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Physical activity, walking and leanness: An analysis of the Northern Ireland Sport and Physical Activity Survey (SAPAS)

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ABSTRACT

Objective. To report on the contribution walking makes to total weekly physical activity and the relationship between the volume and intensity of walking and leanness in a representative sample of the Northern Ireland population.

Method. 4563 adults participated in this cross-sectional survey of physical activity behaviour. Self-reported height and weight was used to determine inverse body mass index (iBMI) as a measure of leanness. Data across all domains of physical activity including self-reported volume and intensity of walking (in bouts of 10 min or more) were analysed to determine their contribution to leanness using ANCOVA, having controlled for age, gender, socio-economic and smoking status.

Results. Over 68% of the participants reported walking >10 minutes during the previous week but only 24% report walking at a brisk or fast pace. Time walking at a brisk or fast pace for personal transport was identified as having the strongest positive association with being lean ($F_{1,4256} = 10.45, \beta = 0.051$ cm^2 kg^{-1} min^{-1} (SE = 0.016), P = 0.001).

Conclusions. In addition to increasing the amount of walking and the percentage of people walking regularly, public health messages encouraging an increase in walking pace may be valuable to increase the proportion of the population meeting physical activity guidelines and gaining associated health benefits.

Introduction

Physical activity is a modifiable risk factor for a range of chronic conditions including, overweight and obesity, hypertension, type II diabetes, and cardiovascular disease (World Health Organization, 2010). Current public health recommendations emphasise the importance of moderate to vigorous intensity physical activity (MVPA) suggesting that all adults should achieve at least 150 min of MVPA per week in bouts of 10 min or more (Department of Health, 2011). This recommended amount can be met through activity accumulated across all domains including, occupational, personal transport, domestic, recreational and sporting activity. The relative importance of these domains in meeting current physical activity guidelines appear to vary with age (Bélanger et al., 2011) with walking being one of the most common activities across age groups (Eyler et al., 2003). Walking has become a cornerstone of physical activity promotion as it is has fewer of the physical, social and psychological barriers associated with more traditional forms of exercise (Allender et al., 2006). It is socially acceptable, accessible to the majority of the population, low cost, relatively low risk and has limited skill or equipment requirements. For sedentary adults, walking for recreational purposes is likely to be moderate intensity (Murtagh et al., 2002).

Self-reported volume of walking has been associated with leanness in a number of populations including healthy US (Guo et al., 1999; Kahn et al., 1997; Williams, 2005) Canadian (Chan et al., 2003) and French and Northern Irish (Wagner et al. 2001) adults. Cross-sectional studies have shown that higher self-reported levels of moderate intensity physical activity are associated with lower levels of adiposity and that this relationship may be nonlinear i.e. those individuals with the highest body weight have greater decreases in adiposity per kilometre walked (Williams, 2005). A 10 year follow-up of more than 79,000 adults showed that those who reported walking more than 4 hours per week had decreased body mass index at follow up (Kahn et al., 1997).

Population surveys attempt to monitor participation of sport and physical activity e.g. Active People Survey (Sport England, 2011) and the Health Survey for England (Craig et al., 2010). In Northern Ireland the Health and Social Wellbeing Survey provides data on physical

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activity levels but does not allow for an assessment of the contribution of different domains to total physical activity (Northern Ireland Statistics and Research Agency (NISRA, 2007). In 2010, Sport Northern Ireland commissioned a large scale survey of adults to determine the levels of participation in physical activity at work, home, in personal transportation and sport and recreation.

The aims of this paper are to report the percentage of the adult population in Northern Ireland who meet current physical activity guidelines, to determine the contribution walking makes to weekly physical activity and to explore the relationship between the volume and intensity of walking and leanness in this population.

Methods

Design

This study is based on secondary analysis of a cross-sectional survey of Northern Irish adults conducted in 2009/10 and known as SAPAS (Sport and Physical Activity Survey). This was the first nationwide survey specifically on sport and physical activity, commissioned by Sport Northern Ireland and carried out by an independent market research agency. 4653 adults (aged 16+) completed face-to-face interviews conducted in their homes using computer assisted personal interviewing.

Sample

The sampling procedures ensured proportionality with the Northern Ireland population based on estimates of the number of residents aged 16 or older provided by the Census Office for Northern Ireland (1.4 million). The sample was stratified by local council area (26 strata) and random samples of households, were drawn within each stratum. The sampling fraction was the same for each council area except for Belfast and Derry the two major cities, where oversampling was used to facilitate detailed analysis. Within selected households, one adult was randomly selected using the last birthday rule. Participants completed a detailed interview (average time — 30 min) with a trained interviewer. 4663 interviews were completed, representing a response rate of 54.6%. The dataset was weighted to control for the oversampling in Belfast and Derry, differences in household size, and to ensure that the age/gender closely matched that of the adult population of Northern Ireland.

Survey description

The survey instrument was designed in partnership with Sport Northern Ireland and was cognitively tested and piloted by the market research agency. The survey was based on the Active People Survey (Sport England, 2011). The 30 min interview collected data on participation in sport and physical activity, perceived health and happiness, fruit and vegetable intake, alcohol consumption and smoking habits as well as sociodemographic information. The list of physical activities was taken from the Department of Culture Media and Sport (DCMS) and Sport England (Ipsos MORI, 2007).

Piloting and cognitive testing consisted of interviews with 30 respondents covering both genders and a wide range of ages, employment statuses and levels of sport participation. A mix of 'think aloud' (whereby respondents are instructed to verbalise their thought processes as they answer the survey questions) and 'verbal probing' techniques were employed, which were adapted to suit individual respondents (with both concurrent and retrospective probing). As a result of this, some survey items were amended to maximise recognition, recall and decision-making by respondents.

Outcome measures

Physical activity/walking

Participants were asked to recall how long they spent being physical active across 4 domains: sport, work, at home or getting about (i.e. personal transport) during the previous 7 days. For each domain additional questions determined the purpose of the physical activity and the effort required. Participants classified the purpose of their walking in three ways: recreational, personal transport or work related. Total time spent walking in bouts of 10 min or more was reported. Walking intensity was estimated on a 4 point scale. Walking rated as at a 'slow' or 'steady average' pace was classified as low intensity and walking at a 'fairly brisk' or 'fast' pace was classified as moderate to vigorous intensity.

Body mass index

Self-reported height and weight were used to calculate Body Mass Index (BMI). The inverse of Body Mass Index was calculated by the formula height $(cm)^2$/weight (kg). We chose inverse BMI (iBMI) as our response variable as this ratio has been shown to be more linearly related to, and hence able to explain more of the variance in, percentage body fat. It is also more symmetric, better approximated by the normal distribution and therefore more suitable than BMI in detecting differences in fatness/leanness in statistical/epidemiological studies (Nevill et al., 2011).

Statistical analyses

We explored the effect of various sources of physical activity (at work, at home, sporting, cycling, and walking activities) on iBMI using ANCOVA, having controlled for the confounding effects of age, gender, socio-economic and smoking status using statistical software (SPSS version 16). The categorical variables (gender, age group, socio-economic and smoking status) were entered as fixed factors and the continuous variables (time spent at various types of exercise) were incorporated as continuous linear covariates. Time spent at various types of exercise were entered initially as time spent at any level of exercise intensity and subsequently as time spent in MVPA only.

Results

A total of 4653 participants provided complete interviews. From self-reported activity across all domains 42.7% of the population can be categorised as achieving current recommendations for physical activity of 150 min MVPA per week. The proportion of individuals meeting or falling below the current recommendation by gender age and social class is shown in Table 1. Some 3189 participants (68.5%) reported at least one occasion of 10 min or more of walking during the previous 7 days. The median duration of self-reported walking was 45 min per week. Self-reported walking by age group and gender is illustrated in Fig. 1. A total of 2367 (50.9%) participants reported walking for recreation, 2219 (47.7%) reported walking for personal transport and 1000 (21.5%) reported walking while at work. The proportion of respondents walking for recreation, occupational or transport purposes and the intensity and volume of this walking is shown in Table 2.

The initial ANCOVA identified all four main effects (gender, age group, socio-economic and smoking status) together with three higher-order interactions (gender-by-age group, gender-by-socio-economic status, and gender-by-smoking status) as significant determinants of iBMI. In addition, three sources of physical activity, time spent playing sport ($F_{1,4258}=5.84$, $\beta=0.014\ cm^2\ kg^{-1}\ min^{-1}$ ($SE=0.006$), $P=0.016$), time spent cycling ($F_{1,4258}=4.84$, $\beta=0.041\ cm^2\ kg^{-1}\ min^{-1}$ ($SE=0.019$), $P=0.028$) and time spent walking ($F_{1,4258}=5.77$, $\beta=0.005\ cm^2\ kg^{-1}\ min^{-1}$ ($SE=0.002$), $P=0.016$) were identified as significant positive predictors of iBMI as our measure of leanness ($R^2=0.130$ (Adjusted $R^2=0.122$)).

When we replaced time spent in physical activity at any intensity with time spent in MVPA in the above analysis, the same four main effects together with the same three interactions remained significant determinants of iBMI. However, in this ANCOVA, three sources of MVPA (time spent playing sport ($F_{1,4258}=5.93$, $\beta=0.014\ cm^2\ kg^{-1}\ min^{-1}$ ($SE=0.006$), $P=0.015$), time spent cycling ($F_{1,4258}=4.02$, $\beta=0.041\ cm^2\ kg^{-1}\ min^{-1}$ ($SE=0.020$), $P=0.045$) and time spent walking ($F_{1,4258}=14.17$, $\beta=0.016\ cm^2\ kg^{-1}\ min^{-1}$ ($SE=0.004$), $P<0.0001$)) were identified as significant positive predictors of leanness (R Squared = 0.132 (Adjusted R Squared = 0.125)).

In the above analysis, time walking at a brisk or fast pace was identified as having the strongest association with leanness (higher values of iBMI and hence the lowest levels of BMI $P<0.0001$), considerably greater than time spent playing sport or cycling at moderate to