SCIENTIFIC JOURNAL OF SPORT AND PERFORMANCE

ORIGINAL ARTICLE

Physical activity participation of university students in the United Kingdom

Oscar Rhodes . *Department of Physical and Sport Education. University of Valencia. Valencia, Spain.*

ABSTRACT

Every year more than 2.38 million students attend university in the United Kingdom. However, there is limited research up to this date addressing current physical activity participation of the university students in the United Kingdom. This study explored the current physical activity habits among students studying at university level in the United Kingdom. An online survey was administered and completed by 466 students from over 52 faculties. Participants answered questions on demographic variables such as gender, age, socioeconomic status of family, location of studies, types of studies, year of studies, living arrangements and monthly expenditure. They were provided the English version of the IPAQ-Short form and asked to fill out the questionnaire with their physical activity habits during a typical week of university study. Results identified 64.4% of the sample were "*moderate*" active, with 14.2% "*high*" and 18.5% "*low*" active as categorized by the IPAQ-Short form scoring. Disparities in physical activity participation were present on demographic variables such as gender, year of study and family socioeconomic level upon analysis by ANOVA. To conclude, a discussion of the results within the overall field of physical activity participation in higher education was positioned and critiqued.

Keywords: Performance education, Physical activity, Participation, Students, United Kingdom, University.

Cite this article as:
Rhodes, O. (2024). Physical activity participation of university students in the United Kingdom. *Scientific Journal of Sport and Performance*, *3*(2), 251-260. https://doi.org/10.55860/LUIG7901

Corresponding author. *Department of Physical and Sport Education. University of Valencia. Valencia, Spain.*
E-mail: 98oscar@hotmail.es
Submitted for publication January 30, 2024.
Accepted for publication February 19, 2024.
Published March 04, 2024.
Scientific Journal of Sport and Performance. ISSN 2794-0586.

doi: https://doi.org/10.55860/LUIG7901

INTRODUCTION

Frequent physical activity remains a vital behaviour for promoting health, delaying, or preventing prevalent musculoskeletal disorders such as mechanical low back pain, neck and shoulder pain and decreasing the risk of developing hypertension, diabetes, osteoporosis, obesity, colon cancer and coronary heart disease (Jones et al, 1998; Vuori, 1995). Many studies outline the worldwide decline of physical activity, and the increase of obesity and other disease risks (WHO, 2010). Physical activity may reduce those risks while constructing and maintaining healthy muscle and bone, reduce obesity, reduce stress and anxiety, and promote well-being and healthy lifestyle to its participants (El-Gilany et al 2011).

It has been suggested in the physical activity literature that interventions aimed at increasing physical activity participation should be tailored to specific population subgroups such as women, middle-aged and older adults, and rural residents (King et al,2000; Blanchard et al, 2005; Gangeness, 2010).

The period of adolescence represents the transition from childhood to adulthood and the formation of lifetime habits such as regular exercise are normally formulated during this transition (Andersen & Haraldsdottir, 1993; Engstrom, 1986). Research suggests that physical activity rates decline consistently throughout this stage. Many factors may affect participation levels. These include demographic variables, knowledge, attitudes, and beliefs about physical activity, as well as other sociocultural issues. The steepest decline was evident during the stage of entering university (Kwan et a, 2012; Sigmundova et al, 2013; Fagaras et al, 2015). Over one third of active students in high school became insufficiently active upon transitioning to university life.

In the literature, demographics (e.g., age, gender), psychological factors (e.g., self- efficacy, perceived enjoyment), social factors (social support from family and friends), and physical environmental factors (e.g., living/built environment, access to facilities) were reported to be feasibly influencing factors of college/university students' physical activity participation (Haase et al, 2004; Reed & Phillips, 2005). Haase (2004) believes the relationship between physical activity participation is affected by several individual factors such as culture, cost, environment, gender and living arrangement within the university population. Current university cohort research within the UK has been inconclusive. Adults should engage in 150 minutes of moderate-intensity physical activity or 75 minutes of vigorous- intensity physical activity per week, according to the World Health Organization (WHO) (WHO, 2015; Aceijas et al, 2017).

Physical activity aids in weight management, reduces the development of chronic diseases, and improves mental well-being when combined with an adequate and balanced nutrient intake. With so much evidence, it makes perfect sense to put student health at the top of the public health agenda by implementing appropriate strategies to prevent negative behaviours from developing. Several studies suggest that the transition to university life makes students susceptible to adopting those unhealthy behaviours (Deliens et al, 2015). Examples include the weight gain within the student population is substantially higher than in the equivalent population not attending universities (Vella-Zarb & Elgar, 2010). Rooted to the cause is insufficient physical activity and an unbalanced diet (Tsitsika et al, 2016). UK based research suggests students spend up to 8 hours a day on sedentary activities. Combined with dietary patterns that deteriorate with increases in fat, sodium and sugar intake, and suboptimal levels of fruit, vegetable, and whole grain consumption (Strong et al, 2008).

Some researchers suggest that while knowledge on what constitutes a balanced diet exists on campus, the problem is translating these into physical cooking and eating behaviours (Miles et al, 2016).

A study by Blake (2017) aimed at investigating the physical activity levels of UK nursing and medicine university students, examining predictors of physical activity and the most influential benefits and barriers to exercise to address this gap. Although nursing and medical students are taught about the health benefits of regular physical activity, this knowledge does not always translate into lifestyle choices (Blake et al, 2017). This is a critical issue: translating knowledge of the positive health outcomes associated with physical activity participation into sustained participation.

In particular, this research article is focused on physical activity participation and aims to identify the physical activity habits of university students in the UK, according to basic sociodemographic variables. The time devoted to different types of physical activity (light, moderate, vigorous), especially moderate-to-vigorous, will concentrate the scientific attention of this study.

METHODS

The current study employs a quantitative methodology with a cross-sectional design, a survey type, that uses data from questionnaires distributed online. Information regarding students' individual demographics and time students devoted to different types of physical activity were collected. University students (n = 465; mean age of 23.93 ± 4.83) located in the United Kingdom voluntarily accepted to participate in the current study. Participants were studying different academic levels (Undergraduate 71.9%, postgraduate 22.9% and PhD 5.2%) and came from different year of study (1st year 54.4%, 2nd year 31.3% and 3rd year 14.3%).

Participants were required to be full-time university students at any level (undergraduate, postgraduate and PhD) irrespective of year of study. Students attending subject specific universities or open university (dentistry, medical, chiropractic, ...etc) were also included. Exclusion was defined as attendees at non-English institutions such as foreign based schools with international campuses based in England, and international students studying Erasmus in England. In the current study, physical activity was assessed using the short form of the international Physical Activity Questionnaire (IPAQ) (Booth & Oja, 2003; Frederick & Evans, 2020). The 9-item instrument asks participants about their physical activity habits over the previous week. Participants reported their time allocation in four different categories of activity (vigorous-intensity, moderate-intensity, walking, and sitting) over the prior week. A definition of vigorous and moderate intensity activity was included for the ease of participants. Vigorous intensity was defined as "*activities that take hard physical effort and make you breathe much harder than normal"*. Moderate intensity was defined as "*activities that take moderate physical effort and make you breathe somewhat harder than normal*".

Demographic and self-reported IPAQ-SF descriptive statistics were computed. Participants had to have completed all the self-reported measures in order to be included in the study. SPSS software, version 28.0.1, was used for all statistical analyses. Participants were asked if they met the inclusion criteria (full-time university student at a UK faculty), and if so, then informed them by written consent that participation was voluntary, that all information was confidential, that no record of respondents' name would be made, and withdrawal was available at any point they wished to do so. If in agreement, the participant then completed the online survey (Lovell & Parker, 2010). This study was approved by the Ethics Committee of the Universitat de València, Spain.

Statistical analysis

Demographic and self-reported IPAQ-SF descriptive statistics were computed. Participants had to have completed all the self-reported measures in order to be included in the study. SPSS software, version 28.0.1, was used for all statistical analyses. For each UK university student, frequency counts, means, and standard

deviations (SDs) were computed for the IPAQ-SF time values among the different items. A three-way ANOVA was used to determine differences between moderate and vigorous physical activity between the samples demographic variables under study.

RESULTS

A total of 466 participants partook in the current study, answering questions regarding individual demographics and physical activity habits (IPAQ-Short version). Participants' individual characteristics varied. A breakdown of the samples individual demographics can be viewed below in Table 1.

Table 1. Demographic of participants.

Variable	**Male**	**(%)**	**Female**	**(%)**
Global Value	147	30.6	305	63.5
Year of study				
1st Year	81	55.5	166	54.8
2nd Year	46	31.5	94	31.0
3rd Year	19	13.0	43	14.2
Socioeconomic level of family				
Over 3000£	96	63.5	209	68.5
Under 3000£	51	34.6	96	31.4
Living arrangement				
On campus	45	30.6	92	30.2
Off campus	102	69.4	213	69.8
Move away for study				
Yes	97	66.0	174	57.0
No	50	34.0	131	43.0

The current study uses the short form of the International Physical Activity Questionnaire (IPAQ- short version). The 9-items relate to participants' physical habits over the previous week. Participants then report their time allocation in four different categories of activity (vigorous, moderate, walking and sitting) over the past week. In Table 2 you can view the mean times performing light, moderate and vigorous physical activity between the university students in an average week while studying at university.

Table 2. Mean hours spent performing different physical activity categories.

Activity category	**n**	***Mean (SD)***
Light	466	1.1 (0.30)
Moderate	466	4.8 (0.52)
Vigorous	466	4.5 (0.60)
Moderate-vigorous	466	9.3 (1.10)

This data indicates that among university students in the United Kingdom, moderate forms of physical activity is performed for more time per week (4.85hrs) than those light (1.1hrs) or vigorous (4.5hrs) forms of physical activity. The mean time spent performing moderate- vigorous forms of physical activity was a mean of 9.35 hours per week. Lastly, concerning time spent sitting, students in the current study acknowledged sitting for a mean time of 4.32 ± 1.02 hours on an average weekday. You can observe those means in Table 3 below.

Table 3. Mean of time spent sitting on a typical weekday by IPAQ physical activity category.

IPAQ Classification	Time spent sitting (hours)
Light	4.00 ± 1.14
Moderate	4.32 ± 0.99
Vigorous	4.58 ± 0.95
Moderate-vigorous	4.32 ± 1.02

A three-way ANOVA was conducted that examined the effect of gender, year of study and family monthly expenditure on vigorous physical activity participation. a significant interaction between gender and family monthly income on time spent doing vigorous physical activity on any given session per week was observed ($F = 7.383$, $p = .001$). Male participants reported a mean performance time (hours) of 1.53 ± 0.97, while female participants spent 1.42 ± 0.76 hours per session. A further significant interaction can be observed between gender and year of study ($F = 2.359$, $p = .031$) and time spent performing vigorous physical activity. With observed gender differences and vigorous physical activity performance, significance was also reported between year of study and time spent performing vigorous physical activity.

A further three-way ANOVA was performed to explore the effect gender, year of study and family monthly expenditure had on days and time spent performing moderate physical activity options on an average week. A statistically significant three-way interaction between gender, year of study and family monthly expenditure was observed ($F = 4.545$, $p = .004$) on days performing moderate physical activity. Additionally, a significant interaction ($F = 5.203$, $p = .006$) between year of study and family monthly income was reported with days performing moderate physical activity. Finally, the results of a further three-way ANOVA observed statistical significance between gender, year of study and family monthly expenditure on time spent performing moderate physical activity ($F = 4.206$, $p = .016$). Although no differences in time spent performing moderate physical activity were observed between genders or years of study.

DISCUSSION

Sufficient physical activity has a positive effect on participants' wellbeing and quality of life. University settings provide an important opportunity to advocate for positive physical activity behaviour in young adults worldwide. Despite this, there is a scarcity of data on those students' attitudes toward physical activity. The studies general physical activity categorisation of the sample according to the IPAQ short version was 64.4% moderately active, with a further 14.2% highly active. Notably, 18.2% were classified as being inactive. When it came to the physical activity category, there were gender differences with males performing more forms of vigorous physical activity than females. This is consistent with previous research indicating that males engage in more vigorous forms of physical activity and are generally more physically active than females (Thompson & Mirwald, 2003; El Ansari & Stock, 2022). The studies second objective was to determine the variation in UK university students MVPA according to gender, year of study and socioeconomic level of the family. Statistical significance was found within the relationship between gender and family monthly income and time spent performing vigorous forms of physical activity. In addition, there was a significant three-way relationship between gender, year of study, and family monthly income for time and days spent engaging in moderate physical activity.

Several variables have been found to differ in educational context and physical activity research. The current study gathered information on several variables that will be investigated in the following section. We wanted to position the main findings within the overall findings of physical activity level and observe the comparison to other research in this section. The current study found that moderate and vigorous forms of physical activity

were performed on an average of 3.09 days per week. Moderate physical activity (mean of 1.57 hours) is performed for a longer period than vigorous forms (mean of 1.46 hours). Other studies using the IPAQ- SF found similar results in American college students (Dinger & Han, 2006; Kaleth & Tong, 2010), but significantly different results in Chinese and Portuguese populations when concerning days and time spent performing moderate and vigorous physical activity (Lee & Stewart, 2011; Romero-Blanco et al, 2020).

Regardless of how many hours the students in the sample sat on an average day at university (a mean of 4.32 hours on a typical weekday) 78.6% of the study sample was classified as moderately or highly active. In some populations, individuals who are highly active and participate in sports and exercise also have more sedentary time (Jago & Watson, 2005; Peterson & Erickson, 2018). Furthermore, evidence suggests that most individuals fall into one of only a couple commanding behaviour and activity level categories. Jago et al (2010) noted that a certain number of participants fit into one of three groups: high SB with high PA, moderate SB with low PA, and low SB with PA (Jago et al, 2010). Despite meeting the recommended daily physical activity guidelines, more than one-third of the adolescent and adult populations were classified as highly sedentary in a similar study involving both children and adults (Spittaels et al, 2012). According to these findings, individuals with high levels of physical activity in certain populations may also have high levels of Sedentary Behavior. Importantly, Ekelund et al (2016) discovered that moderate to vigorous physical activity can reduce all-cause mortality associated with sedentary behaviour; however, additional research on other factors such as disease morbidity and health-related quality of life may be required (Ekelund et al, 2016).Differences in physical activity habits according to gender, year of study and family socioeconomic status were reported in the current study. Gender differences in physical activity level, intensity and frequency are widely reported in this field (Bauman & Pratt, 2009; Azevedo & Hallal, 2007).

A longitudinal study by Naber & O'Brien carefully measured physical activity using accelerometers in male and female students aged 9 to 15 in a large geographically diverse population of US children with age and gender reported as highly influential in the MVPA levels throughout adolescence (Nader & O'Brien, 2008). Within the university population, these differences are observed, with differences in moderate and vigorous physical activity participation (Wilson & Bopp, 2022; Magoc & Bridges, 2016; Zhang & Chen, 2022). Individual differences were observed in the current study, which discovered a significant interaction between gender and time spent performing vigorous and moderate physical activity. Females made up 70% of first year inactive students in the current study. This data is consistent with other studies (Craike & Zimmermann, 2009; Reifsteck & Brooks, 2013) that show females have a significant drop-off in physical activity levels once they begin their college/university experience.

CONCLUSIONS

Universities in the United Kingdom interact with over 2.38 million students yearly, many of which are of an age that is susceptible to inactivity, poor diet and social pressures. University life consists of developing oneself within the educational environment along with developing social skills and dependency as an independent individual, learning to adapt to new environments, social circles and studies. The current study sought out to identify a set of objectives, the principal of which was to ascertain the physical activity levels of university students in the UK. The current study used the IPAQ-SF to categorise participants based on their physical activity habits. Most students fell within the moderate category (64.4%), while those categorised as high (14.2%) and low (18.5%) were the smaller outliers. The mean time spent performing "*light*" physical activity (1.1 hours) was substantially different compared to "*moderate*" (4.85 hours) and "*vigorous*" (4.5 hours) physical activity on an average university week. When examining the effect these variables had on a students'

physical activity level, it was noted that gender, year of study and family monthly income had an influence on students' physical activity levels.

However, the current results indicate that most students meet the "*moderate*" category for physical activity established by the IPAQ-SF, although it remains unclear what physical activity makes up the performance of those students. Nevertheless, universities and local institutions should strive to highlight the positive impact physical activity has on students' physical, social, and mental development. These adaptations will be based on the city's individual differences, acclimating such characteristics to encourage student participation in physical activity, embracing such activity as a means of social integration, social engagement, and environmental mapping, thereby facilitating integration into university life.

SUPPORTING AGENCIES

No funding agencies were reported by the author.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the author.

REFERENCES

Aceijas, C., Waldhäusl, S., Lambert, N., Cassar, S., & Bello-Corassa, R. (2017). Determinants of health-related lifestyles among university students. Perspectives in public health, 137(4), 227-236. https://doi.org/10.1177/1757913916666875

Andersen, L.B. and Haraldsdottir, J., 1993. Tracking of cardiovascular disease risk factors including maximal oxygen uptake and physical activity from late teenage to adulthood An 8-year follow-up study. Journal of internal medicine, 234(3), pp.309-315. https://doi.org/10.1111/j.1365-2796.1993.tb00748.x

Arriaza Jones, D., Ainsworth, B.E., Croft, J.B., Macera, C.A., Lloyd, E.E. and Yusuf, H.R., 1998. Moderate leisure-time physical activity: who is meeting the public health recommendations? A national cross-sectional study. Archives of family medicine, 7(3), p.285. https://doi.org/10.1001/archfami.7.3.285

Azevedo, M. R., Araújo, C. L. P., Reichert, F. F., Siqueira, F. V., da Silva, M. C., & Hallal, P. Baranowski, T., Thompson, W. O., Durant, R. H., Baranowski, J., & Puhl, J. (1993). Observations on physical activity in physical locations: Ager gender, ethnicity, and month effects. Research quarterly for exercise and sport, 64(2), 127-133. https://doi.org/10.1080/02701367.1993.10608789

Bauman, A., Bull, F., Chey, T., Craig, C. L., Ainsworth, B. E., Sallis, J. F., ... & Pratt, M. (2009). The international prevalence study on physical activity: results from 20 countries. International journal of behavioral nutrition and physical activity, 6(1), 1-11. https://doi.org/10.1186/1479-5868-6-21

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. https://doi.org/10.1111/jan.13181

Blanchard, C.M., McGannon, K.R., Spence, J.C., Rhodes, R.E., Nehl, E., Baker, F. and Bostwick, J., 2005. Social ecological correlates of physical activity in normal weight, overweight, and obese individuals. International journal of obesity, 29(6), pp.720-726. https://doi.org/10.1038/sj.ijo.0802927

Craig, C. L., Marshall, A. L., Sjöström, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., ... & Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. Medicine and science in sports and exercise, 35(8), 1381-1395. https://doi.org/10.1249/01.MSS.0000078924.61453.FB

Craike, C., Symons, C., & Zimmerman, J. (2009). Why do adolescent girls drop out of sport and physical activity? A social ecological approach. Annals of Leisure Research, 12(2), 149-172. https://doi.org/10.1080/11745398.2009.9686816

Deliens, T., Deforche, B., De Bourdeaudhuij, I., & Clarys, P. (2015). Determinants of physical activity and sedentary behaviour in university students: a qualitative study using focus group discussions. BMC public health, 15(1), 1-9. https://doi.org/10.1186/s12889-015-1553-4

Dinger, M. K., Behrens, T. K., & Han, J. L. (2006). Validity and reliability of the International Physical Activity Questionnaire in college students. American journal of health education, 37(6), 337-343. https://doi.org/10.1080/19325037.2006.10598924

Ekelund, U., Steene-Johannessen, J., Brown, W. J., Fagerland, M. W., Owen, N., Powell, K. E., El Ansari, W., Khalil, K., Crone, D., & Stock, C. (2022). Physical activity and gender differences: correlates of compliance with recommended levels of five forms of physical activity among students at nine universities in Libya.

El Ansari, W., Khalil, K., Crone, D., & Stock, C. (2022). Physical activity and gender differences: correlates of compliance with recommended levels of five forms of physical activity among students at nine universities in Libya.

El Gilany, A.H., Badawi, K., El Khawaga, G. and Awadalla, N., 2011. Physical activity profile of students in Mansoura University, Egypt. EMHJ-Eastern Mediterranean Health Journal, 17 (8), 694-702, 2011. https://doi.org/10.26719/2011.17.8.694

Engstrom, L.M., 1986. The process of socialization into keep fit activities. Scandinavian Journal of Sports Science, 8(3), pp.89-97.

Fagaras, S.P., Radu, L.E. and Vanvu, G., 2015. The level of physical activity of university students. Procedia-Social and Behavioral Sciences, 197, pp.1454-1457. https://doi.org/10.1016/j.sbspro.2015.07.094

Frederick, G. M., Castillo-Hernández, I. M., Williams, E. R., Singh, A. A., & Evans, E. M. (2020). Differences in physical activity and perceived benefits and barriers to physical activity between LGBTQ+ and non- LGBTQ+ college students. Journal of American College Health, 1-6. https://doi.org/10.1080/07448481.2020.1842426

Gangeness, J.E., 2010. Adaptations to achieve physical activity in rural communities. Western journal of nursing research, 32(3), pp.401-419. https://doi.org/10.1177/0193945909353767

Haase, A., Steptoe, A., Sallis, J.F. and Wardle, J., 2004. Leisure-time physical activity in university students from 23 countries: associations with health beliefs, risk awareness, and national economic development. Preventive medicine, 39(1), pp.182-190. https://doi.org/10.1016/j.ypmed.2004.01.028

Jago, R., Anderson, C. B., Baranowski, T., & Watson, K. (2005). Adolescent patterns of physical activity: Differences by gender, day, and time of day. American journal of preventive medicine, 28(5), 447-452. https://doi.org/10.1016/j.amepre.2005.02.007

Jago, R., Fox, K. R., Page, A. S., Brockman, R., & Thompson, J. L. (2010). Physical activity and sedentary behaviour typologies of 10-11 year olds. International Journal of Behavioral Nutrition and Physical Activity, 7, 59. https://doi.org/10.1186/1479-5868-7-59

Kaleth, A. S., Ang, D. C., Chakr, R., & Tong, Y. (2010). Validity and reliability of community health activities model program for seniors and short-form international physical activity questionnaire as physical activity assessment tools in patients with fibromyalgia. Disability and rehabilitation, 32(5), 353-359. https://doi.org/10.3109/09638280903166352

King, A.C., Castro, C., Wilcox, S., Eyler, A.A., Sallis, J.F. and Brownson, R.C., 2000. Personal and environmental factors associated with physical inactivity among different racial- ethnic groups of US middle- aged and older-aged women. Health psychology, 19(4), p.354. https://doi.org/10.1037//0278-6133.19.4.354

Kwan, M.Y., Cairney, J., Faulkner, G.E. and Pullenayegum, E.E., 2012. Physical activity and other health-risk behaviors during the transition into early adulthood: a longitudinal cohort study. American journal of preventive medicine, 42(1), pp.14-20. https://doi.org/10.1016/j.amepre.2011.08.026

Lee, P. H., Macfarlane, D. J., Lam, T. H., & Stewart, S. M. (2011). Validity of the international physical activity questionnaire short form (IPAQ-SF): A systematic review. International journal of behavioral nutrition and physical activity, 8(1), 1-11. https://doi.org/10.1186/1479-5868-8-115

Lovell, G. P., Ansari, W. E., & Parker, J. K. (2010). Perceived exercise benefits and barriers of non-exercising female university students in the United Kingdom. International Journal of Environmental Research and Public Health, 7(3), 784-798. https://doi.org/10.3390/ijerph7030784

Magoc, D., Tomaka, J., Shamaley, A. G., & Bridges, A. (2016). Gender differences in physical activity and related beliefs among Hispanic college students. Hispanic Journal of Behavioral Sciences, 38(2), 279-290. https://doi.org/10.1177/0739986316637355

Miles, C., & Benn, T. (2016). A case study on the experiences of university-based Muslim women in physical activity during their studies at one UK higher education institution. Sport, Education and Society, 21(5), 723- 740. https://doi.org/10.1080/13573322.2014.942623

Nader, P. R., Bradley, R. H., Houts, R. M., McRitchie, S. L., & O'Brien, M. (2008). Moderate- to-vigorous physical activity from ages 9 to 15 years. Jama, 300(3), 295-305. https://doi.org/10.1001/jama.300.3.295

Peterson, N. E., Sirard, J. R., Kulbok, P. A., DeBoer, M. D., & Erickson, J. M. (2018). Sedentary behavior and physical activity of young adult university students. Research in nursing & health, 41(1), 30-38. https://doi.org/10.1002/nur.21845

Reed, J. A., & Phillips, D. A. (2005). Relationships between physical activity and the proximity of exercise facilities and home exercise equipment used by undergraduate university students. Journal of American College Health, 53(6), 285-290. https://doi.org/10.3200/JACH.53.6.285-290

Reifsteck, E. J., Gill, D. L., & Brooks, D. L. (2013). The relationship between athletic identity and physical activity among former college athletes. Athletic Insight, 5(3), 271-284.

Romero-Blanco, C., Rodríguez-Almagro, J., Onieva-Zafra, M. D., Parra-Fernández, M. L., Prado-Laguna, M.D. C., & Hernández-Martínez, A. (2020). Physical activity and sedentary lifestyle in university students: changes during confinement due to the COVID-19 pandemic. International Journal of Environmental Research and Public Health, 17(18), 6567. https://doi.org/10.3390/ijerph17186567

Sigmundová, D., ChmelÍk, F., Sigmund, E., Feltlová, D. and Frömel, K., 2013. Physical activity in the lifestyle of Czech university students: Meeting health recommendations. European Journal of Sport Science, 13(6), pp.744-750. https://doi.org/10.1080/17461391.2013.776638

Spittaels, H., Van Cauwenberghe, E., Verbestel, V., De Meester, F., Van Dyck, D., Verloigne, M., ... & De Bourdeaudhuij, I. (2012). Objectively measured sedentary time and physical activity time across the lifespan: a cross-sectional study in four age groups. International Journal of Behavioral Nutrition and Physical Activity, 9(1), 1-12. https://doi.org/10.1186/1479-5868-9-149

Strong, K. A., Parks, S. L., Anderson, E., Winett, R., & Davy, B. M. (2008). Weight gain prevention: identifying theory-based targets for health behavior change in young adults. Journal of the American Dietetic Association, 108(10), 1708-1715. https://doi.org/10.1016/j.jada.2008.07.007

Thompson, A. M., Humbert, M. L., & Mirwald, R. L. (2003). A longitudinal study of the impact of childhood and adolescent physical activity experiences on adult physical activity perceptions and behaviors. Qualitative Health Research, 13(3), 358-377. https://doi.org/10.1177/1049732302250332

Tsitsika, A. K., Andrie, E. K., Psaltopoulou, T., Tzavara, C. K., Sergentanis, T. N., Ntanasis- Stathopoulos, I.,... & Tsolia, M. (2016). Association between problematic internet use, socio-demographic variables and obesity among European adolescents. The European Journal of Public Health, 26(4), 617-622. https://doi.org/10.1093/eurpub/ckw028

Vella-Zarb, R. A., & Elgar, F. J. (2010). Predicting the 'freshman 15': Environmental and psychological predictors of weight gain in first-year university students. Health Education Journal, 69(3), 321-332. https://doi.org/10.1177/0017896910369416

Vuori, I., 1995. Exercise and physical health: musculoskeletal health and functional capabilities. https://doi.org/10.1080/02701367.1995.10607912

Wilson, O. W., Panza, M. J., Evans, M. B., & Bopp, M. (2021). A scoping review on college student physical activity: How do researchers measure activity and examine inequities?. Journal of Physical Activity and Health, 18(6), 728-736. https://doi.org/10.1123/jpah.2020-0370

World Health Organisation (2010). Global recommendation on Physical activity for health.

World Health Organization (2015). Physical Activity Fact Sheet No. 385. World Health.

Zhang, Z., He, Z., & Chen, W. (2022). The relationship between physical activity intensity and subjective well-being in college students. Journal of American College Health, 70(4), 1241-1246. https://doi.org/10.1080/07448481.2020.1790575