport and exercise activities is in the Supplementary material.

2.3. Sample

There were 4894 adult (age ≥ 16 years) responses to the 2013 SHeS. The decision to include 16–18 year olds was made to maintain comparability as they are considered adults in the UK health surveys and reported on as such, despite the adult UK PA guidelines applying to those aged 19 years upwards ([Department of Health, 2011](#)). We excluded cases if they reported implausible/incomplete values (over 10 h per day in one domain) ($n = 9$). If there were missing data for an individual sport or exercise activity, or for a whole domain, the contribution of this activity or domain was set to 0 rather than excluding the whole case.

The current analysis included the remaining 4885 adults. Activity status was determined by average reported weekly PA: those reporting no minutes of MVPA ($n = 909$), insufficiently active individuals reporting 1–149 min ($n = 960$) and active individuals reporting ≥ 150 min ($n = 3016$). Those reporting 0 min of MVPA were not included in any further analysis because the denominator of a percentage cannot be zero.

2.4. Statistical analyses

The relative proportions and the weekly minutes of MVPA of each domain were calculated for each individual who reported any MVPA ($n = 3976$). Linear regression analyses were used to assess differences in the absolute and relative contributions of the domains stratified by sex and activity status and split by age group (16–24, 25–34, 35–44, 54–64, 65+). Differences in total MVPA were also assessed. We did not run regression analyses if the maximum relative contribution of the domain was $< 10\%$.

Individuals who reported ≥ 150 min MVPA per week were analysed twice; (1) with occupational activity included; and (2) with occupational activity excluded (even if this took them under 150 min MVPA, although those who dropped to 0 min ($n = 63$) had to be excluded as the denominator could not be 0). This was because a low number of individuals reported a very high level of occupational PA, potentially distorting the findings; by conducting both analyses we could assess this effect. Only the relative contributions and total MVPA were reported and reanalysed using regression analyses as the exclusion of the 63 individuals barely altered the absolute contributions (a maximum of 6 min). No insufficiently active individuals reported any occupational activity.

All analyses were conducted in STATA/SE 14.0 using the “svyset” command to take into account the complex sampling design. This included using the weights provided by the SHeS to account for non-response bias and unequal selection probabilities to ensure reliable population estimates ([Corbett et al., 2014](#)).

3. Results

We found 64.3% of the sample (unweighted $n = 3016$) reported ≥ 150 min of weekly MVPA and therefore met the PA guidelines; 18.6% (unweighted $n = 960$) were insufficiently active reporting between 1 and 149.99 min of MVPA per week; 17.2% (unweighted $n = 909$) did not report any minutes of MVPA. As shown in [Table 1](#), the proportion of adults meeting the PA guidelines decreased with age in both sexes. The proportion reporting 0 min of weekly MVPA increased with age in

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