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B – Collection and/or assembly of data
C – Data analysis and interpretation
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Health behaviours and depressive symptoms in Portuguese higher education students

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Abstract

Introduction: The transition to higher education and the long duration of university studies have implications for students' health behaviours. They are faced with greater autonomy of choice but also with greater academic obligations that condition their behaviour. The purpose of this study is to determine which health behaviours differentiate higher education students with moderate to severe depressive symptoms from those with mild to low symptoms.

Material and methods: A cross-sectional study was conducted with 166 Portuguese higher education students (58.4% males). The health behaviours assessed were physical activity and sitting time through the International PA Questionnaire – Short Form (IPAQ-SF), active choices through the Active Choice Index Questionnaire, and sports practice and sleeping time through the National Dietary and Physical Activity Survey. Depressive symptoms were assessed using the Patient Health Questionnaire-9. The Mann-Whitney test was used to assess gender differences in depressive symptoms. An Odds-Ratio was calculated to establish the probability of being classified with moderate to severe depressive symptoms.

Results: 24.1% of students showed moderate to severe depressive symptoms. In an analysis by gender, it was found that girls spend less time sitting on average than boys ($p < 0.001$). Students with moderate to severe depressive symptoms show on average more sitting time ($p = 0.018$) and less sleep time during weekdays ($p = 0.005$).

Conclusions: Sitting time and sleep time are health behaviours that are associated with higher depressive symptoms in higher education students. Higher education institutions are considered to play a key role in promoting health behaviours that can interfere with students' mental health.

Keywords: depression, exercise, sedentary behaviour, sleep duration, students

Introduction

The transition from adolescence to adulthood brings changes in the body, the mind and social relationships [1]. These changes are also experienced in the transition to higher education, adding emotional and psychological

challenges, increased autonomy in individual choices, exposure to academic pressures and increased responsibilities, which sometimes leads to unhealthy lifestyle practices [2,3].

One of the lifestyle behaviours affected by this transition is physical activity (PA). Engaging in



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regular PA helps to combat and prevent diseases such as cardiovascular disease, type 2 diabetes and various types of cancer [4,5]. In addition, PA also has benefits for mental health (prevention of cognitive decline and symptoms of depression and anxiety) and general well-being. Despite these benefits, 27.5% of adults and 81% of adolescents fail to meet the recommended minimums [4].

Studies targeting university students show that this age group has a similar prevalence of insufficient PA to the general population of adults [6], with a high proportion of students not meeting PA recommendations. Some studies indicate that approximately half of students do not get enough PA, and these low levels of PA carry serious risks to their health [7]. A review study has shown that between 30% and 50% of students are not active enough to achieve benefits for their health [8] and another has demonstrated that low PA levels tend to increase after graduation [9].

Detrimental health behaviours (HB) in higher education students are not only confined to low levels of PA; the literature also reports high levels of sedentary behaviour [3]. High level of sitting time (ST) are characteristic of this subgroup of the population, since their daily activities involve classes or studies that require them to be seated for long periods of time [10]. The accumulation of sedentary time is associated with a greater risk of negative health outcomes [11]. As a result, the academic environment ought to assist students in adopting a healthy lifestyle by promoting initiatives and establishing techniques that can promote the development of HB thought to forestall the onset of chronic non-communicable diseases, such as mental illness [12]. Another negative HB among students in higher education is not getting enough sleep [13]. Short intervals of sleep and insomnia increase the risk of persistent mental disease [14].

Students and young adults have been found to exhibit depressive symptoms (DP) [15,16]. Students are more likely to experience stress and sadness due to an excessive academic workload and exposure to a competitive university atmosphere [16]. Studies [17,18] have looked at HB including exercise and sedentary behaviour as potential defences against depressive symptoms in this age range. The results, however, are still limited [18,19]. More studies are needed to determine which health behaviours may be related to elevated depressive symptoms [20].

Furthermore, it is critical to recognize that Portugal has one of the highest rates of depression in Europe [21], making it imperative to find elements that can help combat the high prevalence of depression. It is imperative to take into account the need for research using populations from rural areas, where healthcare access is

more restricted and preventive measures are more crucial [22].

Thus, the purpose of this study is to determine which HB differentiate higher education students with moderate to severe DP from those with mild to low symptoms.

Materials and methods

Participants

A non-probability convenience sample was used. The sample size of the study was 166 Portuguese students attending higher education (58.4% male and 41.6% female), aged between 18 and 45 (21.57 ± 4.3) years. The Polytechnic Institute of Beja is made up of four Polytechnic schools, and this study only includes participants from three Polytechnic schools. The fact that students from the Business Polytechnic school didn't take part is due to the fact that they didn't show any interest in taking part in the World Physical Activity Day, when the data was collected. All the participants in this study were undergraduate students. Participant characteristics are shown in Table 1.

Tab. 1. Overall characteristics of the study participants

Characteristics	n (%)
Polytechnic school	
Agriculture	2 (1.2)
Education	97 (58.4)
Health	67 (40.4)
Academic year	
First	88 (53)
Second	52 (31.3)
Third	26 (15.7)

Outcome measures

Health behaviours

The short version of the International PA Questionnaire – Short Form (IPAQ-SF), validated for the Portuguese population [23], was used to determine the level of PA. IPAQ-SF questions were structured to provide specific scores in the domains of walking, moderate-intensity activity, vigorous-intensity activity and ST. The PA score (low, moderate, high) was determined using the tool available on the IPAQ website [23].

Sports practice behaviours (“Do you practise any kind of scheduled leisure physical activity on a regular basis?”) and sleeping time (“How many hours do you sleep on average per day during the week?”; “How

many hours do you sleep on average per day during the weekend?”) were assessed according to the National Dietary and PA Survey [24]. Regarding sleeping time, participants were asked about the duration of their sleep on weekdays and at weekends. The risk classifications for ST and sleep time were ≥ 8 hours [25] and < 7 hours [26], respectively.

Active choices during participants' daily routine were assessed through the Activity Choice Index (ACI), which has previously been validated for the Portuguese population [27]. This scale proposes different activities (e.g., climbing stairs instead of using the lift) that are assessed using a Likert scale ranging from 1 (never) to 5 (always). The score was given by the mean of the six questions and the cut-off value assumed to define the risk was the median. The cut-off point was three (< 3 reduced active choices).

Depressive symptoms

Mental health was assessed through the Portuguese version of the Patient Health Questionnaire-9 (PHQ-9) scale [28]. This instrument has been validated for the Portuguese population and the sample used in this validation consisted of university students. The scale has nine items, with responses ranging from 0 (never) to 3 (nearly every day). The depressive symptom score ranges from 0 to 27, with higher scores indicating severe depression. DP are classified as minimal 0–4, mild 5–9, moderate 10–14, moderately severe 15–19, and severe 20–27.

Procedures

The data was collected during World Physical Activity Day (April 2022), which was open to the entire educational community. Different activities were proposed for undergraduate students to take part in during lessons, one of which involved answering a questionnaire that gave rise to this research. A QR Code was available for students to fill out the questionnaire during the activities. The questionnaire took an average of ten minutes to complete.

Before completing the questionnaire, written consent from participants was required for their participation in the study, according to the Helsinki Declaration. Ethical approval was obtained from the Ethical Committee of the Polytechnic Institute of Beja (Parecer n.º 1/2021).

Statistical analysis

The Pearson chi-square test was used to identify the differences between HB (PA, sports practice, sitting time, sleep duration) and level of DP by gender and academic year. As none of the continuous variables had a normal distribution, the Mann-Whitney test

was used to assess differences between groups. Specifically, the Mann-Whitney test was used to assess gender differences in the variables ST, weekly sleeping time, weekend sleeping time, ACI and DP. The Mann-Whitney test was also used to assess the differences between mild to low and moderate to severe DP in HB. To establish the probability of being classified with moderate to severe DP, an Odds-Ratio was calculated. IBM SPSS statistics version 28 (Armonk, NY: IBM Corp.) was used for the analyses and the significance level adopted was 5%.

Results

The results showed that 52.4% of the students participated in regular sports and 66.9% reported high levels of PA. During their everyday activities, 48.2% chose to engage in active behaviours. Regarding other HB such as sleeping time, our results revealed that 74.1% slept “the ideal time” during the week and 90.4% slept “the ideal time” over the weekend. The second health behaviour examined was ST, where 74.7% of the participants reported “low ST.” Regarding their mental health, 75.9% of students report having mild to low DP.

The analyses of HB and level of DP by gender and academic year are presented in Table 2 and Table 3, respectively.

Students who have mild to low DP spend, on average, less time sitting ($p = 0.018$) and more time sleeping during weekdays ($p = 0.005$) than students who exhibit moderate to severe DP. There were no statistically significant differences ($p > 0.05$) between the different categories of DP for the remaining HB (weekend sleep time or the activity choice index).

Students who spend more than 8 hours sitting are 2.2 times more likely to have moderate to severe DP than those who spend less than 8 hours sitting (OR: 2.200; 95%CI: 1.020; 4.745). Students who do not meet daily sleep recommendations exhibit a 2.44 times greater risk (95%CI: 1.140; 5.239) of having moderate to severe DP compared to students who meet these recommendations. The level of PA, the choice of active options in daily life and the practice of sports do not present a significant risk for the occurrence of moderate to severe DP.

The analysis of the ACI according to DP categories is shown in Figure 1.

The analysis of the ST (hours) according to DP categories is shown in Figure 2.

The analysis of sleeping hours (during the weekend) according to DP categories is shown in Figure 3.

The analysis of sleeping hours (during the week) according to DP categories is shown in Figure 4.

Tab. 2. Health behaviours and level of depressive symptoms analysed by gender

Variables	Male	Female	p
Physical activity; n (%)			
Low-moderate	46 (47.4)	9 (13)	< 0.001*
High	51 (52.6)	60 (87)	
Sports practice; n (%)			
Yes	34 (33)	54 (78.3)	< 0.001*
No	64 (66)	15 (21.7)	
Sitting time; M (\pm SD)	7.01 (4.27)	5.70 (4.30)	< 0.001*
Weekly sleeping time; M (\pm SD)	7.27 (1.13)	7.22 (1.10)	0.560
Weekend sleeping time; M (\pm SD)	8.51 (1.57)	8.73 (1.69)	0.392
Activity Choice Index; M (\pm SD)	2.95 (0.84)	3.00 (0.89)	0.638
Depressive symptoms; M (\pm SD)	7.49 (5.19)	5.32 (4.40)	0.003*

* – statistically significant result ($p < 0.05$); M – mean, SD – standard deviation.

Tab. 3. Health behaviours and level of depressive symptoms analysed by academic year

Variables	1st year	2nd year	3rd year	p
Physical activity; n (%)				
Low-moderate	25 (28.4)	18 (34.6)	12 (46.2)	0.365
High	63 (71.6)	34 (65.4)	14 (53.8)	
Sports practice; n (%)				
Yes	51 (58)	31 (59.6)	5 (19.2)	0.001*
No	37 (42)	21 (40.4)	21 (80.8)	
Sitting time; M (\pm SD)	6.39 (4.59)	6.66 (4.26)	6.34 (3.57)	0.571
Weekly sleeping time; M (\pm SD)	6.95 (1.14)	7.56 (1.00)	7.63 (0.99)	< 0.001*
Weekend sleeping time; M (\pm SD)	8.55 (1.51)	8.73 (1.69)	8.54 (1.88)	0.661
Activity Choice Index; M (\pm SD)	3.08 (0.88)	3.0 (0.89)	3.3 (0.90)	0.603
Depressive symptoms; M (\pm SD)	7.02 (5.18)	6.81 (4.62)	4.69 (4.71)	0.033*

* – statistically significant result ($p < 0.05$); M – mean, SD – standard deviation.

Discussion

The aim of this research was to determine which HB differentiate higher education students with moderate to severe DP from those with mild to low symptoms. There are many behaviours that influence health. Being physically active, avoiding sedentary behaviour and sleeping the right number of hours are

some of the behaviours university students should adopt.

Regarding PA, there is an increase in disrespect for a healthy lifestyle and a decline in the practice of moderate to vigorous physical exercise during the transition to university [29]. Contrary to this study, in which there is a high prevalence of students who have high levels of PA, regardless of gender and year of schooling, the

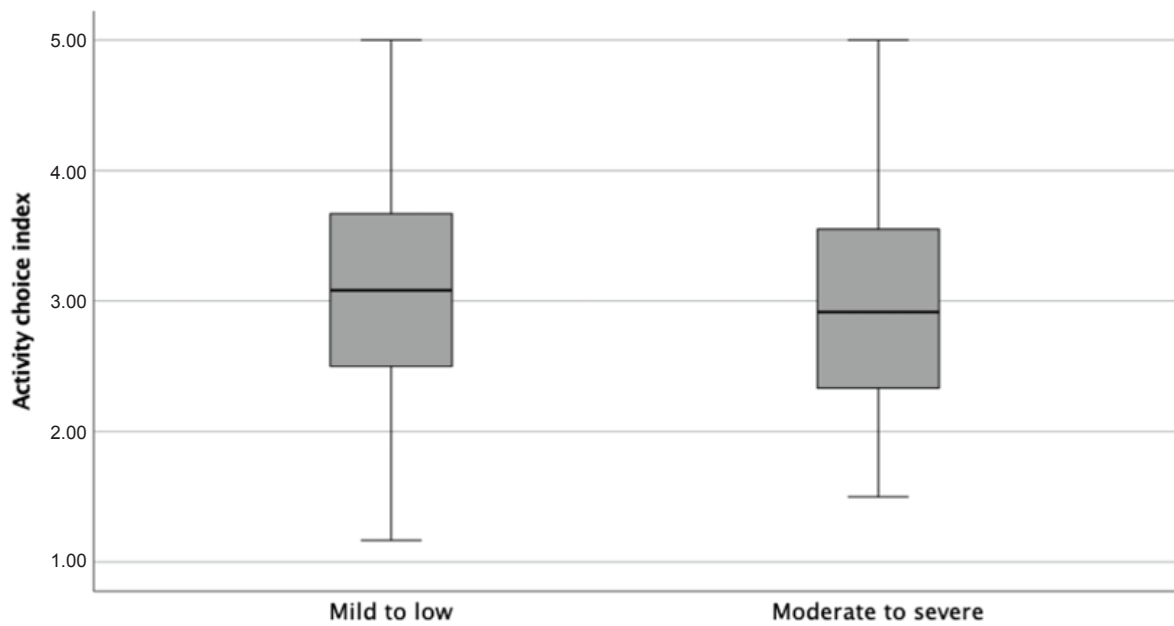


Fig. 1. Active Choice Index according to depressive symptom categories

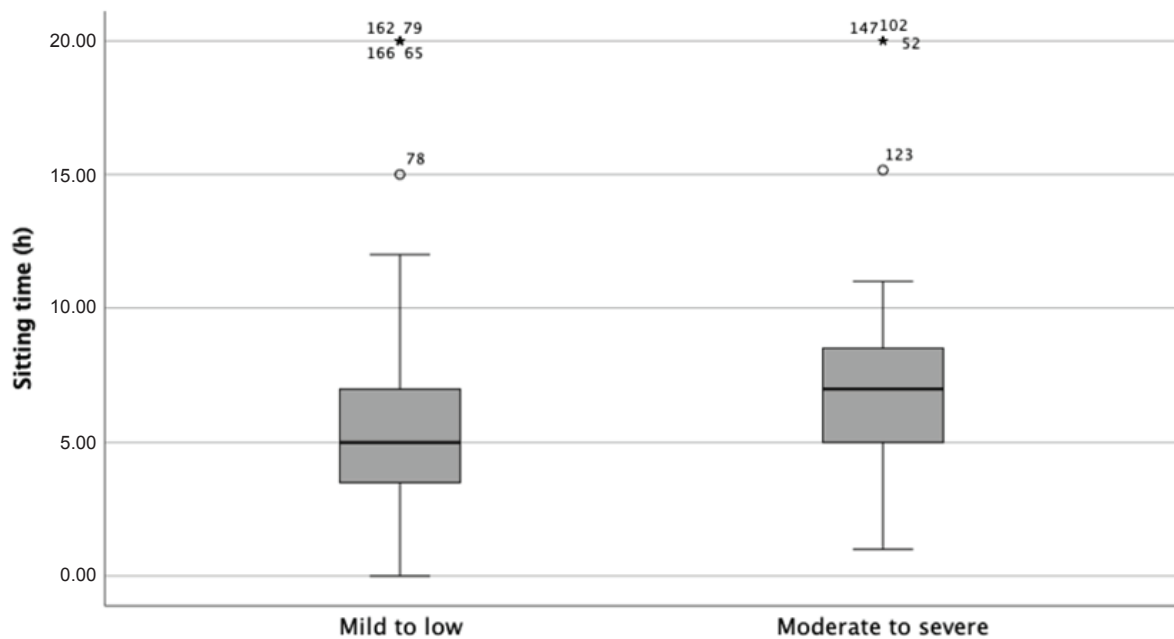


Fig. 2. Sitting time according to depressive symptom categories

literature shows that approximately half of students do not have enough PA to achieve health benefits [7,8]. However, this discrepancy could be due to the characteristics of the sample in this study, which was mostly composed of sports students. According to Gómez-López et al. [30], the most common reasons provided by university students for not participating in PA include a lack of time, a dislike of PA, a lack of practicality or usefulness, feelings of laziness or apathy, or the belief that they are incompetent in this type of activity.

Studies of university students in several countries demonstrate a decline not only in students' PA levels [25,26], but also in their sleep duration, which has been found to be of low quality [26]. In the present study, students slept on average for 7.25 h on weekdays and 8.6 h at weekends, which is a longer average sleep duration than has been found in other studies within this population [31]. On the other hand, 25.9% of the students slept for less time than would be ideal, which is a smaller proportion than in a recent study

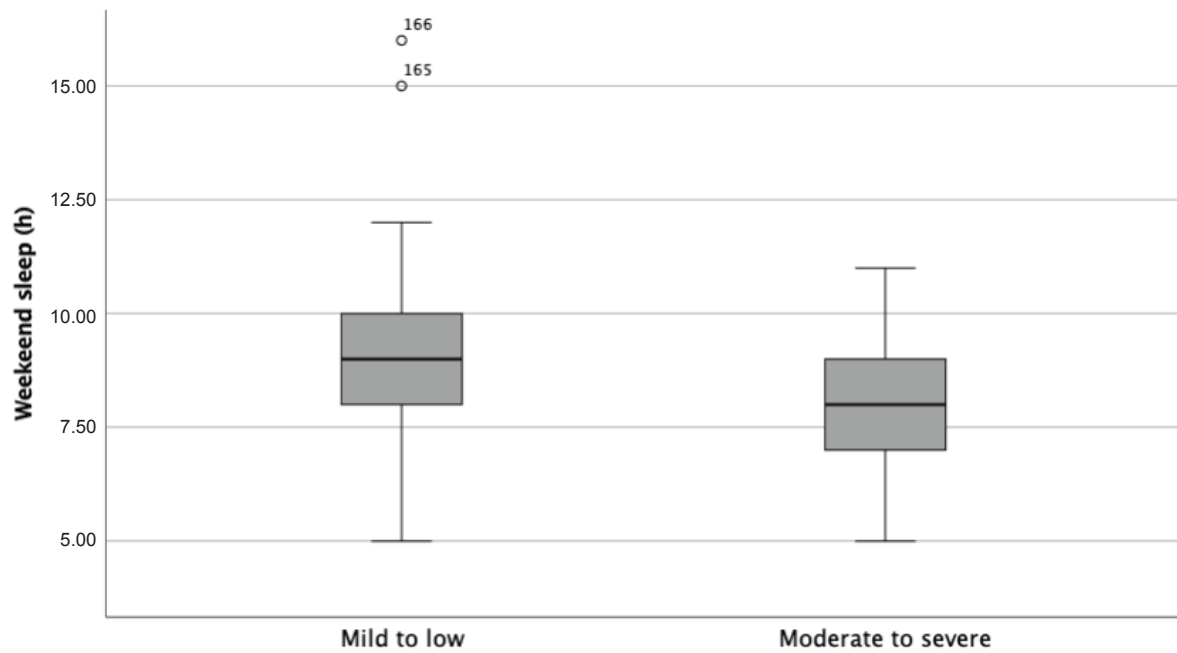


Fig. 3. Sleeping hours during the weekend according to depressive symptom categories

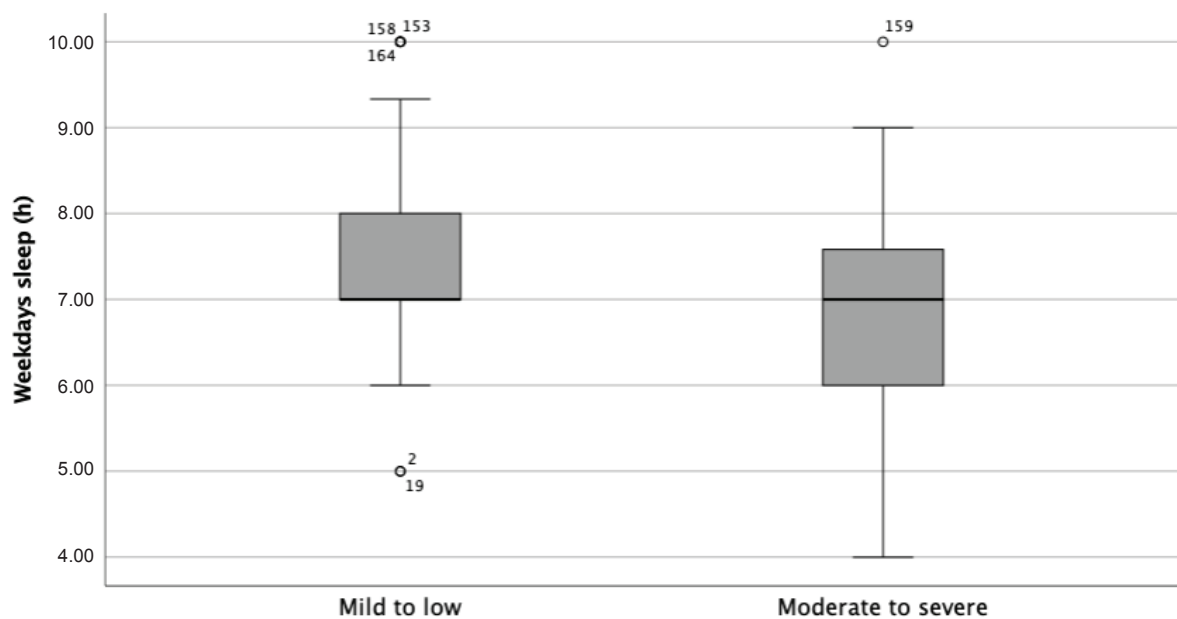


Fig. 4. Sleeping hours during the week according to depressive symptom categories

involving Chinese students [31]. There were also no differences between genders, contrary to the results of Lu et al. [31].

University students are a subgroup of the population that is more predisposed to accumulate excessive ST, as their main daily tasks are related to sitting activities [10]. In the present study, students spent an average of 6.57 h/day sitting, which is slightly lower than reported in other investigations [11,32]. Female students spend less time sitting compared to male students, as found in a study involving Spanish students [33].

Additional studies discuss the issue of DP among higher education students [20,34]. DP may be associated with the independence and the change in lifestyle that come with the transition to higher education, affecting students' academic performance and physical function [35]. The prevalence of DP in this study was lower (75.9%) than that found in some previous studies [32,36] but similar to others [37]. DP tend to decrease with the length of time spent in higher education according to a study with Brazilian students [38]. The moment of transition and entry into higher education can

entail greater stress for students, so first-year students may show more pronounced DP. With the adaptation to a new academic reality, anxiety and stress indices may decrease and consequently DP may decrease as well. However, in this study, the fact that the sample mostly consisted of first-year students make it a good indicator of the mental health of these students.

Sedentary behaviour is generally associated with an increase in DP [39]. Screen time (sitting time) is a predictor of DP in university students [32,40], as was observed in the present study.

Corroborating the results of the present study, Reardon et al. [41] found that shorter sleep duration during the week is associated with the development of psychological problems. However, this relationship was not found for sleep duration at the weekend. In other studies, inappropriate sleep duration has been associated with a high prevalence of DP [34]. In general, the literature shows that a sleep duration of less than 7h is related to a high prevalence of DP [34,37,42]. In the current research, despite the high prevalence (74.1%) of students who had optimal sleep duration, those who slept less than 7h had an increased risk of having severe to high DP. Insufficient sleep time leads to higher perceived stress, which is a risk factor for DP [43].

It is important to consider the methodological limitations of this study when interpreting the results. The study adopted a cross-sectional design, in which all measures were assessed by self-report. Although all the instruments included in this study were validated for the participants' characteristics, future studies should use objective instruments, such as accelerometers, to assess PA. The sample size is small and includes many students from sports sciences, which affects the interpretation of PA and its relationship with DP. However, the convenience sampling method was used. In future studies, in addition to increasing the size of the sample, an analysis by area of study (e.g. health sciences, sports sciences) may be included to assess whether it has an influence on DP. It would therefore be interesting to study the difference between students of health sciences and education. It is also thought that in future studies, it would be pertinent to include other psychological and social variables, as these can also influence health.

Conclusions

Among the HB studied, ST and sleeping time throughout the week and weekend appeared to be linked with moderate to severe depressive symptoms in university students. Active behaviours, on the other hand, were not associated with the presence of depressive symptoms in university students. Higher education

institutions are thought to play an important role in promoting health practices that can harm students' mental health.

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Conflicts of interest

The authors declare no conflict of interest.

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