Preventive Medicine 116 (2018) 194–202

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

Review Article

Correlates of sedentary behaviour in university students: A systematic review

Oscar Castro[a,*], Jason Bennie[a], Ineke Vergeer[a], Grégoire Bosselut[b], Stuart J.H. Biddle[a]

[a] Physically Active Lifestyles Research Group, Institute for Resilient Regions, University of Southern Queensland, Springfield Central, Queensland, Australia
[b] Laboratory Epsylon "Dynamics of Human Abilities and Health Behavior" (EA 4556), University of Montpellier, Montpellier, Hérault, France

ARTICLE INFO

Keywords:
Sitting
Sedentary time
College students
Ecological model
Intrapersonal
Interpersonal
Environmental

ABSTRACT

High levels of sedentary behaviour are associated with negative health-related outcomes. However, there is limited evidence on the variables influencing sedentary behaviour in university students. The aim of this systematic review was to identify the intrapersonal, interpersonal, environmental, and time correlates of sedentary behaviour in university students. Records from 12 electronic databases were screened by two independent reviewers. Inclusion criteria included: (i) peer-reviewed articles written in English, Spanish, or French; (ii) studies including undergraduate or postgraduate university students; (iii) studies reporting on the association between sedentary behaviour and at least one variable. The protocol is registered in PROSPERO (CRD42017074198). A total of 126 studies published between 1994 and 2017 met the inclusion criteria. The primary measure of sedentary behaviour was self-reported screen time (61%), followed by total sitting time (28%). Most studies were cross-sectional (86%). After excluding high risk of bias studies (58%), only three intrapersonal variables were sufficiently investigated (≥4) to determine an association with sedentary behaviour: physical activity (negative association with sitting time), obesity markers (indeterminate associations with TV viewing), and gender - female (null associations with total sitting time and screen time). Overall, most of the reported correlates of sedentary behaviour were intrapersonal, non-modifiable factors. Further research on modifiable correlates covering all socio-ecologic levels is required to inform future intervention development. In addition, longitudinal studies are needed to enable the identification of determinants. Improvements in designing and reporting future studies are recommended to help strengthen the available evidence and facilitate future reviewing efforts.

1. Introduction

Sedentary behaviours – defined as any waking activity characterized by an energy expenditure ≤1.5 metabolic equivalents (METs), while in a sitting, reclining, or lying posture (Tremblay et al., 2017) – have become more and more prevalent in modern societies due to changes in the physical, social, and economic environments (Owen et al., 2010). Evidence suggests that high levels of sedentary behaviour are associated with detrimental effects on health and wellbeing, including an increased risk of colon and rectal cancer (Cong et al., 2014; Schmid and Leitzmann, 2014), metabolic syndrome (Greer et al., 2015), depression (Teychenne et al., 2010; Vallance et al., 2011), diabetes, cardiovascular disease, and mortality (Grøntved and Hu, 2011; Katzmarzyk et al., 2009; Wilmot et al., 2012). Importantly, the health risks of excessive sedentary behaviour have shown to be somewhat independent of reporting a recommended level of moderate-to-vigorous physical activity (e.g., Katzmarzyk et al., 2009; Thorp et al., 2011). A recent meta analyses showed that only a high level of daily moderate-to-vigorous physical activity (60–75 min/day) appeared to attenuate the risk of all-cause mortality associated with high levels of sedentary behaviour (Ekelund et al., 2016).

The health risks associated with high volumes of sedentary behaviour have been documented across the life span, from school-aged children (Carson et al., 2016), to working-aged (Van Uffelen et al., 2010) and older adults (Stamatakis et al., 2012). While sedentary behaviour and public health research among working-aged adults concentrates largely on office workers (Gardner et al., 2016), university students are also a population sub-group at risk of being sedentary as a significant proportion of their time is spent studying or in class (Cotten and Prapavessis, 2016). Although limited, preliminary evidence exists

* Corresponding author at: University of Southern Queensland, Springfield Campus, PO BOX 4393, Raceview LPO, Raceview, QLD 4305, Australia.
E-mail addresses: Oscar.CastroSerrano@usq.edu.au (O. Castro), Jason.Bennie@usq.edu.au (J. Bennie), Ineke.Vergeer@usq.edu.au (I. Vergeer), Gregoire.Bosselut@umontpellier.fr (G. Bosselut), Stuart.Biddle@usq.edu.au (S.J.H. Biddle).

https://doi.org/10.1016/j.ypmed.2018.09.016
Received 26 April 2018; Received in revised form 29 August 2018; Accepted 22 September 2018
Available online 25 September 2018

suggesting that undergraduate students are highly sedentary (Farinola and Bazán, 2011; Rouse and Biddle, 2010), and that their sedentary behaviour levels equal or even surpass those of desk-based workers (Moulin and Irwin, 2017). For example, a cross-sectional study conducted in Canada concluded university students spend an average of 11.65 h of self-reported sedentary time per weekday, with most of these hours (6.18) being dedicated to university-related sedentary behaviours (Prapavessis et al., 2015).

The scarcity of research on university students leaves an important gap in the literature on adult sedentary behaviour for at least three reasons. First, the number of university students in developed countries constitutes an important portion of the young adult population and a substantial increase is expected in the future (Dragoescu, 2013; Universities, 2017). Second, university students might adopt roles such as teacher or health professional where they may influence social norms and others' health behaviours (Leslie et al., 1999). Third, the university is a critical period for the development of future life patterns; many adult health-related behaviours are established during late adolescence and early adulthood (USDHHS, 2011).

The 'behavioral epidemiology' framework (Sallis et al., 2000a) proposes that identifying correlates (i.e., the variables associated with the target behaviour) is a necessary step prior to developing interventions designed to change behaviour. Indeed, behaviours are often not changed by the intervention itself, but by a change in one or more correlates of the behaviour, which act as 'mediators' of change (e.g., self-efficacy, social support; Baron and Kenny, 1986; Bauman et al., 2002). Non-modifiable correlates (or 'moderators'), such as age or gender, may assist in identifying sub-groups at risk of being excessively sedentary (e.g., Lakerveld et al., 2017).

Among the different theories that can be used to structure the study of correlates, the socio-ecological model has been extensively used in reviews investigating what variables influence physical activity (Bauman et al., 2012) and, most recently, sedentary behaviour (O'Donoghue et al., 2016). The socio-ecological model posits that behaviour is shaped by a dynamic interrelation of variables at multiple levels (McLeroy et al., 1988; Sallis et al., 2008), including intrapersonal (e.g., attitudes, ethnicity), interpersonal (e.g., modelling, social support), physical environmental (e.g., neighbourhood characteristics, building design), and time variables (e.g., day of the week, time of day). Previous systematic reviews have explored the correlates of adult sedentary behaviour (O'Donoghue et al., 2016; Prince et al., 2017; Rhodes et al., 2012). However, to our knowledge, no known specific review has focused on university students. Such a review may be helpful for identifying population-specific correlates of sedentary behaviour and informing future interventions. Therefore, the primary aim of the present study is to systematically review the literature on socio-ecological correlates of total and domain-specific sedentary behaviours in university students.

2. Methods

The research protocol of this study is registered in PROSPERO, an international prospective register of systematic reviews (registration number: CRD42017074198). The PRISMA guidelines were followed (Moher et al., 2009).

2.1. Search strategy

The following 12 electronic bibliographic databases were searched: EBSCOhost MegaFile Ultimate (including Academic Search Ultimate, CINAHL with Full Text, Education Research Complete, ERIC, PsycARTICLES, Psychology and Behavioral Sciences Collection, PsycINFO, and SPORTDiscus with Full Text), Web of Science (including Web of Science Core Collection and MEDLINE), Scopus, and SciELO. Search alerts were set for each database and maintained until the final analyses (January 2018). The search strategy was developed with the assistance of a research librarian and combined the term 'student' with variations on the terms "university" (e.g. undergraduate, higher education), and "sedentary behaviour" (e.g. sitting, screen time). As a more detailed example, the search strategy for EBSCOhost MegaFile Ultimate is available as online supplementary material. Terms in the search were adapted where necessary to meet different database search criteria. In addition to the database search, reference lists of included studies were manually screened to identify studies.

2.2. Inclusion criteria

Articles were included if they met the following criteria: 1) published in a peer-reviewed journal in English, Spanish, or French; 2) included university students; and 3) investigated the association between at least one potential correlate and sedentary behaviour. Inclusion was not restricted by study design or publication date. University students were defined as undergraduate or postgraduate ('graduate') students, regardless of their mode of enrolment (e.g., full-time, part-time, on-campus, or online). Studies with samples other than undergraduate or postgraduate students were excluded (e.g., students at high school, vocational school, or school of music). Studies with special populations (e.g., students with disabilities) were excluded in order to produce findings generalizable to the broader population. In terms of types of sedentary behaviour, one or more of the following were acceptable: total sedentary or sitting time (e.g., minutes/hours per day), screen time (e.g., television, computer, mobile phone, or video games), occupational sedentary behaviour (e.g., attendance to lectures, private study time), or passive transportation (e.g., driving from/to the university). Sedentary behaviour was assessed either through self-reported or accelerometer-based measures. If sedentary behaviour was reported in terms of frequency rather than amount of time (e.g., TV viewing during X days per week), studies were excluded. Valid measures of association between a potential correlate and sedentary behaviour in quantitative studies included correlations, differences between groups, regression estimates, and odds ratios.

2.3. Selection process

The study selection process consisted of three phases: first, two reviewers (OC and GB) independently screened articles based on title and abstract to assess whether they met the inclusion criteria. In cases of doubt or disagreement, articles were included in the next phase. Second, the full texts of all articles selected in the initial phase were screened by two independent reviewers (OC and GB). Inclusion checklists were completed for each study, along with details on why exclusion occurred. Third, the reference list of each included study was fully reviewed to ensure that no relevant articles were missed. Any disagreement between reviewers in phases two and three was resolved by discussion (87% agreement in initial screening). If required, disagreement was resolved through a consensus discussion with a third reviewer (SJHB).

2.4. Data extraction

Two reviewers (OC and GB) independently extracted data from the included studies onto a standardized pre-piloted data extraction form. Discrepancies were identified and resolved through discussion (93% agreement in initial data extraction), with a third researcher mediating where necessary (SJHB). Data extracted included: (i) publication details; (ii) study design, (iii) sample characteristics, (iv) measurement of sedentary behaviour; (v) type of sedentary behaviour; (vi) correlates investigated; and (vii) significant findings.

2.5. Data analysis

A narrative synthesis was used to describe reported associations