PSYCHOLOGY, HEALTH & MEDICINE
https://doi.org/10.1080/13548506.2020.1869796

Taylor & Francis
Taylor & Francis Group

Insomnia is associated with worry, cognitive avoidance and low academic engagement in Argentinian university students during the COVID-19 social isolation

Ana Veronica Scotta [a,b], Mariela Valentina Cortez [a,b] and Agustín Ramiro Miranda [a,b]

[a]Facultad de Ciencias Médicas, Escuela de Fonoaudiología, Universidad Nacional de Córdoba, Córdoba, Argentina; [b]Consejo Nacional de Investigaciones Científicas y Técnicas, CONICET, INICSA, Córdoba, Argentina

ABSTRACT

An increment in mental health problems related to social isolation strategies was evinced in several populations, however few investigations address this problem in students. This study aimed to analyze the relationship between insomnia, worry, coping strategies, and academic engagement in subjects pursuing a university degree in Argentina during the first month of compulsory social isolation against the COVID-19 pandemic. Self-report online questionnaires were administered to 584 participants: Insomnia Severity Index, Penn State Worry Questionnaire, Coping Responses Inventory, Utrecht Work Engagement Scale for Students. Demographic data was recorded. Statistics included bivariate and multivariate techniques. Prevalences of 45% for subthreshold insomnia, 23% for moderate insomnia, and 4% for severe insomnia were found. The severe insomnia group presented higher levels of worry and cognitive avoidance strategies. Insomnia was also associated with daytime concerns. The group without insomnia was more vigorous in their academic engagement. Being physically active was associated with lower sleep problems. Insomnia prevalence is high in socially isolated university students. Cognitive avoidance coping strategies are associated with worry, which leads to an alert state that makes sleep difficult. These findings should be taken into account by academic institutions to define their pedagogic strategies.

ARTICLE HISTORY
Received 13 July 2020
Accepted 22 December 2020

KEYWORDS
COVID-19 pandemic; social isolation; insomnia; coping; worry; academic engagement

Introduction

The COVID-19 pandemic required strict confinement measures worldwide (Matias et al., 2020). Following the first local cases of COVID-19, the Argentinian government enforced the five-phases strategic plan of Preventive and Mandatory Social Isolation (PMSI) on March 20, being one of the earliest applicators of this measure (Ministry of Health of Argentina, 2020) (Table 1). This research focuses on the first two phases, characterized by strict regulations and the circulation of up to 25% of the population.

These measures abruptly interrupted people's lifestyles (Johnson et al., 2020). The education system restructured its pedagogical and didactic practices, implementing virtual

CONTACT Agustín Ramiro Miranda armiranda@fcm.unc.edu.ar INICSA Bv. De La Reforma, Ciudad Universitaria, Córdoba 5014, Argentina

Table 1. Management phases of the preventive and compulsory social isolation in Argentina.

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
Name	Strict confinement	Administrative confinement	Geographical segmentation	Progressive reopening	New normality
Movement authorization	Essential workers only	New authorizations	Provincial exceptions	Provincial exceptions	With hygiene habits and sustained care
Movement restriction	Rest of the population	National restriction	National restriction	National restriction	Not applicable
Population mobility	Up to 10%	Up to 25%	Up to 50%	Up to 75%	Up to 75%
Time of duplication of cases	Less than 5 days	5 to 15 days	15 to 25 days	More than 25 days	Not applicable
Geographical scope	Homogeneous	National exceptions	Segmentation according to epidemiological criteria	Local restrictions	Homogeneous

Retrieved from the National Ministry of Health of Argentina. https://www.argentina.gob.ar/coronavirus/aislamiento/fases.

resources. However, this was a complex issue due to a lack of virtual platforms, access to computers and an internet connection, and digital skills by teachers and students (CAF, 2020), which generates worries, stress, anxiety, insomnia, fear, and mood changes in students since their studies were significantly altered (Taylor, 2019). Most research on the COVID-19 pandemic in Argentina is related to consequences on physical health, hence the need for evidence about the impact on mental health (Sher, 2020). Knowing the prevalence and impact of insomnia in students during the pandemic is of great need, due to the fundamental role that sleep plays in emotional and cognitive regulation, affecting daytime functioning, especially in academic activities (Altena et al., 2020).

Insomnia, one of the most prevalent sleep disorders, is the inability to initiate or maintain sleep, or to achieve an adequate duration and quality of sleep to restore energy and normal wakefulness (Morin et al., 2015). Worry is a cognitive component of the anxiety reaction to process and organize information to face future threatening situations (Castillo et al., 2010). In contexts of great uncertainty, elevated levels of worry are expected, which leads to mental and physical problems, such as insomnia. Furthermore, insomnia and worry have been associated with a decrease in work and academic engagement, which is a positive, persistent, emotional, and cognitive state related to a specific task (Miranda et al., 2020a). Stressful situations can affect people's psychological capital, putting at risk the cognitive, emotional, and physical resources necessary to be engaged (Miranda et al., 2020b).

In part, the health impact will depend on coping strategies. Coping is defined as cognitive and behavioral efforts in response to external and/or internal threatening situations (Lazarus & Folkman, 1984), and it may involve approach or avoidance mechanisms (i.e. if it is oriented either toward or away from the threat) (Mikulic & Crespi, 2008).

Based on the exposed, the following questions were raised: How was the sleep quality for university students during lockdown measures? Were sleep problems associated with worries and the use of coping strategies? Were these processes related to academic engagement? Thus, the aim was to analyze the relationship between insomnia, traits of worry, coping strategies, and academic engagement of subjects pursuing a university degree in Argentina during the first month of the COVID-19 social isolation.

Materials and methods

Subjects and data collection

For this cross-sectional study, self-report online questionnaires were administered to 584 subjects pursuing a university degree from Argentina, who were recruited in virtual learning platforms and social media during the first month of PMSI during the COVID-19 pandemic.

Ethical considerations

All procedures were carried out according to the Declaration of Helsinki and current Argentinean legislation. Participants voluntarily gave their informed consent to be included anonymously in this study.

Instruments

Insomnia assessment

The Insomnia Severity Index (ISI) was used to assess the nature, severity, and impact of insomnia during the last month (Morin et al., 2011). This 7-item questionnaire evaluates the severity of sleep onset, sleep maintenance, early morning awakening problems, sleep dissatisfaction, interference of sleep difficulties with daytime functioning, noticeability of sleep problems by others, and distress caused by the sleep difficulties. Each item was rated on a 5-point Likert scale (0 'no problem' to 4 'very severe'). Scores were transformed on a scale ranging from 0 to 28: absence of insomnia (0–7), subthreshold insomnia (8–14), moderate insomnia (15–21), and severe insomnia (22–28). Its reliability and validity have been reported (Fernandez-Mendoza et al., 2012). In this study, its alpha (.814) was acceptable. Additionally, participants were asked about the occurrence of symptoms after a bad night's sleep (yes/no) during social isolation: daytime fatigue, functional difficulties, mood disturbances, and physical symptoms.

Traits of worry

The self-report Penn State Worry Questionnaire (PSWQ) was used. Each item was rated on a 5-point Likert scale (1 'not at all like me' to 4 'very much like me'), judging how problematic worry applies to themselves (Sandín et al., 2009). Psychometric analyses confirmed its reliability (alpha > .80) and validity (highly correlated with anxiety trait and cognitive anxiety). An excellent internal consistency was found (alpha = .943).

Coping strategies

The Coping Responses Inventory (CRI) was applied to assess responses and coping strategies against stress. This instrument has two parts. First, a problematic situation is described (in this case, social isolation was specified). Second, the participants answer 22 items using a 4-point Likert scale (0 'Never or almost never' to 3 'Always or almost always'), grouped in 4 dimensions:

- cognitive approach coping strategies (CApC): approach strategies aimed at problem-solving in which cognitive mechanisms such as logical analysis and positive reappraisal intervene.
- behavioral approach coping strategies (BApC): approach strategies that tend to seek guidance and support, and actions to solve a problem.
- cognitive avoidance coping strategies (CAvC): strategies aimed at emotional control, such as cognitive avoidance and acceptance/resignation.
- behavioral avoidance coping strategies (BAvC): behaviors that seek alternative rewards and emotional discharge.

Its reliability and validity were confirmed. In this work, an alpha of .780 was obtained, similar to previous studies (Boubeta et al., 2011).

Academic engagement

The Utrecht Work Engagement Scale for Students (UWES-S) was used to assess academic engagement (Cachón-Zagalaz et al., 2018). The 17-item version showed three-dimensions (vigor, dedication, and absorption). Each item was rated on a 7-point Likert scale (0 'never' to 6 'everyday'). Scores were transformed on a scale ranging from 0 to 102, with higher scores indicating a higher level of engagement. Previous studies confirmed its psychometric properties (Cachón-Zagalaz et al., 2018). In this study, its alpha was acceptable (alpha = .910).

Statistical analysis

Statistical analyses were performed using Stata 15 (StataCorp). Reliability was measured by the alpha coefficient (Miranda et al., 2020c). Mean and standard deviation were calculated for all numerical variables, and percentages for categorical variables. Chi-square (χ^2) was used to assess associations among categorical variables. The effect of insomnia on student engagement, coping strategies, and worry was assessed by ANOVA with Bonferroni post-hoc test. Effect sizes were estimated as follows: first, Cohen's *d* was calculated to estimate the magnitude of the effect when comparing the group without insomnia with the groups with insomnia; then, eta-squared (η^2) was calculated to estimate the effect size based on sample variance explained. T-test was used to compare means between physical activity groups.

A multivariate analysis was performed through principal component analysis (PCA). PCA allows examining all data in a lower-dimensional space, identifying relationships between variables, through the construction of axes that project the observations and the variables simultaneously on the same plane. A biplot was constructed; vector length indicated relative variable intensity, and grades of vector separation indicated variable correlation (<90° = positive, 90° = null, and >90° = negative). A correlation matrix was designed to find the covariation of each pair of measured variables. The correlation coefficient (r) represented the covariance of the sample values, assuming values in the interval [−1; 1], where the sign indicated the direction (Azzone & Soncin, 2019).

Results

The mean age was 22.49 years (SD = 6.28). Eighty-one percent of participants identified as female, 18% as male, and 1% as non-binary. Ninety-six percent of the subjects were undergraduate, 35% were in the first year, 24% in the second year, 17% in the third year, 10% in the fourth year, and 14% in the fifth year. The large majority was born in Argentina (99%), studying in public institutions (96%).

Fifty-eight percent were single, and 93% were not parents. Participants' self-perceived socioeconomic status was high (2%), middle (82%), and low (16%). Twenty-seven percent of participants were employed; 8% of them were essential workers and 19% were telecommuters. The average time of confinement was 20.78 (4.78) days, and 89% were confined with family members or partners. Table 2 displays other characteristics.

Table 2. Demographic characteristics of the sample.

	Mean	S.D.
Days of isolation	20.78	4.78
Age (years)	22.49	6.28
	N	%
Gender		
Female	474	81
Male	107	18
Non-binary	3	1
Nationality		
Argentinian	577	99
Other	7	1
Educational level		
Undergraduate	560	96
Graduate	24	4
Administration of University		
Public	561	96
Private	23	4
Couple status		
Single	336	58
In couple	248	42
Children		
No	545	93
Yes	39	7
Employment status		
Telecommuter	109	19
Essential worker [a]	48	8
Unemployed	427	73
Self-perceived socioeconomic level		
Low	94	16
Medium	479	82
High	11	2
Physical activity		
No	285	49
Yes	299	51
Confined with		
Alone	37	6
Family or partner	519	89
Roommates	22	4
Friends	6	1
Personal computer with internet access		
No	36	6
Yes	548	94
Shared computer		
No	290	50
Yes	294	50
Daily time spent in social media		
Does not use social media	5	1
< 2 h	51	9
2–4 h	212	36
5–7 h	194	33
> 7 h	122	21
Housing facilities: Number of rooms		
Single room apartment	11	2
Apartment or house with 2 rooms	176	30
Apartment or house with > 2 rooms	397	68
Housing facilities: Outdoor spaces		
Balcony	73	13
Courtyard	377	65
Both of the above	81	14
None of the above	53	9

a = Based on the National Ministry of Health of Argentina. https://www.argentina.gob.ar/coronavirus/aislamiento/fases.

Table 3. Daytime concerns according to severity of insomnia.

	Absence of insomnia	Subthreshold insomnia	Moderate insomnia	Severe insomnia	χ^2(df), p-value	*d* (95% C.I.)
Daytime fatigue						
Yes	111	221	125	19	34.47(3), p < 0.0001	0.501 (0.334–0.668)
No	54	41	11	2		
Functional difficulties						
Yes	85	195	106	21	42.11(3), p < 0.0001	0.558 (0.389–0.726)
No	80	67	30	0		
Mood disturbances						
Yes	105	182	112	19	17.14(3), p = 0.0007	0.348 (0.183–0.512)
No	60	80	24	2		
Physical symptoms						
Yes	48	119	78	19	42.78(3), p < 0.0001	0.562 (0.394–0.731)
No	117	143	58	2		

d = Cohen's *d* for standardized mean-difference effect size (0.20 = small, 0.50 = moderate, 0.80 = large, and 1.30 = very large effect).

The average ISI score was 10.92 (5.72). Prevalences of 45% of subthreshold insomnia, 23% of moderate insomnia, and 4% of severe insomnia were found. Additionally, 82% of the participants reported daytime fatigue, 70% functional difficulties, 72% mood disturbances, and 45% physical symptoms. These concerns were significantly associated with insomnia categories (Table 3). Furthermore, both insomnia (r = −.05, p = .2625) and worry (r = −.03, p = .4660) were not associated with the time of day the questionnaire was answered.

Table 4 shows ANOVA results, which indicate that worry increases with the severity of insomnia. The groups with moderate and severe insomnia showed lower vigor, and lower CAvC was found in the group without insomnia. Physical activity was found to reduce insomnia and physical symptoms from lack of sleep. Those physically active presented higher academic engagement, vigor, and CApC, and lower insomnia and worry (Table 5).

PCA revealed that component 1 explained variability in 26%, while component 2 explained 19%. The variables with the greatest weight in component 1 were Vigor, Dedication, Absorption, and BAvC. Component 2 had the highest loadings for ISI, Worry, CApC, BApC, CAvC, BAvC, and Isolation (Table 6). The biplot (Figure 1) presents the strongest correlation between insomnia severity and worry, which in turn was positively associated with cognitive coping strategies. The three indicators of engagement were inversely correlated with insomnia and worry, however, it was significant only between ISI and Vigor. Isolation time was negatively associated with coping strategies, especially for BApC (Table 7).

Table 4. Comparisons of the UWES-17, PSWQ, and CRI scores according to severity of insomnia.

	Absence of insomnia [a]	Subthreshold insomnia [a]	*d* (95% C.I.) [b]	Moderate insomnia [a]	*d* (95% C.I.) [b]	Severe insomnia [a]	*d* (95% C.I.) [b]	*p*	*F*	η^2 (95% C.I.) [c]
UWES-17	70.15 (1.21)	69.97 (0.96)	−0.0116 (−0.206–0.183)	67.20 (1.34)	−0.19 (−0.418–0.038)	63.62 (3.40)	−0.4223 (−0.8784–0.0339)	.1045	2.06	.011 (.000-.028)
Vigor	21.75 (0.50)	21.56 (0.40)	−0.0295 (−0.224–0.165)	**20.23* (0.55)**	**−0.2376 (−0.465-(−0.010))**	**17.71* (1.41)**	**−0.632 (−1.0906-(−0.1734)**	**.0111**	**3.74**	**.019 (.001-.042)**
Dedication	25.42 (0.34)	25.22 (0.27)	−0.0459 (−0.241–0.149)	25.07 (0.38)	−0.0799 (−0.307–0.1472)	24.57 (0.96)	−0.1955 (−0.65–0.259)	.8162	0.31	.001 (.000-.008)
Absorption	23.19 (0.40)	22.98 (0.50)	−0.030 (−0.224–0.165)	21.90 (0.55)	−0.211 (−0.439–0.016)	21.33 (1.41)	−0.3533 (−0.810–0.102)	.1886	1.60	.008 (.000-.024)
PSWQ	30.49 (0.80)	**33.74* (0.64)**	**0.3154 (0.119–0.511)**	**38.29* (0.88)**	**0.762 (0.527–0.997)**	**46.19* (2.24)**	**1.536 (1.05–2.016)**	**<.0001**	**23.95**	**.110 (.064-.156)**
CRI-Y	31.60 (0.66)	32.74 (0.73)	0.1073 (−0.088–0.302)	33.35 (0.53)	0.2332 (0.006–0.461)	34.33 (1.86)	0.324 (−0.132–0.779)	.1698	1.68	.009 (.000-.025)
CAvC	4.93 (0.23)	**6.35* (0.19)**	**0.470 (0.273–0.667)**	**6.39* (0.26)**	**0.490 (0.260–0.720)**	**7.90* (0.65)**	**1.0098 (0.544–1.475)**	**<.0001**	**11.79**	**.057 (.023-.094)**
BAvC	6.69 (0.18)	6.60 (0.14)	−0.0400 (−0.234–0.155)	6.46 (0.19)	−0.1017 (−0.329–0.125)	6.38 (0.50)	−0.1349 (−0.589–0.319)	.8164	0.31	.002 (.000-.008)
CApC	12.64 (0.26)	13.13 (0.21)	0.1455 (−0.050–0.341)	13.01 (0.29)	0.111 (−0.117–0.338)	13.81 (0.73)	0.3521 (−0.103–0.807)	.3238	1.16	.006 (.000-.020)
BApC	7.33 (0.28)	7.26 (0.22)	−0.0196 (−0.214–0.175)	6.88 (0.31)	−0.1252 (−0.353–0.102)	6.24 (0.78)	−0.3049 (−0.760–0.150)	.4280	0.93	.005 (.000-.017)

UWES-17 = Spanish Version of the Utrecht Work Engagement Scale for Students; PSWQ = Spanish version of the Penn State Worry Questionnaire; CRI = Spanish version of the Coping Responses Inventory; CApC = cognitive approach coping strategies; BApC = behavioral approach coping strategies; CAvC = cognitive avoidance coping strategies; BAvC = behavioral avoidance coping strategies. Data compared using ANOVA. a = data expressed as mean (standard error). b = Cohen's d to estimate the effect size when compared with the group with the absence of insomnia (0.20 = small, 0.50 = moderate, 0.80 = large, and 1.30 = very large effect). c = Eta squared to estimate the effect size based on sample variance explained (.01 = small, .06 = moderate, and .14 = large effect). *p < .05.

Table 5. Mean scores of the questionnaires and prevalence of daytime concerns in physically active and sedentary subjects during the COVID-19 social isolation.

	Sedentary	Physically Active			
	Mean (SD)	Mean (SD)	*T*	*p*	*d* (95% C.I.)
ISI	11.90 (5.90)	9.99 (5.39)	4.10	<0.0001	0.339 (0.176–0.503)
UWES-17	67.61 (15.48)	70.60 (15.63)	−2.32	0.0200	−0.192 (−0.355 – (−0.029))
Vigor	20.24 (6.29)	22.05 (6.57)	−3.39	<0.0001	−0.281 (−0.444 – (−0.118))
Dedication	25.30 (4.55)	25.39 (4.26)	−1.00	0.3200	−0.083 (−0.245–0.080)
Absorption	22.34 (6.45)	23.16 (6.46)	−1.53	0.1300	−0.127 (−0.289–0.036)
PSWQ	35.54 (10.89)	33.18 (10.76)	2.64	0.0100	0.219 (0.056–0.381)
CRI-Y	32.23 (8.01)	33.24 (8.98)	−1.44	0.1500	−0.119 (−0.282–0.043)
CAvC	6.26 (2.88)	5.79 (3.25)	1.87	0.0600	0.1548 (−0.008–0.317)
BAvC	6.15 (2.18)	7.00 (2.27)	−4.63	<0.0001	−0.3833 (−0.547 – (−0.220))
CApC	12.93 (3.36)	13.05 (3.38)	−0.42	0.6800	−0.0348 (−0.197–0.128)
BApC	6.89 (3.45)	7.41 (3.71)	−1.74	0.0800	−0.144 (−0.307–0.018)
	N (%)	N (%)	χ^2(df)	*p*	*d* (95% C.I.)
Daytime fatigue			2.05 (1)	0.1528	−0.169 (−0.402–0.063)
Yes	239 (40.92)	237 (40.58)			
No	46 (7.88)	62 (10.62)			
Functional difficulties			3.49 (1)	0.0616	−0.187 (−0.383–0.009)
Yes	209 (35.79)	198 (33.90)			
No	76 (13.01)	101 (17.29)			
Mood disturbances			1.22 (1)	0.2700	−0.112 (−0.311–0.087)
Yes	210 (35.96)	208 (35.62)			
No	75 (12.84)	91 (15.58)			
Physical symptoms			4.79 (1)	0.0285	−0.2013 (−0.382- (−0.021))
Yes	142 (24.32)	122 (20.89)			
No	143 (24.49)	177 (30.31)			

UWES-17 = Spanish Version of the Utrecht Work Engagement Scale for Students; PSWQ = Spanish version of the Penn State Worry Questionnaire; CRI = Spanish version of the Coping Responses Inventory; CApC = cognitive approach coping strategies; BApC = behavioral approach coping strategies; CAvC = cognitive avoidance coping strategies; BAvC = behavioral avoidance coping strategies; *d* = Cohen's *d* for standardized mean-difference effect size (0.20 = small, 0.50 = moderate, 0.80 = large, and 1.30 = very large effect).

Discussion

The aim of this study was to analyze the relationship between insomnia, worry, coping strategies, and academic engagement of subjects pursuing university degrees in Argentina during the first month of the COVID-19 social isolation.

We found a prevalence of 45% of subthreshold insomnia, 23% of moderate insomnia, and 4% of severe insomnia. These values were higher than pre-pandemic reports. Choueiry et al. (2016) reported a prevalence of 10% for moderate insomnia and 0.2% for severe insomnia in Lebanese students during 2013–2014. Another study found rates of 55% for subclinical, 10% for moderate, and no severe insomnia in the same population (Younes et al., 2016). The prevalences of moderate and severe insomnia doubled the ones

Table 6. Variable influence (biplot loadings) along the first two principal component analysis axes.

	Axis 1	Axis 2
Isolation	−.06	−.12
Vigor	.85	−.25
Dedication	.79	−.19
Absorption	.86	−.23
Worry	−.09	.39
CApC	.40	.66
BApC	.33	.48
CAvC	.03	.75
BAvC	.50	.39
ISI	−.13	.40

CApC = cognitive approach coping strategies; BApC = behavioral approach coping strategies; CAvC = cognitive avoidance coping strategies; BAvC = behavioral avoidance coping strategies; ISI = Insomnia Severity Index.

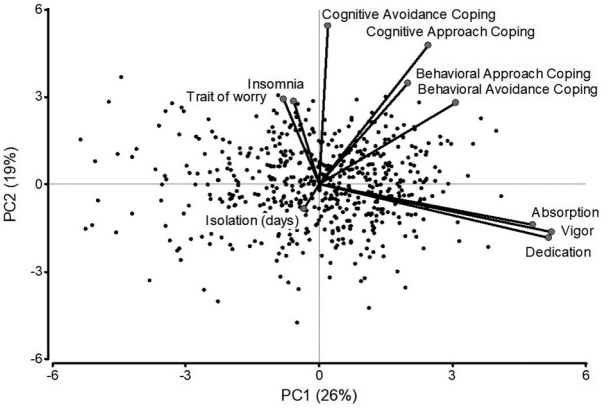

Figure 1. Principal components analysis biplot of the correlation between days of isolation, insomnia, trait of worry, coping strategies and academic engagement.

Table 7. Correlogram between days of isolation, insomnia, traits of worry, academic engagement and coping strategies.

	Isolation	Vigor	Dedication	Absorption	Worry	CApC	BApC	CAvC	BAvC	ISI
Isolation	-	.7008	.8156	.9031	.9598	.0753	.0010	.9667	.6967	.8216
Vigor	−.02	-	<.0001	<.0001	.7502	.0118	.0473	.0354	<.0001	.0097
Dedication	−.01	.60	-	<.0001	.0976	<.0001	.0752	.0620	<.0001	.3730
Absorption	−.01	.82	.65	-	.9036	.0017	.0259	.1467	<.0001	.2313
Worry	− .01	−.01	−.07	.01	-	.1141	.2357	<.0001	.0037	<.0001
CApC	−.07	.10	.17	.13	.07	-	<.0001	<.0001	<.0001	.1373
BApC	−.14	.08	.07	.09	−.05	.35	-	<.0001	<.0001	.0753
CAvC	−.01	−.09	−.08	−.06	.27	.35	.20	-	<.0001	<.0001
BAvC	.02	.23	.23	.18	−.12	.41	.31	.17	-	.1968
ISI	.01	−.11	−.04	−.05	.37	.06	−.07	.23	−.05	-

Correlation coefficients are derived from principal component analysis. P-value are shown in the upper-hemimatrix. Abbreviations: CApC = Cognitive Approach Coping; BApC = Behavioral Approach Coping; CAvC = Cognitive Avoidance Coping; BAvC = Behavioral Avoidance Coping; ISI = Insomnia Severity Index.

previously described for Latin American undergraduate students (Durán-Agüero et al., 2019; Nunes et al., 2018; Ojeda-Paredes et al., 2019).

An increase in insomnia rates was also reported in China during the COVID-19 outbreak (Li et al., 2020) associated with psychological reactions related to the pandemic, poor sleep hygiene, marked anxiety and depressive symptoms related to the disease, the economy, social distance and travel restrictions, changes in daily life, and mental illness. Furthermore, university students may experience a higher level of stress due to worries related to the continuity of their studies. Another study found a high prevalence between 51% and 76.7% of sleep problems during the first 2 weeks of isolation in China (Xue et al., 2020). These values are similar to ours since the sum of the insomnia groups brings the prevalence close to 72%.

Academic engagement is a state of well-being associated with study-related activities, characterised by vigor, dedication, and absorption (Miranda et al., 2020a). Bakker (2011) defined vigor as the high levels of energy and mental resistance that a student experiments during academic activities. It also refers to the desire to invest effort in the task being carried out, even when facing difficulties. We found lower vigor in participants with insomnia. This accounts for the impact of severe insomnia on the energy that subjects may deposit in studying, even if dedication and absorption are preserved. This can be analyzed from the Conservation of Resources Theory. In this sense, sleep is the process of recovery of the central nervous system, and sleep deprivation impairs the restoration of the cognitive functions necessary to achieve adequate academic energy levels (Åkerstedt et al., 2009; Gomes et al., 2011). Furthermore, insomnia and poor sleep quality are associated with poor academic performance (Gilbert & Weaver, 2010).

Matias et al. (2020) describe human needs in COVID-19 isolation and suggest that healthy practices that strengthen personal protection should be promoted as they can help rebalance health, thinking, and feelings. In this sense, promoting physical activity is a valid protection strategy. We consulted the participants whether they were doing physical activity and analyzed its relationship with insomnia, finding lower ISI scores in those physically active and fewer physical symptoms. Furthermore, those physically active presented higher academic engagement, vigor, and avoidance coping, and lower means of worry and insomnia.

Our results showed a strong relationship between insomnia and worry. Like insomnia, worry levels increased in populations confined during the COVID-19 pandemic (Banerjee & Rai, 2020). Cao et al. (2020) reported the following stressors related to COVID-19 in university students: economic worry, academic delays, and influence of the epidemic on daily life. These factors were positively associated with anxiety symptoms. Furthermore, worry, along with loneliness, intolerance to uncertainty, and depression, were predictive factors for insomnia during the COVID-19 pandemic in Greece (Voitsidis et al., 2020). According to the authors, worry causes cognitive arousal and can, therefore, disturb sleep. This could explain the association we found between worry and cognitive avoidance coping strategies. This relationship was previously studied by Dickson et al. (2012), who found that both worry and rumination were positively predicted by cognitive, not behavioral, avoidance. Moreover, worry mediated the effect of cognitive avoidance on anxiety. Although the time of response has been reported as a potential modifier of questionnaire answers (Adan & Guàrdia, 1993; Prat & Adan, 2013), in this research neither insomnia nor worries were significantly associated with the hour of day in which the subjects answered the survey.

To the best of our knowledge, this is the first investigation to study these aspects of mental health in subjects pursuing a university degree in Argentina during PMSI for the COVID-19 pandemic. Our results provide knowledge of the effects of isolation measures in a population whose learning practices have been widely and abruptly modified. Besides, it contributes to the evidence on the effects of the COVID-19 pandemic on mental health. Our findings highlight the need to consider healthy recommendations for students to achieve restful sleep, necessary to reach adequate academic engagement. Likewise, teachers must take into account the mental health status of their students when planning their teaching proposals. However, some limitations must be analyzed. Although we use different statistical approaches, the cross-sectional nature of the study limits the inference on causality among variables (Rothman & Greenland, 2005). Since the sample size may be considered a limitation, we suggest conducting studies with larger samples. However, post-hoc tests showed that we worked with power above .90. Regarding sampling, the participants were recruited through an online questionnaire due to circulation restrictions, and subjects without internet access could not be included. Furthermore, future studies should collect information about changes in daily life, the consumption of psychostimulants, and mental or physical disorders. Links between stress and unhealthy lifestyle changes are well documented. Di Santo et al. (2020) found increment in smoke, alcohol and caffeine consumption, unhealthy diet, and sedentarism during quarantine, which were associated with sleep problems and psychological distress. Lechner et al. (2020) found higher alcohol consumption in university students after campus closure due to the COVID-19 pandemic, which was associated with mood disorders. Despite not having found an association between the time of day the survey was answered and the ISI and PSWQ, we encourage future studies to consider other specific methods to evaluate these potential effects, which would multidimensionally assess the chronobiology of insomnia and worries in complex social contexts. Notwithstanding these limitations, our findings contribute to the available evidence and open new questions for future research in other populations, using different methodological designs and variables.

The psychological impact of COVID-19 pandemic is evident. A significant percentage of the population will experience mental health changes, mainly due to fear of contagion, social isolation, loss of loved ones, and economic crisis (Inchausti et al., 2020). Students are not exempt from these problems. It is necessary for health systems to have trained mental health professionals to intervene during the different stages of this pandemic, recognizing groups of greater vulnerability (e.g. people with previous psychopathologies) in different spaces (e.g. schools and universities). Urzúa et al. (2020) describe different ways in which applied psychology can contribute to mitigating the effects of the pandemic: Effective use of teleassistance; promotion of self-care; mitigation of isolation effects; promotion of physical activity and time management; stress management; prevention of domestic violence; addressing psychological aspects of work and study at home; recommendations for the organization of work and study; approaching the psychological impact of work and academic insecurity; addressing the psychological impact of unemployment and negative academic results. Likewise, educators and other health professionals must be aware of the problem to identify those who need professional assistance and to work interdisciplinary in decision-making. We strongly encourage future research to address the impact of pandemic measures in

more advanced stages, as well as in specific populations, and by focusing on the effects of the interventions previously mentioned, to generate the best evidence for future epidemic events.

The COVID-19 pandemic has great social and individual impact, and university students are widely affected by isolation measures. This study shows a high prevalence of insomnia in socially isolated students, which might be linked to COVID-19-related worries. Moreover, cognitive avoidance coping is associated with worries, which leads to an alert state that makes sleep difficult. These findings should be taken into account by academic institutions when defining their pedagogic strategies in the context of social isolation. Additionally, health recommendations should be encouraged to prevent its impact on sleep. We strongly suggest to follow WHO's mental health and psychosocial recommendations for the COVID-19 outbreak (World Health Organization, 2020).

Data availability statement

The data that support the findings of this study are available on request from the corresponding author, ARM. The data are not publicly available due to their containing information that could compromise the privacy of research participants..

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

The work of Ana Veronica Scotta, Mariela Valentina Cortez, and Agustin Ramiro Miranda were supported by a fellowship provided by the Secretaría de Ciencia y Tecnología, Universidad Nacional de Córdoba.

ORCID

Ana Veronica Scotta http://orcid.org/0000-0003-2269-582X
Mariela Valentina Cortez http://orcid.org/0000-0003-3124-2240
Agustín Ramiro Miranda http://orcid.org/0000-0001-6673-606X

References

Adan, A., & Guàrdia, J. (1993). Circadian variations of self-reported activation: A multidimensional approach. *Chronobiologia*, *20*(3–4), 233–244. https://psycnet.apa.org/record/1994-23904-001

Åkerstedt, T., Nilsson, P. M., & Kecklund, G. (2009). Sleep and recovery. In S. Sonnentag, P. L. Perrewé, & D. C. Ganster (Eds.), *Current perspectives on job-stress recovery* (pp. 205–247). Emerald Group Publishing Limited. https://doi.org/10.1108/S1479-3555(2009)0000007009

Altena, E., Baglioni, C., Espie, C. A., Ellis, J., Gavriloff, D., Holzinger, B., Schlarb, A., Frase, A., Jernelöv, S., & Riemann, D. (2020). Dealing with sleep problems during home confinement due to the COVID-19 outbreak: Practical recommendations from a task force of the European CBT-I Academy. *Journal of Sleep Research*, *29*(4), e13052. https://doi.org/10.1111/jsr.13052

Azzone, G., & Soncin, M. (2019). Factors driving university choice: A principal component analysis on Italian institutions. *Studies in Higher Education*, *45*(12), 2426–2438. https://doi.org/10.1080/03075079.2019.1612354

Bakker, A. B. (2011). An evidence-based model of work engagement. *Current Directions in Psychological Science*, *20*(4), 265–269. https://doi.org/10.1177/0963721411414534

Banerjee, D., & Rai, M. (2020). Social isolation in Covid-19: The impact of loneliness. *International Journal of Social Psychiatry*, *66*(6), 525–527. https://doi.org/10.1177/0020764020922269

Boubeta, A. R., De La Iglesia, G., Ongarato, P., & Liporace, M. F. (2011). Dimensionalidad del Inventario de Afrontamiento para adolescentes y universitarios. *Psicothema*, *23*(3), 464–474. http://www.psicothema.com/psicothema.asp?id=3911

Cachón-Zagalaz, J., Lara-Sánchez, A., Zagalaz-Sánchez, M. L., López-Manrique, I., & Mesa, C. G. G. D. (2018). Psychometric properties of the utrecht work engagement scale in teacher training students. *Suma Psicológica*, *25*(2), 113–121. http://dx.doi.org/10.14349/sumapsi.2018.v25.n2.3

CAF. (2020). *Las oportunidades de la digitalizacion en America Latina frente al Covid-19*. Retrieved May 20, 2020, from https://scioteca.caf.com/handle/123456789/1541

Cao, W., Fang, Z., Hou, G., Han, M., Xu, X., Dong, J., & Zheng, J. (2020). The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Research*, *287*(May), 112934. https://doi.org/10.1016/j.psychres.2020.112934

Castillo, C., Macrini, L., Cheniaux, E., & Landeira-Fernandez, J. (2010). Psychometric properties and latent structure of the Portuguese version of the Penn State Worry Questionnaire. *The Spanish Journal of Psychology*, *13*(1), 431–443. https://doi.org/10.1017/S113874160000398X

Choueiry, N., Salamoun, T., Jabbour, H., El Osta, N., Hajj, A., & Khabbaz, L. R. (2016). Insomnia and relationship with anxiety in university students: A cross-sectional designed study. *PloS One*, *11*(2), e0149643. https://doi.org/10.1371/journal.pone.0149643

Di Santo, S. G., Franchini, F., Filiputti, B., Martone, A., & Sannino, S. (2020). The effects of COVID-19 and quarantine measures on the lifestyles and mental health of people over 60 at increased risk of dementia. *Frontiers in Psychiatry*, *11*(October), 578628. https://doi.org/10.3389/fpsyt.2020.578628

Dickson, K. S., Ciesla, J. A., & Reilly, L. C. (2012). Rumination, worry, cognitive avoidance, and behavioral avoidance: Examination of temporal effects. *Behavior Therapy*, *43*(3), 629–640. https://doi.org/10.1016/j.beth.2011.11.002

Durán-Agüero, S., Sepúlveda, R., & Guerrero-Wyss, M. (2019). Sleep disorders and anthropometric measures in Chilean university students. *Nutrición Humana y Dietética*, *23*(3), 153–161. https://doi.org/10.14306/renhyd.23.3.646

Fernandez-Mendoza, J., Rodriguez-Muñoz, A., Vela-Bueno, A., Olavarrieta-Bernardino, S., Calhoun, S. L., Bixler, E. O., & Vgontzas, A. N. (2012). The Spanish version of the Insomnia Severity Index: A confirmatory factor analysis. *Sleep Medicine*, *13*(2), 207–210. https://doi.org/10.1016/j.sleep.2011.06.019

Gilbert, S. P., & Weaver, C. C. (2010). Sleep quality and academic performance in university students: A wake-up call for college psychologists. *Journal of College Student Psychotherapy*, *24*(4), 295–306. https://doi.org/10.1080/87568225.2010.509245

Gomes, A. A., Tavares, J., & de Azevedo, M. H. P. (2011). Sleep and academic performance in undergraduates: A multi-measure, multi-predictor approach. *Chronobiology International*, *28*(9), 786–801. https://doi.org/10.3109/07420528.2011.606518

Inchausti, F., García Poveda, N. V., Prado Abril, J., & Sánchez Reales, S. (2020). La psicología clínica ante la pandemia COVID-19 en España. *Clínica y Salud*, *31*(2), 105–107. https://doi.org/10.5093/clysa2020a11

Johnson, M. C., Saletti, L., & Tumas, N. (2020). Emociones, preocupaciones y reflexiones frente a la pandemia del COVID-19 en Argentina. *Ciência e Saúde Coletiva*. Retrieved May 20, 2020, from http://www.cienciaesaudecoletiva.com.br/artigos/emociones-preocupaciones-y-reflexiones-frente-a-la-pandemia-del-covid19-en-argentina/17552?id=17552&id=17552

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer publishing company.

Lechner, W. V., Laurene, K. R., Patel, S., Anderson, M., Grega, C., & Kenne, D. R. (2020). Changes in alcohol use as a function of psychological distress and social support following COVID-19 related

University closings. *Addictive Behaviors*, *110*(November), 106527. https://doi.org/10.1016/j.addbeh.2020.106527

Li, Y., Qin, Q., Sun, Q., Sanford, L. D., Vgontzas, A. N., & Tang, X. (2020). Insomnia and psychological reactions during the COVID-19 outbreak in China. *Journal of Clinical Sleep Medicine*, 16(8),1417–1418.

Matias, T., Dominski, F. H., & Marks, D. F. (2020). *Human needs in COVID-19 isolation*. https://doi.org/10.1177/1359105320925149

Mikulic, I. M., & Crespi, M. C. (2008). Adaptación y validación del Inventario de Respuestas de Afrontamiento de Moos (CRI-A) para adultos. *Anuario de Investigaciones de la Facultad de Psicología*, *15*(May), 305–312. https://www.redalyc.org/articulo.oa?id=369139944030

Ministry of Health of Argentina. (2020). *Confirmación del primer caso importado de COVID-19 en la República Argentina*. https://www.argentina.gob.ar/sites/default/files/actualizacion-epidemiologica-coronavirus-confirmacion-caso_2020.pdf

Miranda, A. R., Rivadero, L., Bruera, J. Á., Villarreal, V., Bernio, L. Y., de Los Ángeles Baydas, L., Brizuela, M. L., & Serra, S. V. (2020a). Examining the relationship between engagement and perceived stress-related cognitive complaints in the Argentinian working population. *Europe's Journal of Psychology*, *16*(1), 12–31. https://doi.org/10.5964/ejop.v16i1.1832

Miranda, A. R., Rivadero, L., Serra, S. V., & Soria, E. A. (2020c). Multidomain self-report assessment of fronto-executive complaints in Spanish-speaking adults. *Psychology & Neuroscience*, *13*(3), 357–374. https://doi.org/10.1037/pne0000187

Miranda, A. R., Scotta, A. V., Méndez, A. L., Serra, S. V., & Soria, E. A. (2020b). Public sector workers' mental health in Argentina: Comparative psychometrics of the perceived stress scale. *Journal of Preventive Medicine and Public Health*, *53*(6), 429–438. https://doi.org/10.3961/jpmph.20.229

Morin, C. M., Belleville, G., Bélanger, L., & Ivers, H. (2011). The Insomnia Severity Index: Psychometric indicators to detect insomnia cases and evaluate treatment response. *Sleep*, *34*(5), 601–608. https://doi.org/10.1093/sleep/34.5.601

Morin, C. M., Drake, C. L., Harvey, A. G., Krystal, A. D., Manber, R., Riemann, D., & Spiegelhalder, K. (2015). Insomnia disorder. *Nature Reviews Disease Primers*, *1*(1), 15026. https://doi.org/10.1038/nrdp.2015.26

Nunes, T. C., Hirano, R. S., Cruz, L. C., Seixas, A., Jean-Louis, G., & da Silva Fonseca, V. A. (2018). Self perceived memory difficulties in medical students as another symptom of anxiety. *Trends in Neuroscience and Education*, *11*(June), 9–12. https://doi.org/10.1016/j.tine.2018.04.001

Ojeda-Paredes, P., Estrella-Castillo, D. F., & Rubio-Zapata, H. A. (2019). Calidad de sueño, síntomas de insomnio y rendimiento académico en estudiantes de medicina. *Investigación En Educación Médica*, *8*(29), 36–44. https://doi.org/10.22201/facmed.20075057e.2019.29.1758

Prat, G., & Adan, A. (2013). Relationships among circadian typology, psychological symptoms, and sensation seeking. *Chronobiology International*, *30*(7), 942–949. https://doi.org/10.3109/07420528.2013.790044

Rothman, K. J., & Greenland, S. (2005). Causation and causal inference in epidemiology. *American Journal of Public Health*, *95*(1), S144–S150. https://doi.org/10.2105/AJPH.2004.059204

Sandín, B., Chorot, P., Valiente, R. M., & Lostao, L. (2009). Validación española del cuestionario de preocupación PSWQ: Estructura factorial y propiedades psicométricas. *Revista de Psicopatología y Psicología Clínica*, *14*(2), 107–122. https://doi.org/10.5944/rppc.vol.14.num.2.2009.4070

Sher, L. (2020). COVID-19, anxiety, sleep disturbances and suicide. *Sleep Medicine*, *70*(June), 124. https://doi.org/10.1016/j.sleep.2020.04.019

Taylor, S. (2019). *The psychology of pandemics: Preparing for the next global outbreak of infectious disease*. Cambridge Scholars Publishing.

Urzúa, A., Vera-Villarroel, P., Caqueo-Urízar, A., & Polanco-Carrasco, R. (2020). La psicología en la prevención y manejo del COVID-19. Aportes desde la evidencia inicial. *Terapia Psicológica*, *38*(1), 103–118. https://doi.org/10.4067/S0718-48082020000100103

Voitsidis, P., Gliatas, I., Bairachtari, V., Papadopoulou, K., Papageorgiou, G., Parlapani, E., Syngelakis, M., Holeva, V., & Diakogiannis, I. (2020). Insomnia during the COVID-19

pandemic in a Greek population. *Psychiatry Research*, *289*(July), 113076. https://doi.org/10.1016/j.psychres.2020.113076

World Health Organization. (2020). *Mental health and psychosocial considerations during the COVID-19 outbreak, 18 March 2020* (No. WHO/2019-nCoV/MentalHealth/2020.1).

Xue, Z., Lin, L., Zhang, S., Gong, J., Liu, J., & Lu, J. (2020). Sleep problems and medical isolation during the SARS-CoV-2 outbreak. *Sleep Medicine*, *70*(June), 112. https://doi.org/10.1016/j.sleep.2020.04.014

Younes, F., Halawi, G., Jabbour, H., El Osta, N., Karam, L., Hajj, A., & Khabbaz, L. R. (2016). Internet addiction and relationships with insomnia, anxiety, depression, stress and self-esteem in university students: A cross-sectional designed study. *PloS One*, *11*(9), e0161126. https://doi.org/10.1371/journal.pone.0161126