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Mental Health, Well-being, and Sociocultural Adjustment of International Students: Role of Physical Activity during the COVID-19 Pandemic

Jevgenij Razgulin¹, Agnė Slapšinskaitė-Dackevičienė², Kastytis Šmigelskas¹

¹*Department of Health Psychology, Faculty of Public Health, Medical Academy, Lithuanian University of Health Sciences, Tilžės g. 18, Kaunas LT-47181, Lithuania.*

²*Health Research Institute, Faculty of Public Health, Medical Academy, Lithuanian University of Health Sciences, Tilžės g. 18, Kaunas LT-47181, Lithuania.*

Abstract

The aim of this study was to assess physical activity and its role in international students' sociocultural adjustment, well-being, and mental health indicators during the COVID-19 pandemic. In total, 175 second-year international students participated in this study. They filled in the self-reported questionnaire. The study revealed that 47% of international students were moderately active and 64% of those students were vigorously active. In total, 62% of the sample reported having symptoms of depression and 37% had symptoms of anxiety on a moderate or severe level. More than half of international students expressed adequate well-being. This study also revealed, that more vigorously and moderately physically active students had a better sociocultural adjustment. Moreover, vigorously active students had better well-being and subjective health. They also had fewer symptoms of depression and fewer psychosomatic symptoms. However, no associations were reported between physical activity and anxiety among international students. Overall, as physical activity plays an important role in international students' sociocultural adjustment and their mental health different moderate and vigorous activities should be facilitated among the students to promote their well-being.

Keywords: International students, Physical activity, Sociocultural adjustment, Mental Health, Well-being.

1. Introduction

It is well established that regular physical activity is one of the most cost-effective facets for lower stress, well-being, and healthy lifestyle (1–3). Nevertheless, the COVID-19 pandemic affected physical activity level among university students, including walking as well as moderate and vigorous exercise (4). For instance, physical activity among Chinese students during the pandemic decreased by 52% (5).

Remarkably, physical activity is a behaviour that not only interacts with better physical and mental health, but also plays a crucial role in socialising. It is well known that physical activity serves not only as a context for observing social behaviour among peers, but also as a place where people interact with each other (6). The researchers argue that participation in sports or physical activity can increase an understanding and respect for cultural diversity, as well as influence the formation of cross-cultural friendship and adaptation to university (7).

Researchers have conducted limited research on the consequences of reduced participation in physical activity during the COVID-19 pandemic. A special focus should be placed on the holistic benefits physical activity may facilitate on students' mental health, well-being, and sociocultural adjustment.

1.1. Physical activity

One in four adults and 81% of adolescents worldwide were inactive due to insufficient moderate-to-vigorous physical activity (8). Previous research has shown that the greatest decline in physical activity levels

occurred at the time of entry into university (9, 10). Specifically, a meta-analysis found that about 40–50% of university students are physically inactive (11). Moreover, men students are more physically active compared with student women (12).

It is well documented that physical activity and exercise adaptation relate to the long-term physiological and biochemical changes that occur in human body as a result of physical activity and exercise (11,13). On the other hand, there is also a body of research suggesting that physical activity can help to reduce stress reactivity and stress-related disease (14) and suggesting that physical activity may act as a stress buffer (15–18). For example, higher levels of physical activity and fitness are associated with attenuated responses to psychosocial stress, as indicated by lower increases in salivary cortisol (19–21). One recent study found that students' physical activity, cardiovascular fitness, and mental health are interlinked, and short-term aerobic exercises act as a buffer against depression and perceived stress within 6 weeks of low to moderate aerobic exercise (22).

1.2. Sociocultural adjustment

Sociocultural adjustment is the ability of a person to adapt to a new social and cultural environment (23). During the process of sociocultural adjustment, a person gains new competencies which are needed to function well in the new culture. Also, these skills are needed to interact effectively with people in the host country. It addresses some competencies to cope with a variety of situations that might occur in everyday life in a new cultural environment (24), in getting to know more about the new

country and acquiring some necessary social skills. People might perform poorly if they do not possess enough knowledge and competencies important for the new environment.

Usually, the greatest number of problems people experience are at the beginning of their stay in the new culture. The beginning is very important as it is a time when international students have to get to know a lot new information and to gain needed skills. In 2020, most international students were forced to leave their host countries. They were isolated from the new social environment due to the COVID-19 pandemic and the natural process of adjustment of the international students might have been disturbed.

1.3. Mental health and Well-being

Even in regular circumstances, international students face more stressors and mental health problems than the local students (25, 26). Han et al. (2013) concluded that international students are at increased risk of experiencing psychological problems such as depression and anxiety due to the need to adjust to a new country and its cultural environment. According to a study at Yale University, 29% of Chinese international students exhibit symptoms of anxiety, and 45% show symptoms of depression (27). There can be a lot of difficulties foreign students face during their adjustment to a new environment, which could negatively affect their psychological well-being or mental health. Several studies suggest that international students experience higher levels of anxiety than their counterparts in the host country (28), since they perceive themselves to

be in greater social isolation and lack social support in their new environments.

Due to the COVID-19 pandemic, significant changes have happened in the lives of international students. Students had to deal with new unexpected challenges which caused them a lot of stress. Universities changed their mode of study from face-to-face to online to protect their students. Those various stressors contributed to the increased levels of stress, anxiety, and depressiveness among the students (29). International students had to leave their study environment and return to their home countries in a rush and face even more challenges. Because of online studies, communication with group mates and the other students were limited and the adjustment process to a new cultural environment was disturbed as the international students did not have much connection with the local people and culture. Further, during this pandemic the students have changed their daily activities and habits, including physical activity.

Therefore, the main aim of this study was to assess physical activity and its role in international students' sociocultural adjustment, well-being, and mental health indicators during the COVID-19 pandemic. Specifically, we also wanted to analyse if these potential effects of physical activity are similar among men and women.

2. Methods

2.1. Sample

Second-year international students from two universities in Kaunas city, Lithuania, had participated in this study. The study was conducted from October 2020 to June 2021. International students filled in the questionnaire

in lecture rooms. The permission was obtained from the Kaunas Regional Ethics Committee for Biomedical Research (No. BE-2-8, 08-01-2020).

In total, 175 international students participated in this study (44% men and 56% women). Their mean age was 22.8 ± 3.25 years. The biggest number of international students studied Medicine, Veterinary Medicine,

Odontology, and different fields of Engineering. The majority of international students were from Europe, Israel, India, and Arab countries. Participants were also from different religious groups (mostly Jews, Christians, and Muslims). The distribution of the sample by sociodemographic groups is presented in Table 1.

Table 1. Main characteristics of study sample.

Characteristic	Category	n	%
Gender			
	Men	76	44.4
	Women	95	55.6
Study Programme			
	Medicine	124	70.9
	Odontology	20	11.4
	Veterinary Medicine	22	12.6
	Physiotherapy	1	0.6
	Mechatronics	1	0.6
	Aviation Engineering	3	1.7
	Electronic Engineering	2	1.1
	Material Physics and Nanotechnology	1	0.6
	Religion		
Non-religious		37	22.2
Christians		36	21.1
Jews		46	28.4
Muslims		28	17.3
Hindus		1	0.6
	Others	14	8.6
Region			
	European Economic Area (EEA)	68	39.8
	Israel	65	38
	India and Southeast Asia	10	5.8
	Post-Soviet countries except EEA	3	1.8
	Arab countries and Turkey	9	5.3
	Other	16	9.4

2.2. Tools

The measure of Physical activity included two questions about how often students were vigorously or moderately physically active for at least 60 minutes per day recently. Items were scored on a 7-point scale. The responses range was from “every day” to “almost never”.

The Sociocultural Adaptation Scale (SCAS) was used to measure **sociocultural adjustment**, (24). This scale consists of 40 items (30). It is scored on a 5-point scale (from ‘no difficulty’ to ‘extreme difficulty’). The students must indicate the number of problems they experience in different areas; however, the difficulty is not explicitly framed in affective terms relating to anxiety, discomfort, and embarrassment. The internal consistency of this 40-item scale was 0.96.

The Center for Epidemiologic Studies Depression Scale-Revised (CESD-R10) (31) scale was used to assess the level of **depressiveness**. This scale has 10 statements. The total score is calculated by summing the 10 items scores. A person scoring 10 or more is considered depressed (32). The internal consistency of this scale was 0.80.

For the measurement of the risk of general **anxiety** disorder, the GAD-7 scale (33) was used. This 7-items brief self-report instrument was developed to identify cases of general anxiety disorder. A score higher than 10 represents a reasonable cut-off for cases of GAD. Cut-off points of 5, 10, and 15 might be interpreted as showing mild, moderate, and severe levels of anxiety on the GAD-7. The scale may be useful in assessing the

severity of the symptoms. In this study, the scale’s internal consistency was 0.90.

In order to measure well-being, the WHO-5 Well-Being Index (34) was used. The WHO-5 is a self-report scale with five items scored concerning the past two weeks on a five-point scale (from ‘all of the time’ to ‘at no time’). The total raw score, ranging from 0 to 25, is multiplied by 4 to get the final score, with 0 revealing the worst and 100 representing the best well-being. The scale’s internal consistency was 0.87.

In order to assess the students’ **subjective health**, the Self-rated Health Question (35) was used. The question “How do you rate your health” is scored on a 5-point scale from ‘very good’ to ‘very bad’. The self-rated health question is purposely vague to assess people’s assessment of health according to their own definition of health (36).

The HBSC Symptom Checklist (HBSC-SCL) was used to measure subjective **health complaints**. The scale assesses psychosomatic complaints (37). This instrument is a flexible scale as it is meaningful both on a single-item level and also by summing the score (38). The HBSC-SCL is a non-clinical measure with 8 health complaint items: headache; abdominal pain; backache; feeling low; irritability or in a bad mood; feeling nervous; sleeping difficulties; and dizziness. Participants were asked how often they experienced those symptoms over the last six months. The scale responses are from ‘about every day’ to ‘rarely or never’ (37,38). The scale’s internal consistency in our study was 0.86.

2.4 Data analysis

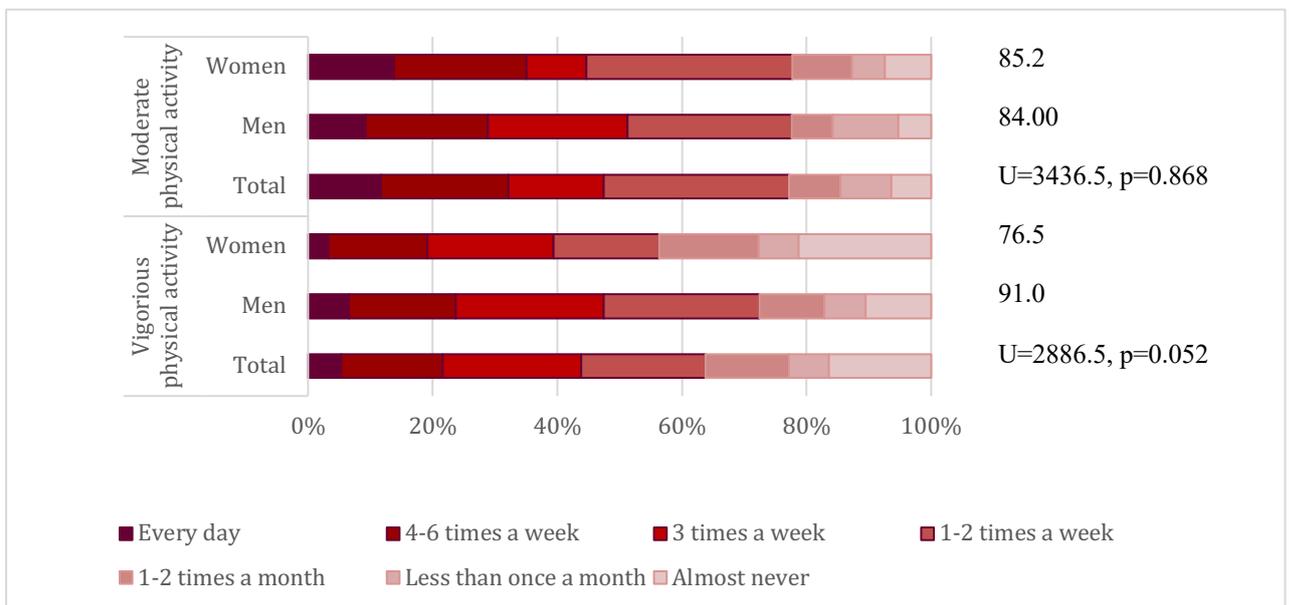
For data analysis, IBM SPSS Statistics for Windows, Version 27 (The IBM Corp. Released 2020. IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp software) was used. Arithmetic mean \pm standard deviation (SD) and proportions (%) were used to present descriptive statistics. Mann-Whitney test was used to compare mean ranks of physical activity by gender. Spearman's correlation coefficient was used to measure the strength and direction of associations between the variables. Cronbach's alpha was used to measure the internal consistency of scales. The statistical significance level was set at 5% ($p < 0.05$).

3. Results

3.1. Physical activity

In total, 47% of international students were moderately active at least 3 times a week. Also, 63.7% of the international students' population were vigorously active at least once a week. According to recommendations, those students were sufficiently active. By gender, no statistically significant differences in moderate physical activity were observed ($p > 0.05$; Figure 1). However, men were more vigorously physically active than women on the borderline significance ($p = 0.052$). Among women, 44.7% were moderately active at least 3 times per week and 56.4% were vigorously active at least once a week. The respective proportions among men were 51.3% and 72.4% (Figure 1).

Figure 1. Vigorous and moderate physical activity by gender: mean ranks



3.2 Mental health, Well-being and sociocultural adjustment

In total, 62% of the sample reported having symptoms of depression and 20% of moderate anxiety, while 17.1% met the criteria

for severe anxiety level. Overall, 54.3% of international students expressed adequate well-being. By gender, no differences in subjective

health were observed ($p>0.05$; Table 4). However, women reported more symptoms of depression, anxiety, and more psychosomatic symptoms than men ($p<0.05$). Also, women

expressed lower well-being. Descriptive characteristics of the main variables in total and by gender are presented in Table 2.

Table 2. Distribution of mental health indicators and sociocultural adjustment in total sample and among genders

Indicator (scale)	Mean	SD	Median	Skewness	Kurtosis	Men	Women	t	p
Sociocultural adjustment (SCAS40)	2.02	0.590	1.97	3.03	0.587	2.11±0.63*	1.90±0.5*	-2.48	0.014
Depression (CES-D)	11.09	5.590	11	0.174	-0.402	9.73±4.81*	12.21±6.01*	2.98	0.003
Anxiety (GAD-7)	8.33	5.510	7	0.471	-0.786	7.13±5.27*	9.263±5.64*	-2.55	0.012
Well-being (WHO-5)	13.92	5.247	14	-0.105	-0.623	15.04±5.08*	12.85±5.14*	2.78	0.006
Subjective Health (SH)	2.01	0.857	2	0.442	-0.575	1.99±0.89	2.03±0.827	-0.34	0.732
Health complaints (HBSC-SCL)	3.69	0.928	3.75	-0.343	-0.867	3.98±0.85*	3.45±0.94*	3.84	0.001

* $p<0.05$

3.3. Mental health, Well-being, and Sociocultural adjustment by Physical activity

The main aim of this study was to assess the psychosocial indicators and physical activity. According to correlations, international students who were more physically active (moderately and vigorously) were better adapting to the host cultures. Moreover, students who were more vigorously physically active had better well-being and fewer symptoms of depression and fewer psychosomatic symptoms, they also had better subjective health ($p<0.05$). Physical activity, however, did not show any significant correlations with anxiety (Table 3).

Among different genders, men who were more moderately physically active reported better sociocultural adjustment. These findings were more prominent among men than in women. However, moderate physical activity among men was not associated with any mental

health indicator. Vigorous physical activity was associated with depression, well-being, and subjective health among men ($p<0.05$) and these correlations were stronger than in women. No associations between physical activity and anxiety were observed (Table 3).

Similarly, as in the men group, women who were moderately physically more active reported better sociocultural adjustment. Vigorous physical activity was associated with a better sociocultural adjustment and better subjective health. The correlation between vigorous physical activity and subjective health was weaker than among men. However, similarly as in the other groups, no associations were found between physical activity and anxiety among women (Table 3).

Table 3. Physical activity in relation to sociocultural adjustment and mental health indicators

			Sociocultural adjustment	Depression. total	Anxiety. total	Well-being	Subjective health	Psychosomatic symptoms
Men	Moderate physical activity	rho	0.26*	0.10	0.19	-0.20	0.13	-0.02
		p	0.023	0.376	0.103	0.088	0.275	0.858
	Vigorous physical activity	rho	0.19	0.25*	0.18	-0.38*	0.36*	-0.21
		p	0.107	0.033	0.131	0.001	0.002	0.078
Women	Moderate physical activity	rho	0.22*	0.20	-0.03	-0.13	0.01	-0.10
		p	0.031	0.052	0.751	0.225	0.926	0.365
	Vigorous physical activity	rho	0.22*	0.19	0.02	-0.19	0.24*	-0.19
		p	0.035	0.065	0.831	0.072	0.018	0.066
Total sample	Moderate physical activity	rho	0.23*	0.14	0.06	-0.13	0.06	-0.05
		p	0.003	0.060	0.449	0.080	0.480	0.517
	Vigorous physical activity	rho	0.22*	0.22*	0.12	-0.28*	0.29*	-0.22*
		p	0.004	0.004	0.124	<0.001	<0.001	0.004

*p<0.05

4. Discussion

In our study, we found that almost half of the international students' population were moderately active at least 3 times a week and two thirds were vigorously active as is recommended. Men were more vigorously active than women. However, no differences in moderate physical activity were observed. These results are in line with previous research which showed men students were more active than women (12, 39).

Depression was reported by two-thirds of the sample. Among the sample of our study, 20% showed symptoms of moderate anxiety, and 17% showed signs of severe anxiety. More than half of students were satisfied or very satisfied with their lives. The numbers of depression and anxiety are similar to those reported in Kim's study (2021) (40). That study reveals that the prevalence of depression and anxiety among international students in South

Korea in the COVID-19 pandemic were 49% and 40%, respectively. The number of symptoms of depression, anxiety, and psychosomatic symptoms among women was greater than that of men.

It is clear that both moderate and vigorous physical activity have a role in the sociocultural adjustment of foreign students, both in the overall sample and specifically among women. Vigorous physical activity has a link with such mental health indicators as depression, well-being, subjective health and psychosomatic symptoms in the total sample and with depression, well-being and subjective health among men and subjective health among women. These findings complement previous studies that reveal that physical activity was negatively associated with mental health problems (41). Studies by other authors show that vigorous, moderate physical activity, stretching exercises, household work were negatively associated with depressive symptoms (42, 43). Specifically, a study by Vankim &

Nelson (2013) revealed that students who complied with recommendations for vigorous physical activity were less likely to report poor mental health and perceived stress than students who did not comply with recommendations (44).

Previously, the researchers have found that physical activity influences many physiological and psychological processes implicated in the pathophysiology of depression (45). Plausible the mechanisms behind include neurobiological, physiological, psychosocial, and behavioural mechanisms with the most popular theories involving increases in neurotransmitters (i.e., dopamine, serotonin, glutamate, GABA) (46) and neurotrophins (BDNF) (47). Evidence suggests that physical activity stimulates several neuroplastic processes, elicit changes in neuroplasticity, inflammation, oxidative stress, the endocrine system, self-esteem, social support, and self-efficacy (45, 48, 49). Even though there are still some debates on the mechanisms underlying the effects of physical activity, it is likely that physical exercise is useful in decreasing symptoms of depression and improving the other indicators of mental health (50).

As physical activity has been proven to improve mental health, it can be considered a complementary intervention to promote mental health, well-being and more successful sociocultural adjustment among international students and there is a need to facilitate international students to become more physically active both on a vigorous and moderate level.

5. Limitations

These results should be generalized with caution keeping in mind certain limitations. First, the size of the sample was not large as the number of second-year international students was very limited in Kaunas, Lithuania. Second, English is not a native language for many of the international students in Kaunas, however the questionnaire for this study was presented in English which may have had an impact on respondents' understanding of the statements. Additionally, the general sample of the international students in Kaunas is comprised of a very diverse mix of ethnicities and nationalities, which is why this study's sample is also very heterogeneous. Furthermore, more factors that might contribute to the mental health of international students were omitted from this study. The role of such factors as acculturation stress, acculturation strategies, discrimination etc. for the mental health of international students could be evaluated in the future studies.

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