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Study and Life: How first year university students use their time

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Abstract

Starting university changes the way students must structure their day. This study describes the patterns of time use of 444 Australian first year students and explores differences between gender and age groups. Overall, students were studying on average four hours per day (h/day), sleeping eight h/day and meeting Australian physical activity guidelines. A sizable portion of students' days were spent engaging in 'non-modifiable' activities including self-care, chores and travel. Stereotypical gender and age differences were observed, with males accumulating significantly more screen-time (+68 minutes per day [min/d]) and physical activity (+21 min/d), while females did more chores (+18 min/d) and self-care (+26 min/d). Younger students slept more (+42 min/d), and did fewer chores (-43 min/d). Given there are strong associations between how students use their time and health, well-being and academic success, a better understanding of how students allocate their time on a day-to-day basis will enable more effective support for students in making these changes.

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Introduction

The importance of time management skills in the first year

Life transitions, such as starting work, marriage and retirement, are times when there is an obligatory re-organisation of the way people use their time (Cowan, 1991). Starting university is another example (Hussey & Smith, 2010). Students shift from highly structured and externally-imposed use of time environments (school or work) into a relatively unstructured and internally-regulated environment (university). The development of time management skills is therefore critical in order to successfully negotiate this new stage in their lives (Nonis, Hudson, Logan, & Ford, 1998; Nonis, Philhours, & Hudson, 2006; Sauvé, Fortin, Viger, & Landry, 2016; van der Meer, Jansen, & Torenbeek, 2010).

Often, students entering university today are not focussing on study alone and are spending their time quite differently to those from previous generations (Babcock & Marks, 2010). Study modes are becoming more diverse (van der Meer et al. 2010) and many students have extra-curricular commitments competing for their time, such as part-time work (McInnis & Hartley, 2002) or family/caring responsibilities (Coates, 2010). Time use is also highly stereotyped with expectations around gender, age and status (Ferrar, Olds, & Walters, 2012; Sprod et al., 2016). For example, young male students may be expected to play sport and consume sport on television, go drinking with their male friends, and work to support themselves. On the other hand, young women may be expected to perform the bulk of household chores (including childcare), socialise with friends and provide emotional support, and maintain contacts with family. Effective allocation of time to balance the demands of full-time study with life outside university can therefore be a big challenge for many first year students (Brooker, Brooker, & Lawrence, 2017; Taylor, 2017).

First year students' patterns of time use

Several key associations between student success and both academic and non-academic activities have been found in studies investigating students' use of time throughout different stages of their degree. Spending quality time on study-related activities is consistently related to improved academic outcomes (e.g. Brint & Cantwell, 2010; Plant, Ericsson, Hill, & Asberg, 2005). Additionally, a number of non-academic activities have been found to be associated with academic performance at university: some positively, such as sleep (Curcio, Ferrara, & De Gennaro, 2006), and others negatively, like non-academic internet use during study time (Ravizza, Hambrick, & Fenn, 2014). Factors such as sleep (Gaultney, 2010), physical activity (Keating, Guan, Piñero, & Bridges, 2005), sedentary behaviour (Buckworth & Nigg, 2004), socialising with friends (Shim & Ryan, 2012), and participating in paid work (Hall, 2010) have also been associated with students' physical and psychological health.

However, there has been less focus on everyday activities such as commuting (Kobus, Van Ommeren, & Rietveld, 2015), caring responsibilities, and self-care (eating, showering etc.). These activities may displace time that could otherwise be spent engaging in behaviours associated with more positive academic and health outcomes (such as study and physical activity). With diverse student cohorts, the time demands experienced by individual students are likely to differ. These differences may influence the time students have available for activities associated with more positive outcomes, and their ability to adjust their time use in response to shifting academic demands. Some students' issues with time management may not always be due to

making the 'wrong' choices when allocating their time, rather they may be faced with commitments that are more difficult to alter.

Given there are only 24 hours in a day, if students are to increase time spent in one area, then they will need to reduce time spent in another. Yet the ways in which first year students are currently allocating their time toward both academic and non-academic activities on a day-to-day basis remains unclear.

What is still unknown about time use for first year students

While there are numerous 'time-use' studies in existence for university students, these studies often use a range of stylised questionnaires which capture only specific activities (e.g. study time, physical activity, sleep) (Ahrberg, Dresler, Niedermaier, Steiger, & Genzel, 2012; Bowman, Levine, Waite, & Gendron, 2010; Brint & Cantwell, 2010; Plant et al., 2005), and do not capture the temporal distribution of activities in a fine-grained manner. On the other hand, there are studies that aim to glean more detail through the use of time diaries (or similar) however, due to participant burdens, they still tend to be limited to specific academic activities while omitting all or most other non-academic activities (e.g. George, Dixon, Stansal, Gelb, & Pheri, 2008; Nonis & Hudson, 2006; Nonis et al., 2006).

A wide variety of student cohorts and educational contexts are also explored in the above mentioned literature, from first year to final year at university, and even postgraduate study (Nonis et al., 2006). Importantly, there is a lack of research conducted in the Australian higher education context. The majority of time-use studies come from higher education systems in the United States of America and the United Kingdom, which differ in significant ways from the Australian system (McInnis, 2001). For example, in Australia, the majority of students live in off-campus accommodation (e.g. at home with parents, private rental property) and so commute to university; living on campus is comparatively rare (7.6% nationally) (Newland, 2015).

The aims of this current study are:

1. To describe the *patterns of time use* in Australian first year university students.

2. To explore differences in time use between *gender* and *age* groups.

Method

The data reported here were part of a longitudinal cohort study which followed a group of Australian first year university students through the course of an academic year. Use of time recalls, followed by online personality trait, distress, and satisfaction questionnaires, were administered once during Week 3 of both Semester 1 and Semester 2 of their first year (13 weeks each, March-June and July-November). As the focus of this present work is on student time use, the other measures collected will not be reported here. These other measures will however be reported in the thesis arising from this work.

Participants

The participants in this study were first year Health Science students at the metropolitan campuses of a large Australian university. This student cohort comprised of approximately 48% 'Sport Science' students, with the remainder a mix of Allied Health students (e.g. Physiotherapy, Podiatry, Medical Imaging). There was a total of 444 participants who were involved in both rounds of data collection across the year. Fifty-seven percent of the sample were female, and 81% were under 21 years-old. Socioeconomic-status (SES) was determined using the Index of Relative Socio-Economic Disadvantage (IRSD; based on participants' residential postcodes; standardised national mean 1000 (± 100)). In this sample, the average score was 1001 (± 69).

Recruitment and the first round of data collection occurred during Week 3 of Semester 1 (March) in 2014 with a second round of data collection held during Week 3 of Semester 2 (August). Participants were included if they were in their first year of university, enrolled full time (three or four courses/subjects/papers/units per semester), and studying internally at one of the four metropolitan campuses.

Data collection protocol

Students' use of time was assessed using the Multimedia Activity Recall for Children and Adults (MARCA), a computerised 24-hour use-of-time recall (Gomersall, Olds, & Ridley, 2011). The MARCA provides a valid, reliable, high-resolution snapshot of how people use their time, and can be administered via computer-assisted telephone interviews, 'instructor-led' group sessions, or face-to-face interviews. For this study, instructor-led group sessions were held during students' regular scheduled workshop classes.

Students recalled two days of activities at both time points (some participants only completed one day), that may have been weekdays or weekend days depending on the day data was collected. Of the days collected, 69% were weekdays and 31% were weekends.

Table 1

MARCA Activity Domain Structure

Superdomain	Example
Sleep	-
Study	In-class (e.g. taking notes/class discussion) Offline (i.e. books, notes) Computer for study (i.e. typing, internet)
Study Off-Task	Time during study tasks not related to study (e.g. surfing internet)
Chores	Inside chores (e.g. cooking, childcare)
Work	Retail, restaurant work
Transport	Passive transport (e.g. car, bus) Active transport (e.g. walking)
Sociocultural	Communication (e.g. talking on the phone) Socialising Cultural (e.g. singing, playing instrument)
Screen Time	TV Videogames Computer for personal use (i.e. typing, internet)
Physical Activity	Sport (e.g. gym, swimming) Play (e.g. with animals, table tennis)
Self-Care	Eating Grooming
Quiet Time	Reading Non-reading

Participants were 'walked through' the previous two days from midnight to midnight, recalling each activity chronologically. They could choose from over 300 different activities in time slices as fine as five minutes. Each activity is assigned a metabolic equivalent (MET) value based on the Ainsworth compendium (Ainsworth et al., 2000), so time spent in moderate to vigorous physical activity, sedentary behaviour, and overall daily energy expenditure could also be calculated. The adult MARCA has very high same-day test-retest reliability (ICC = 0.990-0.997) and good validity compared to accelerometry [rho = 0.72; Gomersall et al. (2011)] and a gold standard method of measuring energy expenditure, doubly labelled water [rho = 0.70 (Foley et al., 2012)].

Additional detail was gathered regarding university-related study activities in the MARCA. A pop-up question module, 'University-related', was linked with activities expected to involve university study (e.g. computer work, taking notes/class discussion). Students assigned a score of 0-10 to indicate how much the activity was related to university study. Time spent in study-related activities was then adjusted to reflect the 'university-related' scores (i.e. computer work for 90 minutes with a score of eight would be adjusted to 72 minutes).

As is standard practice for the MARCA, all activities were hierarchically aggregated into 11 'superdomains' (Sleep, Study, Study Off-Task, Chores, Work, Transport, Sociocultural, Screen time, Physical Activity, Self-care, and Quiet time), and a number of sub-domains called 'macrodomains' (see Table 1). Average minutes per day spent in each superdomain and macrodomain was then calculated for each participant for all recalled days from Semester 1 and Semester 2 combined. As a combination of both weekdays and weekends could be recalled, these averages were weighted (5:2) to account for the day type recalled.

Data analysis

Firstly, comparisons were made between students reported time use and recommended guidelines for sleep, study and moderate-to-vigorous physical activity (MVPA). Average minutes/hours per day for sleep, study and MVPA were calculated for each student, and each student assigned to a category within these activity types. Three categories were used for sleep based on the recommended durations for adults (18-64 years old) from the National Sleep Foundation: seven to nine hours per day (recommended), less than seven h/day, or more than nine h/day (Hirshkowitz et al., 2015). Average sleep onset and wake times were also explored. Recommended study times can vary between institutions, however it is quite a common expectation of South Australian university teaching staff that students are spending around 6-10 hours per course per week, totalling about 37.5 h/week for full-time students, on study-related activities (including class time) (McCann et al., 2014). It was on this basis that the binary cut-point of 5.4 h/day was decided. Physical activity (PA) times were calculated from the MARCA based on the combined time spent in activities classified as MVPA, namely activities requiring at least three METs or three times resting metabolic rate (Ainsworth et al., 2000). The average daily times were converted into a 'weekly' average, to enable comparison with current Australian guidelines of at least 150 minutes of moderate to vigorous physical activity per week (Department of Health, 2016).

Next, standard descriptive statistics (mean, SD) by MARCA domain were calculated for all students combined, as well as for men and women, and students aged <21 years-old and 21+ years-old. The amount of time spent in each of the superdomains was compared between genders and age groups using Mann-Whitney U tests. Only MARCA superdomains were analysed and sequential Bonferroni correction was used to adjust for alpha slippage. This

design can detect effect sizes (differences between groups) of d<0.35 with an alpha of 0.05 and a power of 80%.

Finally, the MARCA data were then clustered into five mutually exclusive and exhaustive energy expenditure (EE) bands; 0-0.9 METs (Sleep), 1-1.9 METs (Sedentary), 2-2.9 METs (light physical activity), 3-5.9 METs (moderate physical activity) and ≥ 6 METs (vigorous physical activity). These EE bands are distinct from the superdomains (except for the sleep domain) and may contain any combination of activities determined by the level of physical exertion each activity requires, a standard approach when describing activities based on energy expenditure (measured using METs; Ainsworth et al., 2000). The Physical Activity superdomain only includes activities typically associated with being 'physically active', such as sports, regardless of the physical exertion required (e.g. lifting weights and darts). On the other hand, the EE bands include any activities with a specific level of physical exertion regardless of activity 'type' (e.g. lifting weights and housework). Between-group differences for gender and age were explored as described above for the superdomains, however no corrections were required.

Results

Students meeting recommended levels of sleep, study and physical activity

Of the three sleep categories assessed, on average the majority of students were sleeping for the recommended of seven to nine h/day (53%), while 40% were sleeping longer than nine h/day and 7% sleeping less than seven h/day. Sleep onset times were divided into four categories; before 10.00pm, 10.01-11.00pm, 11.01-12.00 midnight, and after 12 midnight. Fourteen percent of students recorded an average sleep onset time before 10.00pm, with 41% and 34% falling asleep between 10.01-11.00pm and 11.01-midnight respectively. The remaining 11% had average sleep onset times after midnight. Additionally, 121 of the 444 participants reported having at least one nap during one of their recall days (i.e. had interrupted sleep patterns across the day). The average nap duration was 99 minutes (± 58.24), with a range of 15-262 minutes. When investigating study time (including class time), 69% of students reported spending 5.4 h/day or less on average. Only 31% of students reported spending more than the 5.4 h/day on study related activities required if they were to meet the expected weekly average of 37.5 h/week. Most students were found to be meeting, or exceeding, the current Physical Activity guidelines from the Australian Government (68% = 150-300 min/week; 28% = >300 min/week). Only 4% of students reported less than 150 minutes per week of moderate to vigorous physical activity.

Patterns of time use

An overview of student time use as per the MARCA superdomains is shown in Table 2, while Table 3 shows the average time spent in the different energy expenditure (EE) bands. On average, students spent the greatest portion of their day sleeping (521±71 min/d), followed by study-related activities (276±123 min/d). Time spent in transit, in front of a screen, and engaging in self-care was similar at around 118 min/day, however screen time had the highest variability (±95 min/d). More time was spent sedentary than any other EE band (664±115 min/d).

Table 2

Descriptive time use for superdomain and macrodomain activities (minutes per day) for all students, and by gender and age.

Activity Domain	All students n = 444	Males n = 187	Females n = 257	<21 years-old n = 364	21+ years-old n = 80
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Sleep	521 (71)	526 (70)	518 (72)	**529** (70)	**487**^ (68)
Study	276 (123)	**261** (131)	**288** (113)	274 (118)	288 (138)
Class	84 (69)	80 (69)	86 (69)	84 (70)	80 (65)
Offline	172 (112)	158 (120)	182 (105)	168 (105)	189 (140)
Computer (U)	21 (43)	22 (42)	19 (43)	21 (43)	18 (41)
Study Off-task	25 (31)	23 (31)	26 (32)	24 (30)	28 (36)
Work	38 (70)	36 (69)	40 (70)	36 (64)	50 (90)
Chores	43 (46)	**33** (36)	**51*** (50)	**35** (34)	**78**^ (71)
Transport	124 (52)	123 (53)	126 (51)	124 (50)	128 (57)
Active	45 (31)	43 (31)	47 (31)	44 (28)	51 (41)
Passive	79 (41)	79 (42)	79 (41)	80 (41)	77 (46)
Sociocultural	100 (72)	**92** (71)	**106** (73)	102 (73)	91 (67)
Communication	80 (61)	69 (62)	87 (60)	81 (62)	74 (57)
Socialising	18 (35)	20 (34)	17 (35)	19 (35)	16 (31)
Cultural	2 (8)	3 (9)	2 (8)	3 (9)	1 (6)
Screen time	118 (95)	**157** (106)	**89*** (74)	121 (97)	101 (87)
TV	87 (75)	106 (85)	74 (63)	90 (77)	76 (63)
Videogames	11 (36)	23 (49)	2 (19)	11 (37)	10 (33)
Computer (P)	20 (45)	29 (59)	13 (30)	21 (47)	15 (39)
Physical Activity	39 (42)	**50** (45)	**30*** (38)	40 (41)	34 (46)
Self-care	118 (44)	**103** (44)	**129*** (41)	118 (44)	117 (42)
Eating	60 (33)	60 (37)	60 (31)	59 (33)	63 (36)
Grooming	58 (24)	44 (18)	68 (23)	59 (25)	54 (21)
Quiet time	38 (39)	37 (37)	38 (39)	37 (39)	39 (38)
Reading	7 (20)	7 (23)	7 (18)	7 (19)	8 (25)
Non-reading	31 (34)	30 (29)	31 (37)	31 (34)	31 (32)

NOTE: Age groups at March 2014; Computer (U) = university-related, Computer (P) = Personal computer use; Bold = significant pre-Bonferroni correction; * significantly different from males (post-Bonferroni correction); ^ significantly different from younger students (post-Bonferroni correction); $p < 0.001$

Table 3

Descriptive time use for Energy Expenditure bands (minutes per day) for all students, and by gender and age

Energy expenditure bands	All students n = 444	Males n = 187	Females n = 257	<21 years-old n = 364	21+ years-old n = 80
Sleep	521 (71)	526 (70)	518 (72)	529 (71)	487^ (63)
Sedentary	664 (115)	673 (116)	657 (113)	665 (112)	658 (127)
Light PA	139 (69)	120 (66)	153* (67)	133 (63)	167^ (84)
Moderate PA	84 (64)	77 (63)	89* (64)	81 (60)	97 (79)
Vigorous PA	32 (42)	44 (50)	24* (32)	33 (42)	31 (41)

NOTE: Age groups at March 2014; PA = physical Activity; MET = metabolic equivalent; sleep = (≤ 0.9 METs); sedentary = 1.0-1.9 METs; light physical activity = 2.0-2.9 METs; moderate physical activity = 3.0-5.9 METs; vigorous physical activity = ≥ 6.0 METs; * significantly different from males; ^ significantly different from <21 years-old; $p < .05$

Differences in time use between student groupings

The differences in time use between student gender and age groups are represented graphically in Figure 1. Time spent in minutes per day is found on the *y*-axis, while activities are arranged in descending order of MARCA superdomains for each group comparison. In Figure 1a, activities above the line are those in which male students spent more time. Conversely, activities found below the line indicate more time spent by female students.

In this student sample, males spent significantly more time engaged in screen-related activities than females (+68 min/d; $p<.001$), particularly watching television. Males also spent significantly more time engaging in physical activity (+21 min/d; $p<.001$). Females spent more time on self-care (+26 min/d; $p<.001$) and chores (+18 min/d; $p<.001$), and tended to spend more time on study-related activities (+27 min/d; *ns*). In particular, females spent more time grooming, communicating and in offline study. Time spent in class and on a computer were similar for both genders. Work, sleep, transport, quiet time and sociocultural activities were all very similar across genders. The age groups differed significantly in only two of the superdomains (Figure 1b). Younger students spent more time sleeping than their mature peers (+42 min/d; $p<.001$), while students aged 21+ years-old spent longer on chores (+43 min/d; $p<.001$). Younger students also tended to spend more time watching TV (+14 min/d; *ns*), while personal computer use and videogames were similar for both age groups. Sociocultural and study-related activities did not differ significantly between age groups, however a trend toward older students engaging in more offline study was observed (+21 min/d; *ns*). The remaining activity superdomains were very similar across the age groups.

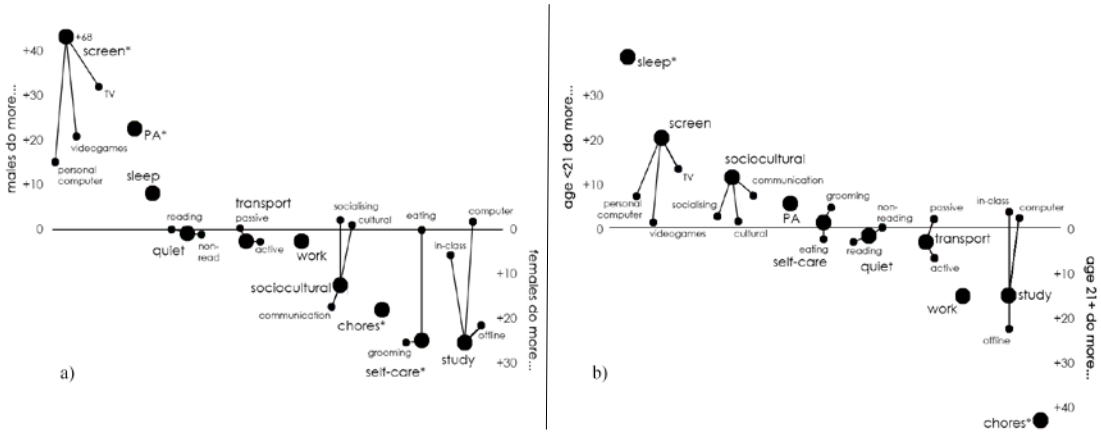

Figure 1 Differences in time use (min/d) between a) male and female students and b) <21 years-old and 21+ years-old students. The large dots represent superdomains and the smaller dots macrodomains. Males/<21 year-old spend more time in any activity above the midline, and females/+21 year-old more time in any activity below the midline. PA = physical activity. *$p < .001$

Some between-group differences were observed for the light, moderate and vigorous physical activity bands. Males typically spent more time engaging in vigorous PA (+20 min/d; $p<.001$), while females spent more time in the light (+33 min/d; $p<.001$) and moderate (+12 min/d; $p<0.05$) PA bands. Finally, 21+ year-old students spent +34 min/d ($p<.001$) longer in light PA than their younger peers, while obtaining significantly less sleep (-42 min/d; $p<.001$).

Discussion

This study set out to explore how first year students in Australia are using their time; both the overall patterns of time use, as well as differences between age and gender groups. The method of time recall used in this study enabled a more nuanced examination of students' time use, particularly their non-academic activities; an important inclusion when considering the time challenges first year students face.

Today's students are faced with multiple, inconsistent and contradictory demands on their time (e.g. 'pulsatile' nature of assessment requirements), while often lacking systemic and structured support from educators, services, employers and family (Kift, 2015). The highly unstructured university environment calls for students to employ time management skills and high levels of internal regulation often not seen in other domains (e.g. school or work). Additionally, this time of life also results in many shifting personal demands, such as establishing relationships, personal development, changing ties with family, and moving out of home. Commencing university students are therefore faced with a very challenging, and individual, set of circumstances they must manage on top of completing their prescribed course work. A time recall activity such as the MARCA could be particularly useful for students when incorporated into larger more holistic support structures (Kift, 2015; Taylor, 2017). This would provide students opportunity to reflect on their own time allocation and ensure they plan in sufficient time for their studies.

Firstly, students in this cohort were, on average, studying just over four hours per day (including in-class time). Sixty-nine percent of students were found to be studying less than the 'full time' load (approx. 37 h/wk) commonly expected by university teaching staff (Crisp et al., 2009; McCann et al., 2014). This may reflect the fact that time-use data were collected during Week 3 of semester, when academic workload is often still relatively low. Indeed, Doerksen, Elavsky, Rebar, and Conroy (2014, p.18) describe that students are more likely to plan their time at a weekly level, rather than a daily or semester level. This can then result in very busy weeks around assessments and quiet periods either side. However, recent research from the U.S. has reported first year students spend around three to four hours per day on average across the year (Greene & Maggs, 2015; National Survey of Student Engagement, 2013), less than generations past (Babcock & Marks, 2010, p. 468). Similarly to our current sample, Greene and Maggs (2015, p. 1630) also found that females spent more time studying on average than their male peers (+38 min/d, compared to +27 min/d in the present study).

Allocating sufficient time for sleep is crucial for student success (Curcio et al., 2006). While negative changes in sleep patterns, quality, and duration are all frequently reported in university student populations (Curcio et al., 2006; Gaultney, 2010; Lund, Reider, Whiting, & Prichard, 2010), in this sample, the vast majority of students were meeting, or exceeding, the recommended hours of sleep per day (53% - 7-9 hours, 40% - 9+ hours; National Sleep Foundation 2015). Whether this time allocation changes as study load increases was unable to be determined in this instance, however research suggests that students may choose to trade off sleep time when academic demands increase (Galambos, Dalton, & Maggs, 2009; Gomersall, Norton, Maher, English, & Olds, 2015).

Although overall hours of sleep appear adequate, the *timing* of those hours may be problematic. Late sleep/wake times have been associated with poorer quality sleep, and poorer health and cognitive outcomes, which may cause problems for students in the longer term (Curcio et al., 2006). Almost half of the students recorded an average sleep onset time of 11:00pm or later (45%), with 11% of students commencing sleep after midnight. Additionally, almost one third of students reported napping on at least one of their recall days. These disrupted sleep patterns may have assisted in students obtaining adequate total hours of sleep, however are of concern as daytime sleepiness has been associated with poorer cognitive performance (Gaultney, 2010). Sleep is not the only activity to see changes upon commencement of university study with potentially detrimental effects on students' performance and well-being.

Physical activity (PA) has often been reported to decline in university student populations following commencement of study (Leslie et al., 1999; Leslie, Sparling, & Owen, 2001). Simultaneously, sedentary time is likely to increase due to the nature of university study (e.g. reading, sitting in class, computer use). These changes occur at a time when maintaining physical and mental health is crucial. Within this sample of first year students, the majority (96%) were meeting weekly recommended levels. However, this result should be interpreted with caution as this student sample is from a health focused discipline, and the nature of extrapolating from 'average days' can lead to some overestimation. Additionally, as mentioned above, the timing of data collection during a period of relatively low academic load may also contribute to more students meeting recommendations, as PA is often an activity to be 'traded-off' when time pressures increase (Blake, Stanulewicz, & McGill, 2017, pp. 921-924). Consistent with other PA research (e.g. Ferrar et al., 2012; Leslie et al., 1999), males spent significantly more time engaging in PA than females (+21 min/d; $p < .001$). This difference again highlights the continued need for providing encouragement

for females to increase/remain active during their transition to university.

Students were spending a large portion of their day engaging in sedentary activities. On average, over 11 h/day were spent engaging in activities that involved very little physical exertion with no significant differences observed between groups. This is unsurprising given the nature of university study where students are expected to sit both in class and while undertaking self-directed study activities. However, with an average study time of around 4 h/d, there is still a large portion of their time spent sedentary in nature outside of study. A growing body of research highlights the importance of reducing sedentary time to improve one's health and well-being, and so encouraging students to reduce sedentary behaviours outside of study tasks will be important (Tremblay, Colley, Saunders, Healy, & Owen, 2010).

Group differences

There were a number of gender-specific patterns of time use for first year university students. Males tended to spend more time each day in screen-based (+67 min/d; $p < .001$) and physical activities (+21 min/d; $p < .001$), while females spent more time doing household chores (+19 min/d; $p < .001$), engaging in self-care (+26 min/d; $p < .001$), study (+26 min/d; *ns*), and socio-cultural activities (+13 min/d; *ns*). These are very stereotypical time use differences found across all age groups (Ferrar et al., 2012; Sprod et al., 2016). These gender differences are important to remember when supporting students in managing their time; targeted support for the gender groups may be needed. For example, screen time for males is an obvious trade-off for more study time if needed, however chores and self-care for females may be a little more difficult to swap out for study or PA.

There were also differences in time use between younger and older students, most notably younger students spent more time sleeping (+38 min/d; $p < .001$) and in front of a screen (+19 min/d; *ns*) while older students spent more time studying offline (+24 min/d, *ns*) and taking care of chores (+41 min/d; $p < .001$). Again, at first glance these differences are not surprising, and fit the stereotypical behaviours many would expect to see in these two groups. However, they do confirm that differences in time demands exist for students of different ages. With increasing numbers of students commencing undergraduate study later in life (Krause, Hartley, James, & McInnis, 2005), it is important that institutions be aware of how time demands differ across age groups.

Strengths and limitations

Rather than limiting activities of interest to a select few domains, or using broad stylised questionnaires, students used the MARCA to recall 24-hour periods in a fine-grained manner; down to time slices as small as five minutes. With over 300 activities to choose from, all activities within the recall period were able to be recorded (Gomersall et al., 2011). This provided a unique and detailed view of how students were spending their time.

However, while this study sample was moderately large, it was also quite homogeneous; only including students from the Health Science discipline, predominantly younger (<21 years old), and female. On one hand, all students would have been studying similar, if not the same, courses in their first year (common 'core' courses), and so study load would have been comparable. Yet, this does limit the applicability of these results to other disciplines given the differences that exist regarding age and gender makeup, as well as content taught and pedagogy used (e.g. more/less contact hours, practical versus tutorial versus online) (Torenbeek, Jansen, & Suhre, 2013). These students were also likely to have higher physical activity behaviours than peers from other disciplines given their interest/enrolment in health-related

disciplines. Investigating students' time use data from other disciplines would enable both study patterns and life outside of study to be compared.

Additionally, time use may change over the course of the academic year/semester. Activity patterns in week three would likely differ from later in the semester as study load changes in response to assessment deadlines. Assessing at multiple time points *within* a semester would capture these fluctuations.

Finally, although time-use data was collected using a valid, reliable, high-resolution tool, vagaries of self-report and issues of averaging time use may have impacted on the reported data. The one to two days recalled at each time point may not have been representative of students' actual time use.

Implications and future research

This study enabled a more complete picture of student time use to be obtained, including those activities often omitted from university student time use studies (e.g. chores, self-care). The inclusion of these additional activities in future studies will allow more targeted and specific guidance to be provided to students regarding the allocation of their time. When planning how time will be allocated, time spent in 'non-modifiable' activities, such as travel, chores and self-care, should always be considered. These non-modifiable activities are often difficult to change yet they can take up a sizeable portion of students' waking hours, contributing to the time challenges many first year students experience. An awareness of these enables more appropriate planning thereby helping students avoid overcommitting.

Additionally, educators, university services and family could all play a role in trying to alleviate some of these time stresses. Educators could, for example, stagger assessments over the semester to avoid cramming at the end of the semester. Employers might offer flexible hours. Family could help with transport and routine tasks such as shopping, while universities could provide on-campus services such as medical centres, gyms and childcare.

Further, research investigating associations between time use and student outcomes would provide evidence toward more successful patterns of behaviour. Recommendations to students could then move beyond broad statements such as "increase quality study time" or "find more time to sleep".

Conclusion

Assuming all first year, full-time enrolled students will have similar time demands outside of university is misleading. They have multiple, conflicting and inconsistent demands on their time, and will therefore differ in the time they have available to study, and in their ability to balance these competing demands. Overall, students appear to still have quite a bit of discretionary time with around 1.5 h/d available for both socialising and TV, and another 0.5 h/d for personal computer use. The results of this study also reinforce existing gender and age stereotypes relating to time use, highlighting that interventions and/or support may need to be tailored to suit particular student groups.

Effective and high-resolution measurement of time use is crucial to expanding our understanding of what time challenges first year students are facing, how they are currently managing them, and how this may influence first year academic success.

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References

Ahrberg, K., Dresler, M., Niedermaier, S., Steiger, A., & Genzel, L. (2012). The interaction between sleep quality and academic performance. *Journal of Psychiatric Research, 46*(12), 1618-1622. doi:10.1016/j.jpsychires.2012.09.008

Ainsworth, B. E., Haskell, W. L., Whitt, M. C., Irwin, M. L., Swartz, A. M., Strath, S. J., . . . Leon, A. S. (2000). Compendium of physical activities: an update of activity codes and MET intensities. *Medicine & Science in Sports & Exercise, 32*(9), S498-S516. Retrieved from http://journals.lww.com/acsm-msse/Fulltext/2000/09001/Compendium_of_Physical_Activities__an_update_of.9.aspx

Babcock, P., & Marks, M. (2010). The falling time cost of college: evidence from half a century of time use data. *Review of Economics and Statistics, 93*(2), 468-478. doi:10.1162/REST_a_00093

Blake, H., Stanulewicz, N., & McGill, F. (2017). Predictors of physical activity and barriers to exercise in nursing and medical students. *Journal of Advanced Nursing, 73*(4), 917-929. doi:10.1111/jan.13181

Bowman, L. L., Levine, L. E., Waite, B. M., & Gendron, M. (2010). Can students really multitask? An experimental study of instant messaging while reading. *Computers & Education, 54*(4), 927-931. doi: 10.1016/j.compedu.2009.09.024

Brint, S., & Cantwell, A. M. (2010). Undergraduate time use and academic outcomes: Results from the University of California Undergraduate Experience Survey 2006. *Teachers College Record, 112*(9), 2441-2470. Retrieved from http://higher-ed2000.ucr.edu/Publications/Brint_and_Cantwell2008.pdf

Brooker, A., Brooker, S., & Lawrence, J. (2017). First year students' perceptions of their difficulties. *Student Success, 8*(1), 49-62. doi: http://dx.doi.org/10.5204/ssj.v8i1.352

Buckworth, J., & Nigg, C. (2004). Physical Activity, Exercise, and Sedentary Behavior in College Students. *Journal of American College Health, 53*(1), 28-34. doi: 10.3200/JACH.53.1.28-34

Coates, H. (2010). *AUSSE Research Briefing: Getting first-year students engaged*. Retrieved from Australian Council for Educational Research website https://research.acer.edu.au/ausse/6/

Cowan, P. A. (1991). Individual and family life transitions: A proposal for a new definition. In P. A. Cowan & E. M. Hetherington (Eds.), *Family Transitions*. Hillsdale, New Jersey: Lawrence Erlbaum Associates/Taylor & Francis.

Crisp, G., Palmer, E., Turnbull, D., Nettelbeck, T., Ward, L., LeCouteur, A., . . . Schneider, L. (2009). First year student expectations: Results from a university-wide student survey. *Journal of University Teaching and Learning Practice, 6*(1), 11-26. Retrieved from http://ro.uow.edu.au/jutlp/

Curcio, G., Ferrara, M., & De Gennaro, L. (2006). Sleep loss, learning capacity and academic performance. *Sleep Medicine Reviews, 10*(5), 323-337. doi: 10.1016/j.smrv.2005.11.001

Department of Health. (2016). Australia's Physical Activity and Sedentary Behaviour Guidelines. Retrieved from http://www.health.gov.au/internet/main/publishing.nsf/content/health-pubhlth-strateg-phys-act-guidelines

Doerksen, S. E., Elavsky, S., Rebar, A. L., & Conroy, D. E. (2014). Weekly fluctuations in college student leisure activities and well-being. *Leisure Sciences, 36*(1), 14-34. doi: 10.1080/01490400.2014.860778

Ferrar, K. E., Olds, T. S., & Walters, J. L. (2012). All the Stereotypes Confirmed: Differences in How Australian Boys and Girls Use Their Time. *Health Education & Behavior, 39*(5), 589-595. doi:10.1177/1090198111423942

Foley, L., Maddison, R., Rush, E., Olds, T., Ridley, K., & Jiang, Y. (2012). Doubly labeled water validation of a computerized use of time recall in active young people. *Metabolism, 62*(1), 163-169. doi: 10.1016/j.metabol.2012.07.021

Galambos, N. L., Dalton, A. L., & Maggs, J. L. (2009). Losing Sleep Over It: Daily Variation in Sleep Quantity and Quality in Canadian Students' First Semester of University. *Journal of Research on Adolescence, 19*(4), 741-761. doi: 10.1111/j.1532-7795.2009.00618.x

Gaultney, J. F. P. (2010). The prevalence of sleep disorders in college students: impact on academic performance. *Journal of American College Health, 59*(2), 91-97. https://doi.org/10.1080/07448481.2010.483708

George, D., Dixon, S., Stansal, E., Gelb, S. L., & Pheri, T. (2008). Time Diary and Questionnaire Assessment of Factors Associated With Academic and Personal Success Among University Undergraduates. *Journal of American College Health, 56*(6), 706-715. doi:10.3200/JACH.56.6.706-715

Gomersall, S. R., Norton, K., Maher, C., English, C., & Olds, T. S. (2015). In search of lost time: When people undertake a new exercise program, where does the time come from? A randomized controlled trial. *Journal of Science and Medicine in Sport, 18*(1), 43-48. doi: 10.1016/j.jsams.2014.01.004

Gomersall, S. R., Olds, T. S., & Ridley, K. (2011). Development and evaluation of an adult use-of-time instrument with an energy expenditure focus. *Journal of Science and Medicine in Sport, 14*(2), 143-148. doi: 10.1016/j.jsams.2010.08.006

Greene, K. M., & Maggs, J. L. (2015). Revisiting the time trade-off hypothesis: Work, organized activities, and academics during college. *Journal of Youth and*

Adolescence, 44(8), 1623-1637. doi:10.1007/s10964-014-0215-7

Hall, R. (2010). The work–study relationship: experiences of full-time university students undertaking part-time employment. *Journal of Education and Work, 23*(5), 439-449. doi: 10.1080/13639080.2010.515969

Hirshkowitz, M., Whiton, K., Albert, S. M., Alessi, C., Bruni, O., DonCarlos, L., . . . Adams Hillard, P. J. (2015). National Sleep Foundation's sleep time duration recommendations: methodology and results summary. *Sleep Health, 1*(1), 40-43. doi: 10.1016/j.sleh.2014.12.010

Hussey, T., & Smith, P. (2010). Transitions in higher education. *Innovations in Education and Teaching International, 47*(2), 155-164. doi:10.1080/14703291003718893

Keating, X. D., Guan, J., Piñero, J. C., & Bridges, D. M. (2005). A Meta-Analysis of College Students' Physical Activity Behaviors. *Journal of American College Health, 54*(2), 116-126. doi:10.3200/JACH.54.2.116-126

Kift, S. (2015). A decade of transition pedagogy: A quantum leap in conceptualising the first year experience. *HERDSA Review of Higher Education, 2*(1), 51-86. Retrieved from http://www.herdsa.org.au/herdsa-review-higher-education

Kobus, M. B. W., Van Ommeren, J. N., & Rietveld, P. (2015). Student commute time, university presence and academic achievement. *Regional Science and Urban Economics, 52*, 129-140. doi: 10.1016/j.regsciurbeco.2015.03.001

Krause, K-L., Hartley, R., James, R., & McInnis, C. (2005). *The first year experience in Australian universities: Findings from a decade of national studies*. Retrieved from the Centre for the Study of Higher Education, University of Melbourne website https://melbourne-cshe.unimelb.edu.au/research/past-research-projects/experience/the-first-year-experience-in-australian-universities

Leslie, E., Owen, N., Salmon, J., Bauman, A., Sallis, J. F., & Lo, S. K. (1999). Insufficiently active Australian college students: Perceived personal, social, and environmental influences. *Preventive Medicine, 28*(1), 20-27. doi:10.1006/pmed.1998.0375

Leslie, E., Sparling, P. B., & Owen, N. (2001). University campus settings and the promotion of physical activity in young adults: lessons from research in Australia and the USA. *Health Education, 101*(3), 116-125. doi:10.1108/09654280110387880

Lund, H. G., Reider, B. D., Whiting, A. B., & Prichard, J. R. (2010). Sleep patterns and predictors of disturbed sleep in a large population of college students. *Journal of Adolescent Health, 46*(2), 124-132. doi: 10.1016/j.jadohealth.2009.06.016

McCann, B., Brinkworth, R., Burke da Silva, K., King, S., Luzeckyj, A., & Palmer, E. (2014). First Year Student Expectations and Experiences - Results. Retrieved from http://fyhe.com.au/expectations/results/

McInnis, C. (2001). Researching the first year experience: Where to from here? *Higher Education Research & Development, 20*(2), 105-114. doi:10.1080/07294360125188

McInnis, C., & Hartley, R. (2002). *Managing study and work: the impact of full-time study and paid work on the undergraduate experience in Australian universities* (0642772703). Retrieved from http://www.voced.edu.au/content/ngv:5358

National Survey of Student Engagement. (2013). *A fresh look at student engagement - Annual Results 2013*. Retrieved from http://nsse.indiana.edu/NSSE_2013_Results/pdf/NSSE_2013_Annual_Results.pdf

Newland, C. (2015). *Australian Student Accommodation Market Update 2015*. Retrieved from http://www.jll.com.au/australia/en-au/Research/jll-australian-student-accommodation-market-update-2015.pdf

Nonis, S. A., & Hudson, G. I. (2006). Academic Performance of College Students: Influence of Time Spent Studying and Working. *Journal of Education for Business, 81*(3), 151-159. doi:10.3200/joeb.81.3.151-159

Nonis, S. A., Hudson, G. I., Logan, L. B., & Ford, C. W. (1998). Influence of perceived control over time on college students' stress and stress-related outcomes. *Research in Higher Education, 39*(5), 587-605. doi:10.1023/a:1018753706925

Nonis, S. A., Philhours, M. J., & Hudson, G. I. (2006). Where Does the Time Go? A Diary Approach to Business and Marketing Students' Time Use. *Journal of Marketing Education, 28*(2), 121-134. doi:10.1177/0273475306288400

Plant, E. A., Ericsson, K. A., Hill, L., & Asberg, K. (2005). Why study time does not predict grade point average across college students: Implications of deliberate practice for academic performance. *Contemporary Educational Psychology, 30*(1), 96-116. doi:10.1016/j.cedpsych.2004.06.001

Ravizza, S. M., Hambrick, D. Z., & Fenn, K. M. (2014). Non-academic internet use in the classroom is negatively related to classroom learning regardless of intellectual ability. *Computers & Education, 78*, 109-114. doi:10.1016/j.compedu.2014.05.007

Sauvé, L., Fortin, A., Viger, C., & Landry, F. (2016). Ineffective learning strategies: a significant barrier to post-secondary perseverance. *Journal of Further and Higher Education*, 1-18. doi:10.1080/0309877X.2016.1224329

Shim, S., & Ryan, A. (2012). What do students want socially when they arrive at college? Implications of social achievement goals for social behaviors and adjustment during the first semester of college.

Motivation and Emotion, 1-12. doi:10.1007/s11031-011-9272-3

Sprod, J. A., Olds, T. S., Burton, N. W., Brown, W. J., van Uffelen, J. G., Ferrar, K. E., & Maher, C. A. (2016). Patterns and correlates of time use and energy expenditure in older Australian workers: A descriptive study. *Maturitas, 90*, 64-71. doi: 10.1016/j.maturitas.2016.05.009

Taylor, D. (2017). A chronicle of just-in-time information: The secret to building first year university student wellbeing and resilience based on a three year initiative. *Student Success, 8*(1), 35-47. doi:10.5204/ssj.v8i1.373

Torenbeek, M., Jansen, E., & Suhre, C. (2013). Predicting undergraduates' academic achievement: the role of the curriculum, time investment and self-regulated learning. *Studies in Higher Education, 38*(9), 1393-1406. doi:10.1080/03075079.2011.640996

Tremblay, M. S., Colley, R. C., Saunders, T. J., Healy, G. N., & Owen, N. (2010). Physiological and health implications of a sedentary lifestyle. *Applied Physiology, Nutrition, and Metabolism, 35*(6), 725-740. doi:10.1139/H10-079

van der Meer, J., Jansen, E., & Torenbeek, M. (2010). 'It's almost a mindset that teachers need to change': first-year students' need to be inducted into time management. *Studies in Higher Education, 35*(7), 777-791. doi:10.1080/03075070903383211