No time for the gym? Housework and other non-labor market time use patterns are associated with meeting physical activity recommendations among adults in full-time, sedentary jobs

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ABSTRACT

Physical activity and inactivity have distinct cardio-metabolic consequences, suggesting that combinations of activities can impact health above and beyond the effects of a single activity. However, little work has examined patterns of non-labor market time activity in the US population, particularly among full-time employees in sedentary occupations, who are at increased risk of adverse health consequences associated with a sedentary lifestyle. Identification of these patterns, and how they are related to total physical activity levels, is important for developing effective, attainable physical activity recommendations among sedentary employees, who typically have less time available for exercise. This is especially the case for low-income employees who face the highest time and financial barriers to achieving physical activity goals.

This study uses cluster analysis to examine patterns of non-labor market time use among full-time (≥40 h/week) employed adults in sedentary occupations (<3 MET-h) on working days in the American Time Use Study. We then examine whether these patterns are associated with higher likelihood of meeting physical activity recommendations and higher overall physical activity (MET-h). We find that non-labor market time use patterns include those characterized by screen activities, housework, caregiving, sedentary leisure, and exercise. For both genders, the screen pattern was the most common and increased from 2003 to 2012, while the exercise pattern was infrequent and consistent across time. Screen, sedentary leisure, and community patterns were associated with lower likelihoods of meeting physical activity recommendations, suggesting that interventions targeting screen time may miss opportunities to improve physical activity among similarly sedentary groups. Alternately, non-labor market time use patterns characterized by housework and caregiving represented feasible avenues for increasing overall physical activity levels, especially for those with low financial and time resources. Consideration of non-labor market time use patterns may improve strategies to increase physical activity and decrease inactivity among full-time employed adults in sedentary jobs.

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1. Introduction

In the US, one major strategy for preventing obesity, cardiovascular disease, cancer, and diabetes entails recommendations to increase physical activity (Jakicic and Otto, 2005; U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2010; American Cancer Society, 2012). Yet, despite these recommendations, daily activity levels have declined, and the majority of US adults do not achieve the recommendations of

≥30 min of moderate-to-vigorous physical activity (MVPA) at least five days per week (Ng and Popkin, 2012; Gordon-Larsen et al., 2004; Spees et al., 2012; Garber et al., 2011; Zhao et al., 2008; Centers for Disease Control and Prevention, 2011).

In fact, public health experts recognize that simply meeting physical activity recommendations is inadequate (Hamilton et al., 2008). Moreover, a growing body of epidemiologic evidence demonstrates that sedentary behavior has distinct adverse metabolic consequences independent of physical activity (Owen et al., 2010; Bey and Hamilton, 2003; Hamilton et al., 2004; Dunstan et al., 2007). For example, results from Australia show that even amongst physically active adults, TV time was associated with worsening metabolic risk factors, including waist circumference,

systolic blood pressure, and fasting plasma glucose (Healy et al., 2008). In addition, exercise as a means of obesity reduction or prevention have shown limited effectiveness (Ross and Janssen, 2001; Donnelly et al., 2003; Church et al., 2009). Finally, considering only whether someone achieved the MVPA recommendation or not misses individuals whose activities may not be intensive enough to meet these thresholds. While vigorous intensity activities yield the greatest health benefits (Lee and Paffenbarger, 2000), a dose–response relationship between physical activity and health exists such that even light-to-moderate activities are better than remaining sedentary (Blair and Connelly, 1996).

In short, individuals should not simply be categorized into "active" or "not active" based on whether they achieve a certain threshold of physical activity. Rather, the unique physiology of inactivity, physical activity, and how these are incorporated throughout the day suggests that patterns of physical activity and inactivity matter, beyond the individual effect of any type or amount of activity alone (Tudor-Locke and Schuna, 2012). In addition, identifying activity patterns may be useful for developing more attainable physical activity recommendations that reflect how people really spend their time, rather than a "one size fits all" approach which may be unachievable for many (Ferrar et al., 2013a). Building on this potentially important new understanding of the way activity and inactivity affect health, one important question is, what are patterns of (in)activity in the US population? Secondly, how are these patterns related to achieving physical activity goals?

To better describe this picture of time, cluster analysis has recently emerged as a useful methodology to characterize these multidimensional patterns of time use and physical activity in children and adolescents (Ferrar et al., 2013a, 2013b; Liu et al., 2010; Nelson et al., 2005). However, among US adults, most time use research has examined time spent in physical activity domains in absolute measures (minutes or hours), without taking into account the patterning of time (Colman and Dave, 2013; Millward et al., 2013; Tudor-Locke et al., 2011; Zick et al., 2011). Although Kolodinsky et al. examined patterning of time in US adults, this study did not examine energy expenditure associated with activity patterns, nor did it differentiate between labor market time and non-labor market time (Kolodinsky and Goldstein, 2011).

In addition, no research has taken into account hours worked in the labor market or occupational activity level when characterizing patterns of non-labor market time use, despite previous work showing that time spent in the labor market as well as occupational physical activity affect levels of sedentary activity and exercise during non-labor market hours (Tudor-Locke et al., 2011; McInnes and Shinogle, 2011). It is especially important to understand the relationship between non-labor market time use and physical activity among those who spend ≥40 h/week in the labor market (i.e. "full-time employees"), as these individuals face the highest time constraints on non-labor market time: on working days, 32% of time is spent on sleep and 31% is spent on labor market work, leaving little time for exercise (Tudor-Locke et al., 2011). Even more important is identifying patterns of non-labor market time use among full-time employees in sedentary occupations, given that the majority of US employees are employed in sedentary jobs (Church et al., 2011), occupational physical activity is declining across the globe (Ng and Popkin, 2012; Hallal et al., 2012), and occupational inactivity has been linked to myriad adverse health consequences, including obesity, diabetes, cardiovascular disease, and mortality (Church et al., 2011; Hu et al., 2003a, 2003b; Salonen et al., 1988; Ford and Caspersen, 2012). Thus, one key question relates to what patterns of non-labor market time use are associated with increases in physical activity among individuals who spend ≥40 h/week in sedentary jobs. Is exercise the only avenue to meet physical activity recommendations in this population, or are other patterns of non-labor market time use associated with increases in physical activity? Considering that lack of time poses one of the biggest barriers to exercise (Brownson et al., 2009), understanding patterns of non-labor market time use can help inform effective, attainable strategies to increase physical activity among individuals with limited time availability.

Finally, understanding non-labor market time use patterns among low-income employees is particularly important, since in addition to financial limitations and lack of access to safe spaces, low-income employees face even higher time constraints to exercise, due to juggling of jobs, childcare, transportation, and social services (McInnes and Shinogle, 2011; Jabs et al., 2007; Jabs and Devine, 2006; Brownson et al., 2001). Indeed, empirical evidence indicates that individuals with lower income and education are less likely to exercise and spend more time in sedentary activities like television watching (McInnes and Shinogle, 2011; Gordon-Larsen et al., 2000; Mullahy and Robert, 2010). However, one question is whether low income adults spend more time in domestic physical activities like housework or caregiving than higher income groups, who may be more likely to outsource these activities.

The primary objective of this study is to use cluster analysis to characterize patterns of non-labor market time use among full-time employed US adults in sedentary occupations on working days. A second objective is to identify whether certain non-labor market time use patterns are more common amongst low income employees. Finally, we will examine whether non-labor market time use patterns are associated with total daily activity levels, including: 1) increased likelihood of meeting recommendations for MVPA and 2) overall energy cost, as measured by metabolic equivalent hours (MET-h). By using MET-h, which incorporates both time and intensity, we are better able to identify which patterns are associated with increased physical activity, but not necessarily at the intensity required to meet recommendation thresholds.

2. Methods

2.1. American Time Use Study (ATUS)

The methodological details of the American Time Use Survey (ATUS) have been published previously (Hamermesh et al., 2005). ATUS began in 2003 to develop nationally representative estimates of time use in the US. ATUS includes free-living residents of households within the US that are aged ≥15 years, except for active military personnel. From each selected household, one individual is randomly selected to participate in ATUS. Computer-assisted telephone interviews are used to interview respondents about their time use for one 24-h period, including activity and location. Participant responses are then coded into 438 distinct primary activity variables by trained staff (U.S. Census Bureau, 2013). A recent study found that this "previous day" recall method is more valid than questionnaires for assessing non-labor market time, sedentary behavior, and physical activity (correlations with accelerometry of 0.77–0.81) (Matthews et al., 2013).

In the present study, data from 2003 to 2012 were pooled for adults aged 18–65 years working ≥40 h/week across all jobs in sedentary occupations, sampled on a workday (n = 30,133). These full-time sedentary employees represented 68% of ATUS respondents who were employed in the labor market and sampled on a workday. Respondents were excluded from analysis if the diary day was a holiday (n = 7) or they were missing >90 min of activity (n = 15). To retain adequate sample sizes for race/ethnic comparisons, we excluded the small proportion reporting race/ethnicity as non-Hispanic Other (n = 1674), for a final analytic sample of 28,437.