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Patterns and correlates of time use and energy expenditure in older Australian workers: A descriptive study

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ABSTRACT

Background: How people use their time has health implications, but use of time may be influenced by factors such as age, sex, education and health.
Objective: This study aimed to provide detailed information on the daily activity patterns of older working people.
Study design: 139 older Australian adults (aged 50–79 years) undertook comprehensive interviews on their use of time. This paper presents a cross-sectional analysis of the baseline findings from a longitudinal study.
Main outcome measures: Use of time was measured using the Multimedia Activity Recall for Children and Adults (MARCA), administered via computer-assisted phone interview. Activity patterns were described, and compared on the basis of sex, education and health status.
Results: The main activities undertaken were sleep (mean 466 min/day), work (mean 233 min/day) and chores (mean 160 min/day), with little time spent on physical activity (mean 13 min/day). Women spent more time doing chores ($p < 0.001$) while men spent more time on vigorous activities ($p < 0.001$). Participants with "fair" health spent less time on inside chores ($p = 0.05$) and grooming ($p = 0.02$) than healthier participants.
Conclusions: Healthy lifestyle interventions for older workers should aim to increase physical activity levels by targeting specific activities, depending on sex and health status.

1. Introduction

1.1. Background

How people use their time has health implications. For example, being physically active and getting adequate sleep reduces the risk of chronic diseases, some cancers and mental health problems [1,2]. Conversely, prolonged sitting has been positively associated with all-cause mortality, cardiovascular disease, diabetes and metabolic syndrome [3].

Many factors influence daily use of time. As adults age, decreasing time is spent in physical activity [4] and sleeping [5], and time spent in sedentary behaviours increases [6,7]. Furthermore, while men generally do more physical activity than women [8], with increasing age (over 60 years) men become more sedentary while women maintain the same level of light physical activity [9]. The type of sedentary behaviour is also different between the sexes, with men sitting longer to watch television or use a computer while women sit longer to do hobbies or read [10]. Moreover, women are reported to sleep for a longer duration than men [11].

Other key socio-demographic characteristics may also influence use of time. Physical activity is positively associated with education and income [8], although associations depend on the type of behaviour [6,12]. For example, leisure-time physical activity has been positively associated with occupation level while total physical activity (recreational and occupational) is inversely associated [12]. Similarly, watching television is inversely associated with education level, while computer use is positively associated [6].

Australia's population is ageing and there are increased numbers of people entering retirement [13]. Maintaining the health of older workers is of primary importance to reduce the financial burden of disease management [13]. However, many studies investigating activity patterns of older workers have limited their outcomes to specific activities such as leisure-time physical activity or used objective measures which do not stipulate the type of activity undertaken. Little is known about the type, duration and

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frequency of the full range of daily behaviours of older employed people. This more detailed knowledge will assist in the development of lifestyle interventions that target people about to retire.

1.2. Objective

The aims of this study were to (1) describe the amount of time spent participating in a range of behaviours that make up the everyday life of older, working people, (2) describe the daily pattern of energy expenditure of this cohort and (3) to investigate how socio-demographic and health factors, such as sex, education level and self-reported health status, are associated with time use and energy expenditure in this group.

2. Methods

2.1. Study design and participants

The Life After Work Study is an Australian cohort study that followed people during the transition from work to retirement [14]. This paper presents the initial findings from that study, namely the baseline, pre-retirement data. Ethics approval was obtained through The University of South Australia Human Research Ethics Committee and The University of Queensland Behavioural and Social Sciences Ethical Review Committee. The committees' ethics frameworks are based on the Australian Code for the Responsible Conduct of Research [15]. Written, informed consent was obtained from all participants at the commencement of the first face-to-face assessment.

Participants were recruited from two Australian cities, Adelaide and Brisbane, between April 2012 and July 2013, using a broad range of recruitment strategies to provide diversity in participant characteristics, including email mail-outs in numerous large workplaces, newspaper and TV stories, community newspaper announcements, financial planning seminars and recruitment companies. Eligibility criteria were being 50 years of age or older, working 19 h per week or more, having plans to retire within nine months and able to speak English. The presence of a major (life-threatening) condition in the last six months was an exclusion criterion.

At the baseline assessment, participants completed a survey, undertook measures for the Life After Work Study and made appointments for the two use of time phone interviews, which took place in the following week. At the completion of the assessment, participants were sent an honorarium of AUD50 to acknowledge their time and effort and to assist with travel costs.

2.2. Use of time measurement

Use of time was measured using the Multimedia Activity Recall for Children and Adults (MARCA) [16], administered via computer-assisted phone interview. Participants recalled a total of four days (including at least one week day and one weekend day) in 5 min increments, choosing from a compendium of around 500 activities. Activities were aggregated to form mutually exclusive and exhaustive time use "macrodomains" and "superdomains" (Table 1) (e.g. "gardening" and "hanging out washing" contributed to the macrodomain "Outside chores" and this was combined with "Inside chores" to form the superdomain "Chores"). It is important to note that activities are categorised into domains on the basis of the activity itself, rather than the context e.g. computer use falls into the superdomain "work" regardless of whether it is carried out in a work context or not.

Mean daily time spent in each domain was calculated, using a 5:2 weighting for weekdays:weekend days. The MARCA software automatically calculates the average daily time spent in each recorded activity, the energy expenditure of each activity based on the Ainsworth Compendium of Physical Activities [17], and total daily energy expenditure (TDEE) [16]. Time spent in Sedentary activity (<1 MET), Very light physical activity (1–1.9 METs), Light physical activity (2–2.9 METs), Moderate physical activity (3–5.9 METs), and Vigorous physical activity (≥6 METs) were calculated, with "one metabolic equivalent (MET) being the amount of oxygen consumed while sitting at rest" [18].

The MARCA has demonstrated high same day test-retest reliability in adults (ICC ≥ 0.99) for minutes spent in screen time and sleep, good convergent validity for physical activity level with accelerometry (rho = 0.72) [16] and good criterion validity for TDEE with doubly labeled water (rho = 0.70, $p < 0.001$) [19].

2.3. Health variable

Self-reported health status was determined from the 5-item "general health" subscale of the Short-Form Health Survey (SF-36), a widely used health-related quality of life instrument [20,21]. The SF-36 has demonstrated moderate to good test-retest reliability (0.60–0.81) and evidence of satisfactory construct validity compared with four equivalent dimensions of the Nottingham Health Profile [20]. The general health sub-scale comprises five Likert scale items, which are summed to create a total score of 25 (range: 5–25). The scores were categorised into tertiles: fair (5–17); good (18–19); or excellent (20–25) health.

2.4. Socio-demographic variables

Participants reported their age, sex, occupation, work hours, highest level of education, and overall income [22]. For analysis, education was categorised into tertiles: low (primary/elementary school, high school, post-secondary diploma or certificate); medium (bachelor degree); or high (post-graduate qualification).

2.5. Data analysis

A priori power calculations were performed, based on four assessment time points, a power of 80%, small to medium effect sizes (Cohen's d = 0.25) and a significance criterion of $\alpha = 0.01$. To allow for 15% drop-out, a final sample size of 120 was sought.

The differences between use of time and energy expenditure in each super- and macrodomain by sex, education level and health band were initially investigated using generalised linear mixed models, adjusted for site (i.e. Adelaide and Brisbane). No statistically significant differences were found between the sites. Therefore, a simpler analytical model was adopted for each socio-demographic and health factor (sex, education level and health status) in each superdomain and energy expenditure level. For normally distributed data (e.g. superdomains: Chores, Sleep and Work; macrodomains: Inside chores, Television and Computer; and Very light activity), group means were compared using ANOVA and *t*-tests. The other, non-normally distributed data were analysed using Kruskal–Wallis and Mann–Whitney *U* tests. Alpha was set at 0.05, with sequential Bonferroni adjustment used to correct for multiple comparisons.

3. Results

3.1. Participant characteristics

The total number of participants was 139 (50.3% men), ranging in age from 50 to 79 years with a mean age (SD) of 62.0 (4.5) years (Table 2). More than half the participants had a university education (bachelor degree (22%) or post-graduate qualifications (31%)). Participants worked on average 34 h per week, with 58%