



**FACULTAD DE CIENCIAS DE LA SALUD  
CARRERA PROFESIONAL DE MEDICINA  
HUMANA**

**“ACTIVIDAD FÍSICA Y ESTRÉS PERCIBIDO EN  
DOCENTES UNIVERSITARIOS QUE LABORAN DE  
FORMA REMOTA EN EL CONTEXTO DE LA PANDEMIA  
POR SARS-CoV-2”**

Tesis para optar el grado académico de:

**MAESTRO EN EPIDEMIOLOGÍA CLÍNICA Y  
BIOESTADÍSTICA**

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**ACTA DE SUSTENTACIÓN**

Lima, 10 de noviembre de 2023.

Los integrantes del Jurado de tesis:

Presidente: <b>Maestro Akram Abdul Hernández Vásquez</b>
Miembro: <b>Maestro. Eddy Roberto Segura Páucar</b>
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Se reúnen para evaluar la tesis titulada: **“ACTIVIDAD FÍSICA Y ESTRÉS PERCIBIDO EN DOCENTES UNIVERSITARIOS QUE LABORAN DE FORMA REMOTA EN EL CONTEXTO DE LA PANDEMIA POR SARS-CoV-2”**

Presentada por la Bachiller **Ruth Liliana Cruz Ausejo**  
Para optar por el Grado de **Maestro en Epidemiología Clínica y Bioestadística**  
Con la asesoría de: **Maestro. Jorge Enrique Osada Liy.**

Luego de haber evaluado el informe final de tesis y evaluado su desempeño en la sustentación, concluyen de manera unánime calificar a:

Tesis: <b>Ruth Liliana Cruz Ausejo</b>			Nota (en letras): Quince
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Lima, 7 de febrero del 2023

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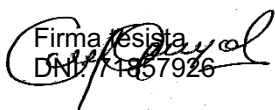
Yo: Ruth Liliana Cruz Ausejo egresado de la maestría de Epidemiología Clínica y Bioestadística de la Universidad Científica del Sur, en conjunto con el asesor de tesis Jorge Enrique Osada Lij declaramos que este informe final de tesis/trabajo de investigación titulado: "Actividad física y estrés percibido en docentes universitarios que laboran de forma remota en el contexto de la pandemia por SARS-CoV-2", sustentado para obtener el título/grado de Magister en Epidemiología Clínica y Bioestadística es original.

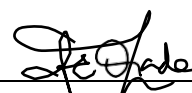
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## INFORME DE REVISIÓN DE ORIGINALIDAD

**Título del documento evaluado.** Actividad física y estrés percibido en docentes universitarios que laboran de forma remota en el contexto de la pandemia por SARS-CoV-2.

**Autores.** Ruth Liliana Cruz Ausejo.

**Mecanismo de revisión de originalidad.** Evaluación con Turnitin (ID 2237242735).

**Resultado de la evaluación.** 7%

**Revisado por.** Magaly Kelly Guerrero Huaracallo.

**Comentarios sobre la revisión.** Filtros usados: excluir fuentes de menos de 12 palabras.



DEDICATORIA

A “Pulguin” por los dos increíbles años que fueron.

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A mi buen sentido del humor.  
A la Universidad Científica del Sur por el apoyo y  
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## RESUMEN

**Introducción:** la pandemia COVID-19 aceleró la adopción temprana del trabajo remoto y propició así, junto a la inestabilidad del contexto, la variación en los niveles de actividad física y estrés.

**Objetivo:** identificar la asociación entre el estrés percibido (EP) y el nivel de actividad física (AF), así como explorar su relación con características sociodemográficas, familiares, laborales e individuales en docentes universitarios que hacen trabajo remoto en el contexto de la pandemia.

**Materiales y métodos:** estudio transversal. El resultado fue el nivel alto de EP evaluado con la Escala de estrés percibido (EEP-14). La AF se midió con el Cuestionario Internacional de Actividad Física (IPAQ). Se estimaron las razones de prevalencia ajustadas (PRa) con un IC de 95% usando modelos de regresión de Poisson con varianzas robustas. Se desarrollaron cinco modelos para evaluar asociaciones individuales entre el EP y AF con variables sociodemográficas, familiares, laborales e individuales.

**Resultados:** Participaron 191 docentes; 39.27% fueron mujeres, edad 52 (RIQ: 41-60). La prevalencia de alto estrés fue 47.12%. La asociación entre AF y EP, fue significativa en todos los modelos. El modelo global mostró que, en comparación con la AF moderada, hubo una asociación estadísticamente significativa entre EP y la AF alta (PRa=0,18; 0,06-0,59), AF baja (PRa=1,42; 1,01-1,99), influenciado principalmente por la edad, ser cabeza de familia y la calidad del sueño.

**Conclusión:** La AF mostró una asociación negativa con los niveles de EP, indicando que niveles más altos de AF se relacionan con niveles más bajos de EP. Además, características en docentes como el ser cabeza de familia, edad y calidad de sueño son factores asociados a una mayor probabilidad de tener alto estrés. Estudios posteriores podrían considerar el rol de condiciones individuales y familiares en el EP y AF dada la permanencia de la educación híbrida.

**Palabras clave:** ejercicio físico, estrés psicológico, salud laboral, salud mental, COVID-19, docentes. Fuente DeCS (BIREME)



## ABSTRACT

**Introduction:** The COVID-19 pandemic led to the transition to remote work, triggering variations in stress and physical activity (PA), associated with context-specific instability. **Objective:** To identify the association between perceived stress (PS) and the level of physical activity (PA) and explore its relationship with the sociodemographic, work and individual characteristics of professors working remotely during the COVID-19 pandemic.

**Material and methods:** Cross-sectional analytical study based on a virtual survey of university professors. The outcome of interest was high PS, assessed using the Perceived Stress Scale (PSS-14). While PA used the International Physical Activity Questionnaire. The adjusted prevalence ratios (aPR) with 95% confidence interval (CI) were estimated using a Poisson regression analysis with robust variance. Five models were developed to assess individual associations of PS and PA with sociodemographic, family, work, and individual variables.

**Results:** The information of 191 professors was analyzed; 39.27% were women, aged 52 (IQR: 41-60), prevalence of high stress was 47.12%. The association between PS and PA remained significant through all the models. The global model shown that, comparing to moderate PA, there was a statistically significant association between PS and high PA (aPR=0,18; 0,06-0,59), low AF (aPR= 1,42; 1,01-1.99), mainly influenced by age, being head of household and sleep quality.

**Conclusion:** The PA showed a negative association with PS, indicating that higher levels of PA are related with lower levels of PE. These findings allow identifying characteristics, such as being head of household, age and quality of sleep among teachers, as being associated with a higher probability of having high stress. Subsequent studies should consider the role of individual and familiar conditions in the PS and PA, given the presence of hybrid education in the education sector.

**Keywords:** physical activity; psychological stress, occupational health; mental health; coronavirus; faculty (MeSH terms).

## VERSION APROBADA PARA PUBLICAR

**Physical activity level and factors associated with perceived stress among Peruvian university professors during the COVID-19 pandemic**

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**Abbreviations:**

PA: Physical activity; PS: Perceived stress; PSS: Perceived stress scale; RW: remote work; CI\_ confidence interval; PR: prevalence ratio; aPR: adjusted prevalence ratio; cPR: crude prevalence ratio; MET: metabolic equivalent of task; IQR: interquartile range; AIC: Akaike information criterion;

**Highlights:**

- University professors with a low level of physical activity are nearly 45% more likely to have high levels of stress compared to those with moderate physical activity.
- The fact of being heads of households and performing low physical activity, increases the probability of having high levels of stress by up to 58%.
- For each year added to teachers' lives, the probability of perceived stress is reduced in 2%.
- Future studies should consider the role of family and individual factors, such as the quality of sleep, as factors influencing stress, and assess these as part of occupational surveillance.

## ABSTRACT

**Introduction:** The COVID-19 pandemic led to the transition to remote work, triggering variations in stress and physical activity (PA), associated with context-specific instability.

**Objective:** To identify the association between perceived stress (PS) and the level of physical activity (PA) and explore its relationship with the sociodemographic, work and individual characteristics of professors working remotely during the COVID-19 pandemic.

**Material and methods:** Cross-sectional analytical study based on a virtual survey of professors. PS was assessed using the Perceived Stress Scale (PSS-14), and PA using an International Physical Activity Questionnaire. The prevalence of high PS and the association with PA were estimated using a Poisson regression analysis with robust variance that estimated crude prevalence ratios (cPR) and adjusted prevalence ratios (aPR) with a 95% confidence interval (CI). Four models were developed to assess associations of PS and PA with sociodemographic, family, work, and individual variables.

**Results:** The information of 191 professors was analyzed; 39.27% were women, aged 52 (41-60). The prevalence of high stress was 47.12%. The age and being head of household did not show significant individual associations with PS. However, the regression analysis assessing the association of PS and other factors showed that compared to the moderate PA group, a statistically significant association was found between stress and high PA (aPR=0.19; 0.06-0.59), low PA (aPR= 1.43; 1.02-2.01), mainly influenced by age, being head of household and sleep quality.

**Conclusion:** Stress was associated with PA level, family and individual factors. These findings allow identifying characteristics, such as being head of household, age and quality of sleep among teachers, as being associated with a higher probability of having high stress. Subsequent studies should consider the role of individuals and working conditions as part of occupational health surveillance, given the presence of hybrid education in the education sector.

**Keywords:** physical activity; psychological stress, occupational health; mental health; coronavirus; faculty (MeSH terms)

## 1. Introduction

Mental health conditions impact the world economy, generating a high cost at the social level and on labor organizations. In the United Kingdom, it is estimated that 213 300 days of work are lost every year as a result of anxiety, depression and stress (1). In the teaching population, stress represents a psychosocial risk conditioned by several factors, such as workload, physical activity (2,3), lack of support (4), interpersonal relationships, personal life, and poor sleep quality (3,5,6) in the context and culture (7).

In this sense, understanding the social structure and working context of the professors is relevant to comprehend the factors that can modify their physical and mental status. From a sociological perspective, the Cultural Capital theory by Bourdieu (8) describes the existence of symbolic capital as a disputable possession within a social group. In the case of professors, this wealth justifies the maintenance of status and power through its several forms: incorporated (knowledge), objectified (cultural goods) or institutionalized (capacity of the group to accredit knowledge). These Capital forms acquire great relevance to their motivation and struggles to the seeking for a status and habitus superior to others which creates an environment of constant competition.

From an occupational point of view, in Perú in 2020, the professors hired hourly or part-time integrated 58.6% of the teaching workforce (9). Usually, these professors spend their work hours in classroom activities; that is some teachers did not receive a compensatory salary for hours dedicated to the development of educational material and tuition, among other tasks (9,10). Similarly, the regime of a full-time professor and exclusive dedication combines teaching, administrative and scientific research activities nonetheless, the salary in this group included the non-schooled hours (9). In both cases, the aforementioned activities are though to evaluate with an instrument given the multiplicity of tasks they perform (10). Moreover, this particular feature of the teacher labor regimen allows professors to work in different institutions in order to increase their economic income, despite the work overload.

Furthermore, conditions such as upbringing and the role of being the head of the family which implies the burden of home activities that can overlap with work must be added

(11). Especially among parents of children of scholarly age or economically dependent, the raises of stress and post-traumatic stress symptomatology have emerged as a consequence of work-life imbalance and perceived financial instability (12). In addition, current conditions such as the accelerated transition to remote work (RW) (2,11,13) and time spent on it, over 9 months per year in university education on average higher workload with a ratio of 36.5 students per full-time university professor in the Peruvian highlands (9) have exacerbated a hostile environment for their work with implications not only on the perception of stress but also on the practice of physical activity (PA) (14,15).

PA is widely recognized as a protective factor against comorbidities, such as diabetes, hypertension (16), and especially stress (17). However, according to Bogaert *et al.*(18) sports activity and no other type of physical exercise performed during free time, prevent stress; that is, not all exercise performed during occupational work is beneficial. In addition, during the pandemic, the practice of PA was recommended in order to prevent or mitigate negative effects on mental health

(19). However, recent reports have shown that work (overload in RW) (20), and individual conditions such as poor quality of sleep (7,20) within the context of COVID-19 are linked to a significant decrease in mobility, walking and an increase in sedentary lifestyle (21). Thus, since the lockdown has restricted some PA options, a decrease in this practice and a non-positive impact on stress might be expected.

Therefore, this study was aimed at identifying the association between perceived stress (PS) in the last month of work and the level of PA among university professors who worked remotely within the context of the COVID-19 pandemic. Likewise, we explored the relationship of this association with sociodemographic, familiar, work and individual characteristics.

## 2. Materials and Methods

### 2.1 Participants and study design

This was a cross-sectional study based on a virtual survey. We assessed the PS and the level of PA in university professors who maintained a current employment relationship to date and worked for at least one month in the RW modality, at a public university located in the department of Huánuco, Peru during the period of March-June 2021. In this period, the population was still under lockdown, with social restrictions and university professors carrying out RW.

### 2.2 Definition of variables

**2.2.1 Perceived stress:** The variable of interest was PS in the last month. This was measured using the Cohen Perceived Stress Scale (PSS-14) (22), validated in the Spanish-speaking population (23), more specifically in university teachers with good psychometric properties as  $\alpha = .82$  (.76-.87; confidence interval [CI] 95%) (4). The PSS- 14 has 14 questions that assess two dimensions of stress: “perception of stress in daily situations” (negative dimension: questions 1,2,3,8,11,12,14), which addresses negative experiences and situations, and “stress control” (positive dimension: questions 4,5,6,7,9,10,13). Each item receives a Likert-type score from 0 “never” to 4 “very often”. The total score varies between 0 and 56 points, with a higher score reflecting a greater presence of stress and vice versa (22,24). Currently, there is no consensus on the cut-off point for the level of stress, and thus, the authors established categories by tertiles or their means (25–28). The median of stress considered 24 as the cut-off point to establish low and high levels of stress.

**2.2.2 Physical activity:** this independent variable was assessed with the 7-item short physical activity questionnaire (International Physical Activity Questionnaire-IPAQ), which has been translated and adapted into Spanish in 12 countries with good psychometric properties reliability  $r = 0.76$  (95% CI, 0.73-0.77) (29). The short version assesses three types of daily activities of moderate intensity, vigorous intensity, and walking. The score is calculated by multiplying the basal metabolic rate (metabolic equity of task - MET) 3.3; 4.0; and 8.0 METs, respectively for the minutes/week of activity. The total result is obtained from

the sum of these activities according to the algorithm detailed in *Guidelines for data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ)-Short Form (30)*.

Confounding variables were identified using a directed acyclic graph (31,32): sex (male, female), head of household (yes, no), age, months in remote work, working hours per week (<30 hours/week, ≥ 30 hours/week), dedication (partial or full-time), and quality of sleep. This last measure determined by the Pittsburgh Sleep Quality Questionnaire, of Buysse (33), consists of 19 questions and the result is distributed into four categories. A score less than 5 indicates “no sleep problems”, from 5 to 7 “deserves medical attention”, from 8 to 14 “deserves medical attention and treatment” and from 15 points to more “serious sleep problems”.

### 2.3 Procedure and data collection

The questionnaire was designed on the Typeforms platform (<https://www.typeform.com/es/>) and was distributed to professors by email. To reduce selection bias due to overreporting, responses were filtered by Network ID in order to avoid duplicate responses. To increase the response rate, participation reminders were sent every 2 weeks for 4 months. The data were exported to an Excel spreadsheet where two researchers LCA, and LRT, independently cleaned the data. There were no lost data as to fill out the survey it was necessary to complete the previous question.

### 2.4 Sample size

The sample size was determined with the STATAv.15 program. According to the literature, a difference of 28.1% in the proportions of stress between those with high PA and low PA (20.4% and 48.5%) (34) and a ratio of 1 was assumed. Thus, considering a 95% CI and statistical power of 80%, a minimum sample size of 102 participants was calculated.

Additionally, the entry of 8 confounding variables in the multiple regression model was considered, for which it was necessary to have a minimum number of participants. This was estimated using the formula:  $N \geq 50 + 8m$  (where “m” is the number of independent variables) (35) and thus, the minimum number of subjects required was

114. Ultimately, 191 participants filled out the survey.

### 2.5 Statistical analysis

Since the quantitative variables did not meet the normality principle, they were summarized by their median and interquartile range (IQR), while the qualitative variables were represented by absolute and relative frequencies. Chi-square, Fisher’s exact and U-Mann Whitney tests were applied to compare the low and high-stress groups, provided the covariates were categorical or quantitative, respectively. Multiple regression analysis was performed for PS, PA, and



covariates. Multivariate analysis used a Poisson-family generalized linear model, log link function with robust variance (36,37) in the STATA 15 program (STATA Corp, College Station, TX, US). Four models were developed, based on the statistical strategy of Shaffer *et al.* (38) to assess unique associations to which variables were added as follows, model 1: unique associations of sociodemographic factors (age, gender) were tested, model 2: family variables (head of household and economically dependent children), model 3: working factors (months in remote work, professional dedication, working hours per week) and model 4: individual factors (sleep quality). Each model assessed unique associations of the factors with PS and PA. Finally, a model that incorporated all the previous variables was developed. A p-value < 0.05 was considered statistically significant.

## 2.6 Ethical considerations

This study was conducted according to the guidelines of the “Declaration of Helsinki”, and the procedures were approved by the Research and Institutional Ethics Committee of the Universidad Científica del Sur (UCSUR), Lima, Peru in Certificate No.299-CIEI- CIENTIFICA-2020. Accepting the (virtual) informed consent was required to continue filling out the survey.

## 3. Results

### 3.1 Characteristics of the study population

Information was collected from 191 participants, of whom 39.27% were women, the mean age was 52 (41 - 60) years old, and the prevalence of low PA was almost double that of high PA. The Sociodemographic, family, work and personal characteristics of the participants are shown in **Table 1**.

**Tabla 1:** características generales de los participantes (n=191).

	n	%
<i>Características sociodemográficas</i>		
Genero		
Masculino	116	60.73
Femenino	75	39.27
Edad †		52 (41-60)
<i>Características familiares</i>		
Jefe de familia		
Si	156	81.68
No	35	18.32
Hijos económicamente dependientes		
No tiene hijos	33	17.28
No tiene hijos económicamente dependientes	39	20.42
Tiene hijos económicamente dependientes	119	62.3
<i>Características laborales</i>		
Meses en trabajo remoto †		10 (8-12)
Horas laborales por semana		
< 30 horas	75	39.27
≥ 30 horas	116	60.73
Dedicación universitaria		
Tiempo parcial	59	30.89
Tiempo completo	132	69.11
<i>Características individuales</i>		
Calidad de sueño		
Sin problemas de sueño	29	15.18
Merecen atención médica	57	29.84
Merece atención y tratamiento médico	97	50.79
Problemas severos de sueño	8	4.19
Estrés percibido		
Bajo estrés percibido	101	52.88
Alto estrés percibido	90	47.12
Actividad física		
AFB <sup>1</sup>	93	48.69
AFM <sup>2</sup>	42	21.99
AFA <sup>3</sup>	56	29.32

† Mediana y rango intercuartílico

1 Actividad física baja

2 Actividad física moderada

3 Actividad física alta



### 3.2 Perceived Stress and physical activity

The median for low stress was 19 (IQR:15-22, range 4-24) and 32 (IQR: 28-38, range: 25-50) for high stress. The characteristics of the population according to stress levels are summarized in **Table 2** we observed that only working hours per week, quality of sleep and physical activity showed statistically significant association with PS. Moreover, **figure 1** shows the distribution of responses for the 14 items of PS. The first dimension “perception in stressful situations” (questions: 1,2,3,8,11,12,14), is assessed by questions n°1 *How often have you been affected by something that has happened unexpectedly?* and n°12 *How often have you thought about the things you have left to do?*, 32.4 % and 39.26 % of professors said they often felt affected. While in the second dimension “subjective control” (questions: 4,5,6,7,9,10,13), assessed by question n°6 *How often have you been confident about your ability to handle your personal problems?* 47.64% of professors stated that they felt confident.

**Tabla 2.** Análisis bivariado del estrés percibido en el último mes (n=191)

Características	Estrés percibido				Valor p
	Bajo n=101		Alto n=90		
	n	%	n	%	
<i>Características Sociodemográficas</i>					
Género †					
Masculino	62	53.45	54	46.5	0.845
Femenino	39	52.00	36	48.0	
Edad ‡	51 (41-60) †		52 (43-60) †		0.955
<i>Características familiares</i>					
Jefe de familia †					
Si	81	51.92	75	48.08	0.576
No	20	57.14	15	42.86	
Hijos económicamente dependientes †					
No tiene hijos	17	51.52	16	48.48	0.694
No tiene hijos económ. dependientes	23	58.97	16	41.03	
Tiene hijos económ. dependientes	61	51.26	58	48.74	
<i>Características laborales</i>					
Meses en trabajo remoto ‡	10 (8-12) †		10 (8-12) †		0.854
Horas laborales por semana †					
< 30 horas	50	66.67	25	33.33	0.002
≥ 30 horas	51	43.97	65	56.03	
Dedicación universitaria †					
Tiempo parcial	36	61.02	23	38.98	0.132
Tiempo completo	65	49.24	67	50.76	
<i>Características individuales</i>					
Calidad de sueño §					
Sin problemas de sueño	28	96.55	1	3.45	< 0.001
Merece atención médica	43	75.44	14	24.56	
Merece atención y tratamiento médico.	29	29.90	68	70.10	
Problemas de sueño severos	1	12.50	7	87.50	
Actividad física †					
AFB <sup>1</sup>	24	25.81	69	74.19	< 0.001
AFM <sup>2</sup>	24	57.14	18	42.86	
AFA <sup>3</sup>	53	94.64	3	5.36	

† Mediana y rango intercuartílico

‡ prueba Chi-cuadrado de Pearson

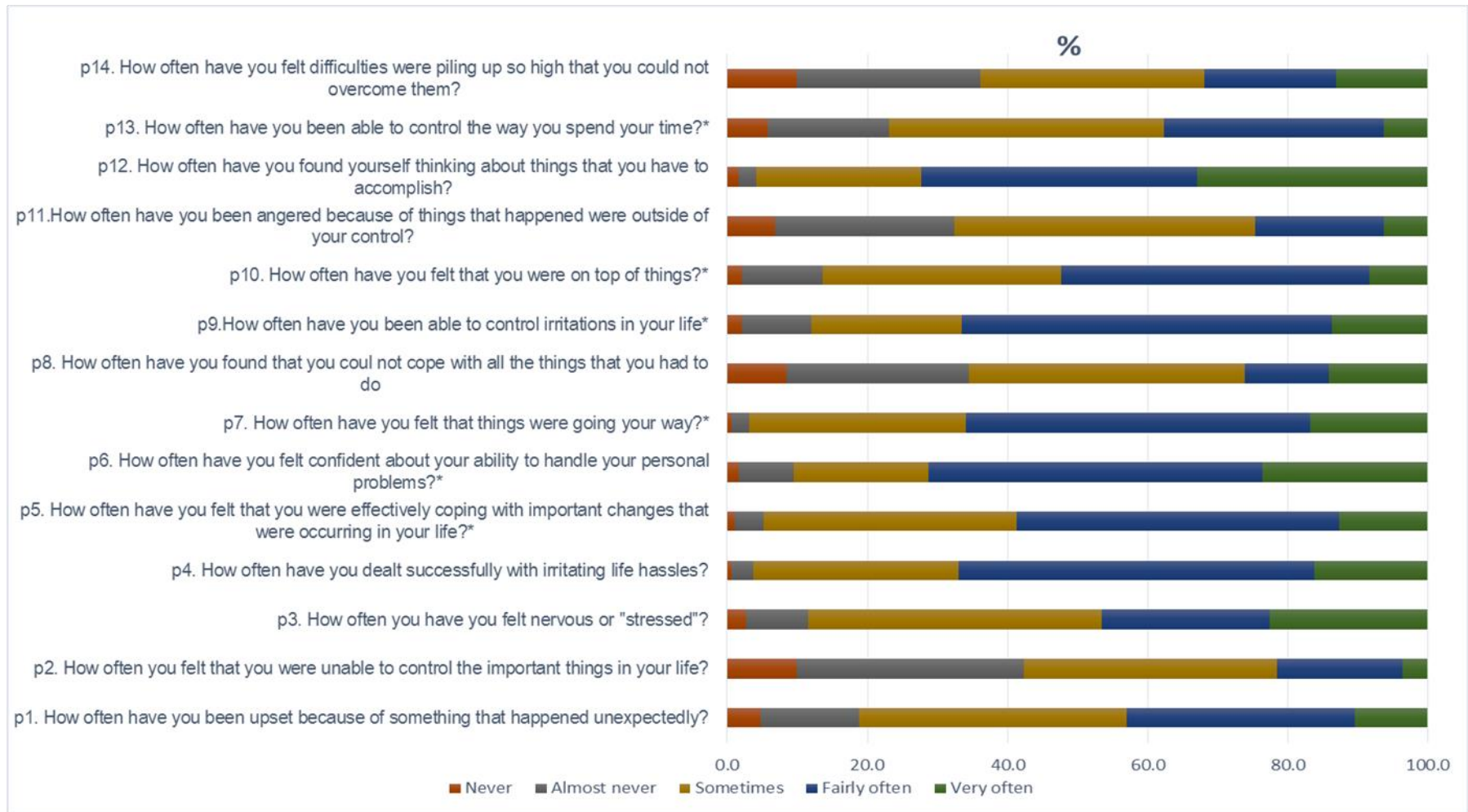
§ Prueba U de Mann-Whitney

§ Prueba exacta de Fischer

<sup>1</sup> actividad física baja

<sup>2</sup> actividad física moderada

<sup>3</sup> actividad física alta



**Figura 1.** Distribution of responses for the Perceived stress scale-PSS-14.

### 3.3 Factors associated with perceived stress and physical activity

The results of the regression model that assessed the independent associations among sociodemographic, family, work and individual factors with PS and PA are shown in **Table 3**. Models 1 and 2 did not show significant associations for sociodemographic and family characteristics with PA and PS. While model 3 identified that professors who worked more than 30h/week presented a 50% higher probability of presenting high stress in comparison to those working less than 30/h week and when PA remained constant. Model 4, showed that those with poorer sleep quality (deserve medical attention and deserve attention plus medical treatment) present from 94% to 98% higher probability of having high stress, compared to those who just deserve medical attention and adjusted for PA.

Model 5, adjusted for all the above variables, showed the association between the level of PA and PS. The level of high PA was shown to be a protective factor against high stress when the confounders remained constant. In addition, among professors who are heads of households, the probability of having high stress increased by almost 60% compared to those who are not heads of households, after adjustment for confounders. Age was identified as a protective factor for high stress. For each year of age, this probability was reduced by 2%, after adjustment for sociodemographic, family and individual variables.

Additionally, requiring medical attention plus treatment and having serious sleep problems almost doubled and tripled the probability of high PS compared to those who only required medical attention

**Table 3.** Multivariate regression analysis of perceived stress and influencing factors.

Perceived stress	cPR	(95% CI)	p	Model 1			Model 2			Model 3			Model 4			Model 5		
				aPR	(95% CI)	p	aPR	(95% CI)	p	aPR	(95% CI)	p	aPR	(95% CI)	p	aPR	(95% CI)	p
<b>Physical activity</b>																		
HPA	0.13	(0.04-0.40)	<0.001	0.12	(0.04-0.40)	<0.001	0.13	(0.04-0.41)	0.001	0.12	(0.04-0.39)	<0.001	0.19	(0.06-0.61)	0.005	0.19	(0.06-0.59)	0.004
MPA	ref.			ref.			ref.			ref.			ref.			ref.		
LPA	1.73	(1.20-2.51)	0.004	1.74	(1.20-2.52)	0.003	1.76	(1.23-2.58)	0.002	1.64	(1.14-2.35)	0.006	1.47	(1.03-2.09)	0.032	1.43	(1.02-2.01)	0.038
Age	1.00	(0.99-1.01)	0.968	1.00	(0.99-1.01)	0.511										0.98	(0.97-0.99)	0.026
<b>Genre</b>																		
Male	ref.			ref.												ref.		
Female	1.03	(0.78-1.40)	0.845	0.92	(0.71-1.19)	0.533										0.94	(0.75-1.19)	0.628
<b>Head of household</b>																		
No	ref.						ref.									ref.		
Yes	1.12	(0.74-1.70)	0.589				1.27	(0.86-1.87)	0.225							1.58	(1.05-2.38)	0.027
<b>Economically dependent children</b>																		
HNCh	ref.						ref.									ref.		
HNEDCh	0.85	(0.50-1.42)	0.528				0.88	(0.58-1.34)	0.562							0.91	(0.59-1.41)	0.670
HEDCh	1.01	(0.68-1.50)	0.979				0.84	(0.59-1.21)	0.349							0.82	(0.60-1.14)	0.245
Months doing remote work	1.00	(0.94-1.05)	0.918							0.98	(0.94-1.03)	0.480				0.98	(0.93-1.03)	0.370
<b>Dedication</b>																		
Partial-time basis	ref.									ref.						ref.		
Fulltime basis	1.30	(0.91-1.87)	0.153							0.96	(0.69-1.34)	0.803				0.95	(0.63-1.44)	0.824
<b>Working hours per week (h/w)</b>																		
<30 h/week	ref.									ref.						ref.		
≥30 h/week	1.88	(1.17-3.41)	0.005							1.50	(1.05-2.13)	0.025				1.48	(0.98-2.22)	0.060
<b>Quality of sleep</b>																		
No sleep problems	0.14	(0.02-1.02)	0.062										0.23	(0.03-1.54)	0.128	0.24	(0.04-1.59)	0.140
Deserve medical attention	ref.												ref.			ref.		
Deserve at. and medical treat	2.85	(1.78-4.59)	<0.001										1.94	(1.24-3.04)	0.004	1.92	(1.24-2.96)	0.003
Severe sleep problem	3.56	(2.10-6.03)	<0.001										1.98	(1.19-3.30)	0.009	2.61	(1.51-4.53)	0.001
AIC initial				1.662			1.662			1.662			1.662			1.662		
AIC final				1.461			1.469			1.459			1.404			1.468		

p < 0.05 significant value, cPR: crude Prevalence ratio, aPR adjusted Prevalence Ratio, HNCh: have no children, HNEDCh: have no economically dependent children, HEDCh: have economically dependent children, HPA: high physical activity, MPA: moderate physical activity, LPA: low physical activity

## 4. Discussion

### 4.1 Main findings

Our results show that about half of the participants had a low PA level, with more than 76% of professors presenting high stress. The presentation of high stress was associated with a low level of PA among university professors, after adjustment for sociodemographic, family, work and individual variables.

### 4.2 Comparison with previous studies

The participants in this study were predominantly male, similar to the national proportion of university professors (39), and other studies (40,41) but different from the studies by Leire *et al.*, Freitas *et al.* and Camargo *et al.*, in which women exceeded 50% of the study participants. The median age was around 52 years old, which contrasts with the national average age of professors (39) and other studies describing the age as being around the 4th decade of life (15,41–43). These results are expected and partly explained by the current requirements of university teaching, requiring greater experience and trajectory, which are characteristics acquired over time, especially among professors of public universities (9).

Our study showed a higher figure of professors in full-time dedication than that reported in the 2nd National University Census (44). This difference is probably due to the response options of the questionnaire, which did not include the *exclusive dedication* option, thereby not allowing distinguishing the latter from full-time work. However in terms of workload the exclusive and full-time modalities are considered equivalent (9). In reference to the weekly working hours, the difference was greater, with more than 60% working more than 30 h/week versus the 18h average schooled-hours of teaching load by Peruvian university professors in the Highlands (9). We have to considered that this figure did not include non-schooled hours, it meant that this difference could be attributed to extra-worked hours (educational material, design of educative test, etc.) and mainly non-paid back hours; nonetheless, this percentage is similar to the average reported in Brazilian professors (42,43).

The context of the pandemic and RW in an atypical environment (13) have led to a set of greater workload (2) with the resulting increase in anxiety, depression and stress symptomatology (45). In this sense, the perception of high stress in this study varied compared to other reports (45–47). On one hand, it is lower than that reported worldwide (45) and nationwide (46), which exceeds 60% while being significantly higher than that experienced by teachers of Paraguayan education (47). Whereas it is similar to the reports of the Polish teaching population of elementary education (48) and Brazilian university professors (40). These differences could be justified by the temporal disparity of the reports before and during different stages of the pandemic, in Huánuco the second wave was officially stated in 31<sup>th</sup> January inducing to mandatory isolation (40,43,45,48) and indirectly extending the RW in education. In addition to the several factors as the representativeness of the population (46), cultural context, and educational level, which influence the perception of work stress (7).

Preview literature recognizes the value and impact of PA on health (49). Although the levels of low and high PA found in this study are worrying, the results are consistent with the insufficiently active profile of university professors, even before the pandemic (42,43,50) while, at the same time, being better than that of inhabitants of the Peruvian highlands in which low and high PA levels reach 66.2% and 5.6%, respectively (51). In addition, if we compare the proportion of professors with high PA to that of professors from Lima (37%) (52), there are discrepancies possibly attributed to the requirement of the level of teaching and administrative load (53), characteristics that affect the availability of free time to carry out personal life activities (18,48).

In relation to sociodemographic characteristic, the findings of this study suggest that both low and high PA are directly and inversely associated with the presence of high stress even adjustment for characteristics such as age, which had a protective role in professors with a good level of PA unlike to Portuguese professors who show a tendency to increase stress with respect to age(41). A reduction in PS in relation to age and the practice of PA in professors could be linked to years of teaching experience; that is, those with a longer service time have a better performance, knowledge of educational strategies, a reflection of professional maturity and experience which, added to the appropriate management of time and responsibilities, would allow the inclusion of leisure activities outside work (18).

The relationship between gender, stress, and PA has been extensively studied, showing that women tend to have higher stress levels and poor PA (50). This relationship is maintained in professors (41–43) and is associated with concern for the fulfillment of work, and personal life, specifically in the performance of household chores (54) and maternal work (11). However, found no differences in stress levels and PA according to sex, which could be explained by shared parenting responsibilities, with greater partner support at home, which translates into a reduction in the gap between family and work obligations, reducing the family burden on women (43).

In addition, familiar factors as house demands a greater commitment for the head of household, who bears most of the economic burden, and thus, it is expected that those who assume this role will experience greater physical and mental wear, associated with the presence of children, economically dependents (elderly or people with disability) and even the reduction or little PA practice in non-working hours (40). This suggests that the differences observed for PS and PA in the heads/non-heads of households could be related to the role of the person in charge of the household, rather than gender *per se*.

Additionally, more than 84% of those surveyed presented some problem related to sleep quality, requiring attention and/or medical treatment, being well above that reported by López-García *et al.*, Crepaldi *et al.* and Freitas *et al.*



(5,6,47). Preliminary reports suggest that professors present sleep problems, such as daytime sleepiness (55) and insomnia (56), an issue that has been aggravated by the transition to RW, reduction in financial stability (13,57) and PA practice (57) due to confinement, which obliges the professors to take several jobs, extending their working hours and workload, with the consequent affectation of their quality of life (55,56) and perceived stress (6).

Moreover, it is necessary to mention that the results observed in this study are likely to be influenced by the coincidence in information collection and the start of the 2nd wave of the pandemic in the department of Huanuco. This can be coupled with other factors related to the organization of work (58), instability contextual and truncated expectations as the main source of anxiety, stress (4), and alteration of sleep quality (5,6) which altogether deteriorate the mental health status of professors.

Finally, by the time of this publication the current period of COVID-19 is basically past all over the world, notwithstanding this research sustains the importance of maintaining healthy PA levels even under tough contexts which has a positive impact on the perception of stress in professors. It should be taken into account that the acceleration of the digital transformation to improve teaching processes, mentioned in the *“National Policy for Higher Technical-Productive Education”* by 2030 (59), indicates the continuity of blended and distance learning in addition to the implementation of telecommuting set by peruvian government which ensures the permanence of this labor modality. Consequently, adopting a culture of promotion and prevention of health through assistance and education programs for professors, as well as having policies to promote the extension of occupational health to telecommuting, are necessary to reduce psychosocial risks in this population.

#### 4.3 Strengths and limitations

We can identify four limitations. First, due to the cross-sectional design of the study in which we only estimated association and not causality, the interpretation of the results must be taken with caution. Second, the sample included may not be representative of university professors in our country, since the participants belonged to a public entity, and thus, we cannot extrapolate the results to private universities in another locality. Third, the data collection took place during the months of March-June 2021, in which inhabitants were still under lockdown, and there was an increase in COVID-19 cases in Peru, which could have influenced the responses, given the adverse context. Therefore, the effect of the stated association may not just be attributed to PS but rather also to COVID-19. And fourth, reverse causality problems could arise since there is a temporal difference and recall bias in the nature of the responses: stress, compared to the last month of work and PA in the last week. However, other studies support the direction of the association presented (34).

On the other hand, this is the first study among Peruvian rural professors that explores the relationship between PS and PA and other factors during the COVID-19 pandemic. This information may help to design specific measures



to prevent high-level stress and deterioration of PA during RW and hybrid education which are considered as being permanent in higher education. Additionally, the occupational health among Peruvian teachers, in general, is one of the most relegated, there are no reports or evidence of the state of workers during this context, and thus, this study provides a first look at professor status and conditions during the pandemic.

## 5. Conclusion

The results support the association between the level of PA and PS in university professors who do RW within the context of the COVID-19 pandemic. Those presenting a high PA level were less likely to have high stress unlike those with low PA adjusted for sociodemographic, work and individual characteristics, with age, being head of household and having sleep problems being determining factors. Furthermore, the reality of public universities in low- and middle-income countries is marked by a lack of infrastructure, technological equipment, multimedia platforms for RW and therefore, future studies must consider the influence of organizational, labor and support factors for Peruvian highland professors with similar features in the context of hybrid education or telecommuting in addition to ensuring the implementation of occupational health surveillance programs in this sector.

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Author contribution statement:

Liliana Cruz-Ausejo: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper. </p>

Jorge Osada: Conceived and designed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper. </p>

Lenin Rueda -Torres: Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper. </p>

Nataly Briggete Ingunza Lastra; Miguel Carrasco Muñoz; Victor Juan Vera-Ponce: Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper. </p>

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The authors declare no conflict of interest.

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#### Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## VERSION INICIAL ENVIADA A PUBLICARA REVISTA

### **Physical activity and influencing factors of perceived stress among peruvian university professors during the COVID-19 pandemic**

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#### **Abbreviations:**

PA: physical activity; PS: perceived stress; PSS: Perceived stress scale

#### **Highlights:**

- University professors with the lowest level of physical activity have almost 45% more probability of manifest high-stress level compared.
- Being head of household and practice low PA, increased in 58% the probability of having high-stress comparing to not being head of.
- For every year old gained in teachers, the probability of perceived high-stress reduces in 2%.
- Following studies might consider the role of family and individual factors like quality of sleep as influencing factors in stress, and its assessment as part of occupational surveillance.

## ABSTRACT

**Introduction:** The COVID-19 pandemic accelerated the transition to remote work. Situation that led to changes in stress and physical activity (PA), associated with context-specific instability.

**Objective:** To identify the association between perceived stress (PS) and the level of physical activity and to explore its relationship with the sociodemographic, work and individual characteristics among professors who work remotely in the context of the COVID-19 pandemic

**Material and methods:** Cross-sectional analytical study based on a virtual survey of university professors. PS was assessed using the Perceived Stress Scale (PSS-14), and PA using the IPAQ questionnaire. The prevalence of high PS and the association with PA were estimated using a Poisson regression analysis with robust variance that estimated crude prevalence ratios (cPR) and adjusted prevalence ratios (aPR) with 95% CI. Four hierarchical models were developed to assess unique associations of PS PA, and sociodemographic, family, work, and individual variables.

**Results:** The information of 191 professors was analyzed, 39.27% were women, age 52 (IQR: 41-60). The prevalence of high stress was 47.12%. Age and being head of household did not show significant individual associations with PS. However, the hierarchical regression analysis that assessed the association of PS and other factors revealed that, compared to the moderate physical activity group, a statistically significant association was found between stress and high physical activity  $RPa=0.19$  (0.06-0.59), low physical activity  $RPa= 1.43$  (1.02-2.01), mainly influenced by age, being head of household and sleep quality with a final AIC:1.468.

**Conclusion:** Stress was associated with physical activity level, family and individual factors. These findings help identify characteristics of teachers with a higher probability of having high-stress. Subsequent studies should consider the role of being head of household, age and quality of sleep among professors and perceived stress, given the presence of hybrid education in the education sector.

**Keywords:** physical activity; psychological stress, occupational health; mental health; coronavirus; teachers (MeSH terms).



## 1. Introduction

Mental health conditions impact the world economy, generating a high cost at social level and on labor organizations. Only in the United Kingdom, it is estimated that 213 300 days of work are lost every year as a result of anxiety, depression and stress (1), a figure that has been increasing since 2004. In the teaching population, occupational stress represents a psychosocial risk conditioned by various factors, such as workload (2,3), demands, lack of support (4), interpersonal relationships, personal life, poor sleep quality (3,5,6), poor physical activity (3), context and culture (7).

Added to this, conditions such as the acceleration of the transition to digital work through the implementation of remote work (RW) during the COVID-19 pandemic (2,8), the concurrence of personal and work life where the professor fulfills different roles at the same time (9) and the workload, on average higher with a ratio of 36.5 students per full-time university professor in the Peruvian highlands(10) have generated a hostile environment for the teaching work with repercussions not only on the perception of stress but also on the practice of physical activity (PA)(11,12).

Physical activity (PA) is widely recognized as a protective factor against comorbidities, such as diabetes, hypertension (13), and especially stress (14). However, according to Bogaert et.al.(15) sports activity and no other type of physical exercise performed during free time prevents stress, that is, not all exercise performed during occupational work would be beneficial. And since confinement has restricted PA options to teaching work itself, it would be expected a decrease in this practice and not exactly a positive impact on stress.

During the pandemic context, the maintenance and practice of PA has been recommended in order to mitigate its effects on mental health (16). However, working and individual conditions(7) have a greater influence on the perception of work stress, so they must be part of the studies and design of preventive programs for the preservation of mental health in professors. As those who do not tolerate stress are prone to greater exhaustion and this leads to greater work absenteeism.

Therefore, the objective of this study was to identify the association between perceived stress in the last month and the level of physical activity among university professors who work remotely in the context of the COVID-19 pandemic and to explore its relationship with the sociodemographic, work and individual characteristics.

## 2. Materials and Methods

### 2.1 Participants

Cross-sectional study based on a virtual survey. We assessed the PSS and the level of PA in university professors who maintained a current employment relationship to date and worked for at least one month in the RW modality, at the Universidad Nacional Hermilio Valdizán located in the department of Huanuco, Peru, during the period of March-June 2021 in the context of the SARS-CoV-2 pandemic.

### 2.2 Definition of variables

**2.2.1 Perceived stress:** The variable of interest was the perceived stress in the last month, this was measured through the Cohen Perceived Stress Scale (PSS-14) (17), validated in the Spanish-speaking population (18). It has 14 questions that assess two dimensions of stress: “perception of stress in daily situations” (negative dimension: questions 1,2,3,8,11,12,14), which addresses negative experiences and situations, and “stress control” (positive dimension: questions 4,5,6,7,9,10,13). Each item receives a Likert-type score from 0 “never” to 4 “very often”. The total score ranges from 0 to 56 points, where

a higher score reflects a greater presence of stress and vice versa (17,19). Currently there is no consensus on the cut-off point for the stress level, so authors establish categories by tertiles or their mean (20–23). This study took the median of stress: 24 as the cut-off point to establish the low and high levels of stress.

**2.2.2 Physical activity:** independent variable, was assessed with the short physical activity questionnaire (IPAQ) of 7 items. This has been translated and adapted into Spanish in 12 countries with good psychometric properties (24), reliability  $r=0.76$  (CI 95%, 0.73-0.77). The short version assesses three types of daily activities of moderate intensity, vigorous intensity, and walking. The score is calculated by multiplying the basal metabolic rate (MET) 3.3; 4.0; and 8.0 METs, respectively for the minutes/week of activity. The total result is obtained from the sum of these activities according to the algorithm detailed in *Guidelines for data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ)-Short Form* (25).

Confounding variables were identified using a Directed Acyclic Graph (DAG) (26,27): sex (male, female), head of household (yes, no), age, months in remote work, working hours per week (<30 hours,  $\geq 30$  hours), dedication (partial or full-time), and quality of sleep, this last measure by the Pittsburgh Sleep Quality Questionnaire, of Buysee (28), consists of 19 questions, the result is distributed in four categories, a score less than 5 indicates “no sleep problems”, from 5 to 7 “deserves medical attention”, from 8 to 14 “deserves medical attention and treatment” and from 15 points to more “serious sleep problems”.

### 2.3 Procedure and data collection

The questionnaire was designed on the Typeforms platform (<https://www.typeform.com/es/>) and was distributed to professors by email. To reduce selection bias due to overreporting, responses were filtered by Network ID in order to avoid duplicate responses. To increase the response rate, participation reminders were sent every 2 weeks for 4 months. The data were exported to an Excel spreadsheet where two researchers LCA, LRT, independently cleaned the data. There were no lost data as to fill out the survey it was necessary to complete the previous question.

### 2.4 Sample size

The power calculation was performed in the STATA 15 program. Assuming a power of 80%, and a significance level of 5%, 102 participants were required to detect a difference of 28.1% in the prevalence of stress between those with high physical activity (HPA) and low physical activity (LPA) (20.4% and 48.5%) (29).

Additionally, the entry of 8 confounding variables in the multiple regression model was considered, for which it was necessary to have a minimum number of participants. This was estimated using the formula:  $N \geq 50 + 8m$  (where “m” is the number of independent variables) (30), so the minimum number of subjects required was 114. Ultimately, with a rejection rate of 47.7%, 191 participants filled out the survey.

### 2.5 Statistical analysis

Since the quantitative variables did not meet the normality principle, they were summarized by their mean and interquartile range, while the qualitative variables were represented by absolute and relative frequencies. Chi-square, Fisher’s exact and U-Mann

Whitney tests were applied to compare the low and high stress groups, provided that the covariates were categorical or quantitative, respectively. Multiple regression analysis was performed for perceived stress, physical activity, and covariates. Multivariate analysis used a Poisson-family glm model, log link function with robust variance (31,32) in the STATA 15 program (STATA Corp, College Station, TX, US). Four hierarchical models were developed, based on the statistical strategy of Shaffer, et al. (33) to assess unique associations where variables were added as follows, model 1: unique associations of sociodemographic factors (age, gender) were tested, model 2: family variables (head of household and economically dependent children), model 3: work factors (months in remote work, professional dedication, working hours per week) and model 4: sleep quality. Each model assessed unique associations of the factors with stress and PA. Finally, a model that incorporated all the previous variables was developed. Each model recorded the variation of information criterion (AIC) as an indicator of the relative quality of the model. A value  $p < 0.05$  was considered statistically significant.

## 2.5 Ethical considerations

This study was conducted according to the guidelines of the “Declaration of Helsinki”, and the procedures were approved by the Research and Institutional Ethics Committee of Universidad Científica del Sur (UCSUR), Lima, Peru in Certificate No.299-CIEI-CIENTIFICA-2020. Accepting the (virtual) informed consent was required to continue filling out the survey.

## 3. Results

### 3.1 Characteristics of the study population

Information was collected from 191 participants, of whom 39.27% were women, the mean age was 52 (41 - 60) years old, the prevalence of LPA was almost double that of HPA. Sociodemographic, family, work and individual characteristics of the participants are shown in **table 1**.

**Table 1.** General Characteristics of the participants (N=191)

Characteristics			
	n	%	
Genre			
Masculine	116	60.73	
Feminine	75	39.27	
Age		52 (41-60) †	
Head of household			
Yes	156	81.68	
No	35	18.32	
Economically dependent children			
Have no children	33	17.28	
Have no economically dependent children	39	20.42	
Have economically dependent children	119	62.30	
Months in remote-work		10 (8-12) †	
Working hours per week (hours)			
< 30 hours	75	39.27	
≥ 30 hours	116	60.73	
University dedication			
Part-time basis	59	30.89	
Full-time basis	132	69.11	
Quality of sleep			
No sleep problems	29	15.18	
Deserves medical attention	57	29.84	
Deserves attention and medical treatment	97	50.79	
Severe sleep problems	8	4.19	
Perceived stress			
Low-perceived stress	101	52.88	
High-perceived stress	90	47.12	
Physical activity			
LPA <sup>1</sup>	93	48.69	
MPA <sup>2</sup>	42	21.99	
HPA <sup>3</sup>	56	29.32	

† Median and interquartile range

<sup>1</sup> Low physical activity

<sup>2</sup> Moderate physical activity

<sup>3</sup> High physical activity

### 3.2 Perceived stress and physical activity

The mean of perceived stress in the last month was  $25.12 \pm 9.08$ . Dividing stress by the mean of reported scores, the mean for low stress was 19 (IQR:15-22, range 4-24) and for high stress was 32 (IQR: 28-38, range: 25-50). Characteristics of the population according to stress levels are summarized in **table 2**. It was observed that perceived stress was associated with working hours, sleep quality and physical activity. In the high-stress group, more than 70% presented BPA, while in the low-stress group it was close to 24%. Moreover, **figure 1** shows the distribution of responses for the 14 items of perceived stress. The first dimension “perception in stressful situations” (questions: 1,2,3,8,11,12,14), with respect to question n° 1 *How often have you been affected by something that has happened unexpectedly?* and n° 12 *How often have you thought about the things you have left to do?*, 32.4 % and 39.26 % of professors said they felt affected

often. While in the second dimension “subjective control” (questions: 4,5,6,7,9,10,13), for question n° 6 *How often have you been confident about your ability to handle your personal problems?* 47.64% of professors said they felt confident.

**Table 2.** Bivariate analysis of perceived stress in the last month (N=191)

Characteristics	Perceived stress				p value †
	Low		High		
	n=101		n=90		
	n	%	n	%	
Genre					
Masculine	62	61.39	54	60.00	0.845
Feminine	39	38.61	36	40.00	
Age	51 (41-60) †		52 (43-60) †		0.955 ¥
Head of household					
Yes	81	80.20	75	83.33	0.576
No	20	19.80	15	16.67	
Economically dependent children					
Have no children	17	16.83	16	17.78	0.694
Have no econom. dependent children	23	22.77	16	17.78	
Have econom. dependent children	61	60.40	58	64.44	
Months in remote-work	10 (8-12) †		10 (8-12) †		0.854 ¥
Working hours per week (hours)					
< 30 hours	50	49.50	25	27.78	<b>0.002</b>
≥ 30 hours	51	50.50	65	72.22	
University dedication					
Part-time basis	36	35.64	23	25.56	0.132
Full-time basis	65	64.36	67	74.44	
Quality of sleep					
No sleep problems	28	27.72	1	1.10	<b>&lt; 0.001 §</b>
Deserves medical attention	43	42.57	14	15.56	
Deserves attention and medical treat.	29	28.72	68	75.56	
Severe sleep problems	1	0.99	7	7.78	
Physical activity					
LPA <sup>1</sup>	24	23.76	69	76.67	<b>&lt; 0.001</b>
MPA <sup>2</sup>	24	23.76	18	20	
HPA <sup>3</sup>	53	52.48	3	3.33	

† Median and interquartile range

‡ Chi-square test

¥ U-Mann Whitney test

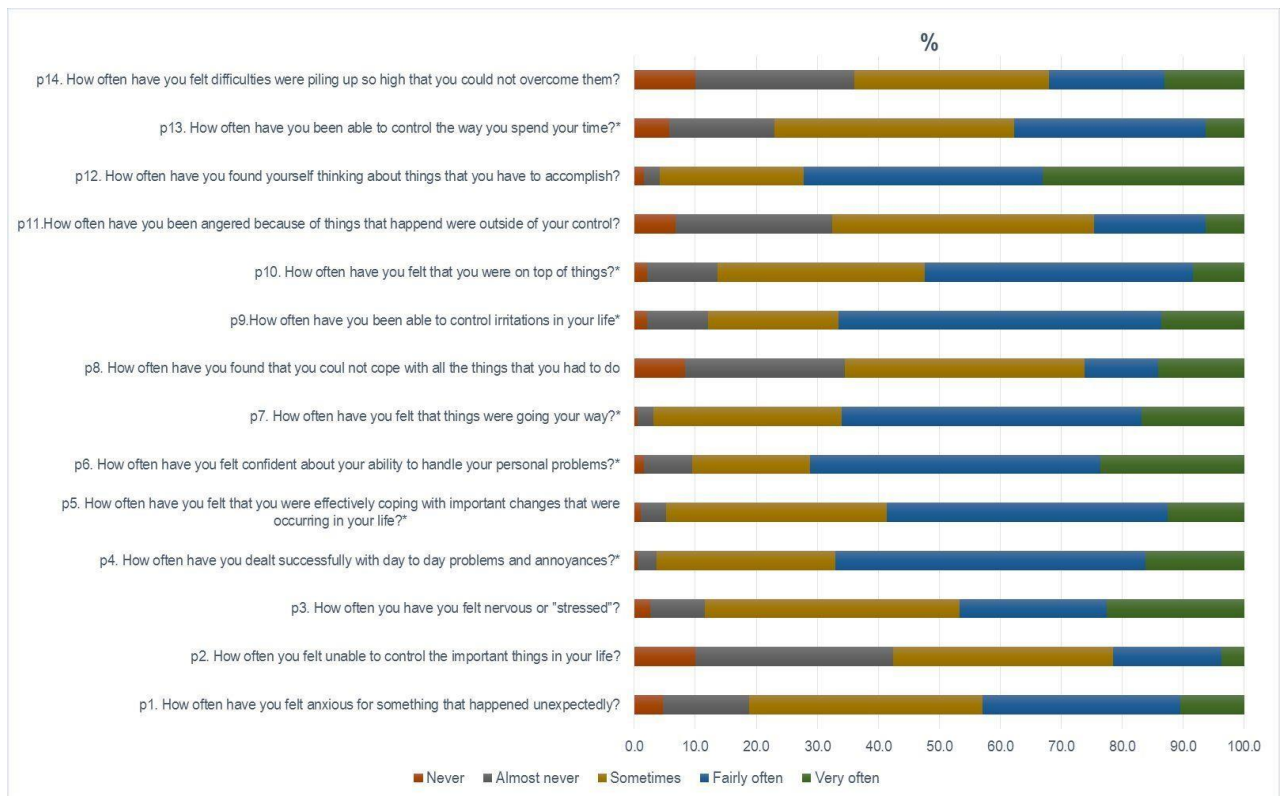
§ Fisher’s exact test

<sup>1</sup> Low physical activity

<sup>2</sup> Moderate physical activity

<sup>3</sup> High physical activity

**Fig.1.** Answers to perceived stress among university professors in the last month



\*These items represent positive dimension

### 3.3 Factors associated with perceived stress and physical activity

The correlation between PS and PA as numeric variables was significant ( $\rho = -0.41, p < 0.001$ ), showing that by increasing the METs of physical activity, the stress score decreases. The results of the hierarchical regression model that assessed the independent associations among sociodemographic, family, work and individual factors with perceived stress and physical activity are shown in **table 3**. Models 1 and 2 did not show significant associations for sociodemographic and family characteristics with PA and perceived stress. While, model 3 identified that workers who work more than 30h/week presented 50% more probability of presenting high stress, when PA remains constant, followed by model 4, where those who have poorer sleep quality (deserve attention and deserve attention plus medical treatment) present from 94% to 98% more probability of having high stress, adjusted by PA. The latter reduced the AIC by 0.203 units.

Model 5, adjusted by all the above variables, showed the association between the level of physical activity and stress. The level of HPA is shown as a protective factor against high stress, when the confounders remain constant. In addition, professors who are heads of households increased by almost 60% more the probability of having high stress compared to those who are not heads of households, adjusted by confounders. Age was identified as a protective factor for high stress, for each year of age this probability is reduced by 2%, adjusted by sociodemographic, family and individual variables. Additionally, deserving medical attention plus treatment and having serious sleep problems almost doubles and triples the probability of perceiving high stress compared to those who only deserve attention. The model had an AIC= 1.468.



**Table 3.** Multivariate hierarchical analysis regression to perceived stress and influencing factors

Perceived stress	cPR	IC 95%	p	Model 1			Model 2			Model 3			Model 4			Model 5		
				aPR	CI 95%	p	aPR	CI 95%	p	aPR	CI 95%	p	aPR	CI 95%	p	aPR	CI 95%	p
Physical activity																		
HPA	0.13	(0.04-0.40)	<0.001	0.12	(0.04-0.40)	<b>&lt;0.001</b>	0.13	(0.04-0.41)	<b>0.001</b>	0.12	(0.04-0.39)	<b>&lt;0.001</b>	0.19	(0.06-0.61)	<b>0.005</b>	0.19	(0.06-0.59)	<b>0.004</b>
MPA	ref.			ref.			ref.			ref.			ref.			ref.		
LPA	1.73	(1.20-2.51)	0.004	1.74	(1.20-2.52)	<b>0.003</b>	1.78	(1.23-2.58)	<b>0.002</b>	1.64	(1.14-2.35)	<b>0.008</b>	1.47	(1.03-2.09)	<b>0.032</b>	1.43	(1.02-2.01)	<b>0.038</b>
Age	1.00	(0.99-1.01)	0.956	1.00	(0.99-1.01)	0.511										0.98	(0.97-0.99)	<b>0.026</b>
Genre																		
Masculine	ref.			ref.												ref.		
Feminine	1.03	(0.76-1.40)	0.845	0.92	(0.71-1.19)	0.533										0.94	(0.75-1.19)	0.626
Head of household																		
No	ref.						ref.									ref.		
Yes	1.12	(0.74-1.70)	0.589				1.27	(0.86-1.87)	0.225							1.58	(1.05-2.36)	<b>0.027</b>
Econom. dependent children																		
HNCh	ref.						ref.									ref.		
HNEDCh	0.85	(0.50-1.42)	0.526				0.88	(0.58-1.34)	0.562							0.91	(0.59-1.41)	0.670
HEDCh.	1.01	(0.68-1.50)	0.979				0.84	(0.59-1.21)	0.349							0.82	(0.60-1.14)	0.245
Months in remote work	1.00	(0.94-1.05)	0.916							0.98	(0.94-1.03)	0.48				0.98	(0.93-1.03)	0.370
Dedication																		
Partial-time basis	ref.									ref.						ref.		
Full-time basis	1.30	(0.91-1.87)	0.153							0.96	(0.69-1.34)	0.803				0.95	(0.63-1.44)	0.824
Working hours per week (h/w)																		
< 30 h/w	ref.									ref.						ref.		
≥ 30 h/w	1.68	(1.17-2.41)	0.005							1.50	(1.05-2.13)	<b>0.025</b>				1.48	(0.98-2.22)	0.060
Quality of sleep																		
No sleep problems	0.14	(0.02-1.02)	0.052										0.23	(0.03-1.54)	0.128	0.24	(0.04-1.59)	0.140
Deserve medical attention	ref.												ref.			ref.		
Deserve at. and medical treat	2.85	(1.78-4.59)	<0.001										1.94	(1.24-3.04)	<b>0.004</b>	1.92	(1.24-2.95)	<b>0.003</b>
Severe sleep problem	3.56	(2.10-6.03)	<0.001										1.98	(1.19-3.30)	<b>0.090</b>	2.61	(1.51-4.53)	<b>0.001</b>
AIC initial				1.662			1.662			1.662			1.662			1.662		
AIC final				1.461			1.469			1.459			1.404			1.468		
ΔAIC				↓0.201			↓0.193			↓0.203			↓0.258			↓0.194		

p < 0.05 significative value, cPR: crude Prevalence ratio, aPR adjusted Prevalence Ratio, HNCh: have no children, HNEDCh: have no economically dependent children, HEDCh: have economically dependent children, HPA: high physical activity, MPA: moderate physical activity, LPA: low physical activity

## 4. Discussion

### 4.1 Main findings

Our results showed that about half of the participants had a level of BPA, of which more than 76% presented high stress. Presenting high stress was associated with a level of LPA in university professors, after adjusting by sociodemographic, family, work and individual variables.

### 4.2 Comparison with previous studies

The participants in this study were predominantly male, similar to the national proportion of university professors(34), and other studies (35,36) but different from that reported by Leire et.al, Freitas et.al and Camargo et.al, where women exceeded 50%. The mean age was around 52 years old, this contrasts with the national average age of professors (34) and other findings, which place it around the 4th decade of life (12,36–38). Expected results and partly explained by the current requirements for the exercise of university teaching, which require greater experience and trajectory, even more in professors of public universities, characteristics acquired over time (10).

More than 69% of professors work full time, a figure higher than that reported in the 2nd National University Census (32.63%) (39), and where full-time professors with exclusive dedication reach 68.1% (39). This difference is probably due to the response options of the questionnaire, which did not include the *exclusive dedication* option, not being possible to distinguish the latter from full-time work. In reference to the weekly working hours, the difference is greater, more than 60% worked more than 30 hours per week versus the 18 average hours of teaching load in Peruvian university professors in the Highlands(10); however, it is similar to the average reported in Brazilian professors(37,38).

The context of pandemic and migration to RW in an atypical environment(8) have led to an environment of greater workload (2) with the resulting increase in anxious, depressive and stress symptomatology(40). In this sense, the perception of high stress in this study is variable compared to other reports. On the one hand, it is lower than that reported worldwide(40) and nationwide(41), which exceed 60%; and significantly higher than that experienced by teachers of Paraguayan basic education (0.24%)(42). However, it is similar to the reports of the Polish teaching population of elementary education(43) and Brazilian university professors (35). Differences that could be justified by the temporal disparity of the reports before and during different stages of the pandemic, such as the first and second waves (35,38,40,43), the representativeness of the population (41), cultural context, and educational level, which influence the perception of work stress (7).

The literature recognizes the value and impact of PA on health(44). Although the levels of LPA and HPA found in this study are worrying, the results are consistent with the insufficiently active profile of university professors, even before the pandemic (37,38,45) and at the same time better than that of inhabitants of the Peruvian highlands where LPA and HPA reach 66.2% and 5.6%, respectively (46). In addition, if we compare the proportion of professors who carry out HPA (29.32%) to that of professors from Lima (37%)(47), we will observe discrepancies possibly attributed to the requirement of the level of teaching and administrative load (48), characteristics that affect the availability of free time to carry out activities of personal life (15,43).

The findings of this study suggest that both LPA and HPA are directly and inversely associated, respectively, with the presence of high stress even adjusted by characteristics



such as age. Which had a protective role in professors with a good level of PA. While, in Portuguese professors there is a tendency to increase stress with respect to age, remaining constant over 60 years old (36). A reduction in perceived stress in relation to age and the practice of PA could be linked to years of teaching experience, that is, those with a longer service time have a better performance, knowledge of educational strategies, a reflection of professional maturity and experience that, added to the appropriate management of time and responsibilities, would guarantee a balance between work and personal life, allowing leisure activities outside of work (15).

The relationship among gender, stress, and PA has been extensively studied, showing that women tend to have higher stress levels and poor PA(45), a relationship that is maintained in professors (36–38). And that it is associated with concern for the fulfillment of work, personal life, specifically in the performance of household chores (49) and maternal work (9). However, we did not find differences in the stress level and PA according to sex, which could be explained by shared parenting responsibilities, where there is greater support at home by the partner, which translates into a reduction in the gap between family and work obligations, reducing the family burden on women(38).

In addition, family work demands a greater commitment from the head of household, who bears most of the economic obligations, so it is expected that those who assume this role will experience greater physical and mental wear, associated with the presence of children and little PA practice(35). This leads us to think that the differences observed for perceived stress and PA in the heads/non-heads of households would be related to the role of the person in charge of household, rather than gender per se.

Additionally, more than 84% of those surveyed presented some problem related to sleep quality, which deserves attention and/or medical treatment, well above that reported by López-García et.al., Crepaldi et.al and Freitas et.al (5,6,42). Preliminary reports suggest that professors present sleep problems, such as daytime sleepiness(50) and insomnia (51), an issue that has been aggravated by the transition to RW (8,52). In addition, a reduction in PA practice and an increase in musculoskeletal problems (52) due to confinement and low salary perception, which forces the professors to take several jobs, extending their working hours and workload, with the consequent affectation of their quality of life (50,51) and stress (6).

Moreover, it is necessary to mention that the results observed in this study are likely to be influenced by the coincidence in information collection and the start of the 2nd wave of the pandemic in the department of Huanuco; coupled with other factors related to the organization of work (53), instability and truncated expectations as the main source of anxiety, stress(4), alteration of sleep quality (5,6), which together deteriorate the mental health status of professors.

Finally, in the context of the pandemic, maintaining healthy PA levels, even during work, has a positive impact on the perception of stress in professors. We must consider that the acceleration of the digital transformation to improve teaching processes, mentioned in the “*National Policy for Higher Technical-Productive Education*” by 2030 (54), indicates the continuity of blended and distance learning. Consequently, adopting a culture of risk prevention through assistance and education programs to professors, as well as having policies to promote occupational health, are necessary to reduce psychosocial risks in this population.

#### 4.3 Strengths and limitations

We can identify four limitations, first due to the cross-sectional design of the study in which we only estimated association and not causality, the interpretation of the results must be taken with caution. Second, the included sample may not be representative of university professors in our country, since the participants belonged to a public university entity, so we cannot extrapolate the results to private universities in another locality. Third, the data collection took place during the months of March-June 2021, months in which there was an increase in positive cases of COVID-19 in Peru, which could influence the responses, given the adverse context. And fourth, reverse causality problems could arise since there is a temporal difference and recall bias in the nature of the responses: stress, compared to the last month and PA in the last week. However, other studies support the direction of the association presented (29).

## 5. Conclusion

The results support the association between the level of physical activity and perceived stress in university professors who migrated to RW in the context of the pandemic. Those who had an APA level were less likely to have high stress and those who had an BPA level increased the probability of having high stress by more than 40%, adjusted by sociodemographic, work and individual characteristics, where age, being head of household and having sleep problems are determining factors. Future studies must consider the influence of organizational, labor and support factors for Peruvian professors, in the new context of hybrid education.

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**Contribution of the authors:** All authors participated in the conception of idea, methodology, analysis and writing of the final version of the manuscript.

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**Conflicts of interest:** The authors declare that they have no conflicts of interest.

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## CARTAS DE RESPUESTA A OBSERVACIONES DE LOS REVISORES

### LETTER OF RESPONSE

Dear Editor and reviewers

On behalf of the research team, I would like to thank you all for the commitment and valuable suggestions made. We are completely sure that these reviews helped to improve the manuscript's scientific quality. Below you will find out the answers to every commentary:

#### **1. Are the objectives and the rationale of the study clearly stated?**

**Reviewer #1:** Yes, it is good.

*Author response #1:* Thanks.

**Reviewer #2:** Objectives of the study were mentioned, but without mentioning the rationale. I would ask why Authors would like to identify the association between PS and PA?. Will results be helpful in identifying any kind of gaps? or to implement any solutions?

*Author response #2:* The rationale for the study is better supported.

*We want to identify an association between the level of physical activity and perceived stress because, during the pandemic context, working factors (transition to remote work, increased working hours, use of electronic devices) and individual factors (lifestyle, family role, quality of sleep) have suddenly changed. These changes have affected both the development spaces, recreating as well as the health status of the teacher, altering the already known dynamics of the physical activity-stress relationship.*

*On the other hand, the reality of public universities in low- and middle-income countries is marked by a lack of infrastructure, technological equipment, and multimedia platforms for remote work. Additionally, occupational health in Peruvian teachers, in general, is one of the most relegated, there are no reports or evidence of the status of workers during this context, so this study is one of the first reports that seeks to describe the dynamic of a teacher's work.*

**Reviewer #3:** I consider that the paper often loses focus on the main objective, handicaps a bias, entering the association between stress and physical activity. I think there are poorly selected (such as head of household) or confounding (full-time or part-time) co-variables - do part-time professors at the University have another job outside?

*Author response #3:*

*In Peru in 2019, the highest percentage of university teachers were hired hourly or part-time (58.6%), that is, there are teachers with less than 40 h/week in classrooms, doing extra university tasks such as formulating educational material, evaluations, and others, without receiving extra salary recognition. This characteristic of the teaching labour regime allows them to work in two or more universities or combine with healthcare assistance activities in order to increase their economic income, even when there is a work overload.*

*On the other hand, full-time and exclusively dedicated teachers combine teaching, administrative and scientific research activities due to the importance of their role in the academy. Activities that turn out to be difficult to evaluate through an instrument given their multitasking performance. In both cases, we must add up the conditions and the role of being the head/head of the family, which implies a load of activities at home that can overlap with work and the consequent impact on their health and work commitment. In this sense, these conditions have a major role in PS among teachers and are not just merely adjuvant conditions.*

**Reviewer #4:** The objective of the study is properly supported by the rationale presented, justifying it consistently



Author response #4: Thanks.

**Reviewer #5:** The title of the study, the objective of the study, and the methods are not consistently correlated and scientifically sound. A descriptive cross-sectional study can't identify influencing factors and establish any hypothesis/association. Major variables related to socio-demographic characteristics, job-related characteristics and personal characteristics must be defined scientifically.

Author response #5: the title is reformulated and aligned with the objectives and methodology of the study..

**2. If applicable, is the application/theory/method/study reported in sufficient detail to allow for its replicability and/or reproducibility?**

**Reviewer #1:** YES

Author response #1: Thanks.

**Reviewer #2:** Mark as appropriate with an X: Yes [X]

The study method was clear but needs to be reported in more detail. I would also ask why the Authors chose these questionnaires specifically.

Author response #2: The IPAQ -short version instrument was chosen since this version has valid and reliable psychometric properties in more than 12 countries  $r=0.76$  (95% CI, 0.73-0.77). It has been widely used in Peruvian research and nutritional surveillance programs at the national level.

The Perceived stress scale-14 (PSS-14) has also been validated in the Peruvian population, specifically among university professors. In addition to having psychometric properties such as  $\alpha=.82$  (.76-.87; 95% CI), and being used in the study of work stress within the occupational context.

**Reviewer #3:** Mark as appropriate with an X: No [x]

The paper has a fundamental limitation/bias, and that is that I have not found the previous or estimated values before the pandemic, so the PA effect or the co-factors cannot be attributed to PS. Although there is literature that reports this phenomenon, and I personally believe that the association is due to COVID, with the current data, and from a scientific perspective (unless some of the data or tables have not been correctly interpreted) we can write of associations, but not motivated by the pandemic. The authors may want to include it in the limitations section.

In some parts of the method (not discussion), the authors must define the data collection period (authors referring to the second wave in limitations but this information should be provided in the method), but the period in which the questionnaire was open was 4 months. Were workers in lockdown or not? Was there any significant change in working or epidemiological conditions in this period? Please include this information in the method, otherwise, it is not possible to temporarily locate this research.

Does the weekly work variable (30 hours) for part-time professors include any other work outside the university? Was this defined?

Author response #3: We took this into consideration. The material and methods section has been updated to: "This was a cross-sectional study based on a virtual survey. We assessed the PS and the level of PA in university professors who maintained a current employment relationship to date and worked for at least one month in the RW modality, at the Universidad Nacional Hermilio Valdizán located in the department of Huánuco, Peru during the period of March-June 2021. In this period, the population was still under lockdown, with social restrictions and university professors carried out RW".

The limitation section has been rewritten as follows: "We can identify four limitations. First, due to the cross-sectional design of the study in which we only estimated association and not causality, the interpretation of the results must be taken with caution. Second, the sample included may not be representative of university professors in our country, since the participants belonged to a public university

entity, and thus, we cannot extrapolate the results to private universities in another locality. Third, the data collection took place during the months of March-June 2021, in which inhabitants were still under lockdown, and there was an increase in positive cases of COVID-19 in Peru that could have influenced the responses, given the adverse context. Therefore, the effect of the stated association may not just be attributed to PS but rather also to COVID-19. And fourth, reverse causality problems could arise since there is a temporal difference and recall bias in the nature of the responses: stress, compared to the last month of work and PA in the last week. However, other studies support the direction of the association presented (34).

**Reviewer #4:** Mark as appropriate with an X: Yes [x]

Author response #4: Thanks

**Reviewer #5:** Mark as appropriate with an X: No [X]

The study didn't produce sufficient details to allow for its reproducibility. The design was consistent and scientifically sound to find the study findings with regard to the study objectives

Author response #5: *We appreciate the comment but strongly disagreed. The material and method section, as well as supplementary material (database), have been updated, shared and well-explained too, so we consider extra explanations are enough to assure its reproducibility in relation to the objectives.*

**3. If applicable, are statistical analyses, controls, sampling mechanisms, and statistical reporting (e.g., P-values, CIs, effect sizes) appropriate and well described?**

**Reviewer #1:** Mark as appropriate with an X: Yes [X]

Author response #1: thanks

**Reviewer #2:** Mark as appropriate with an X: Yes [X]

Sampling needs to be written in a more professional way, and the entry with 8 confounding variables should be justified in a well-written way

Author response #2: *The sample size was determined with the STATA v.15 programs. According to the literature, a difference of 28.1% in the proportions of stress between those with high PA and low PA (20.4% and 48.5%)(34) and a ratio of 1 was assumed. Thus, considering a CI of 95% and statistical power of 80%, a minimum sample size of 102 participants was calculated.*

*Additionally, the entry of 8 confounding variables in the multiple regression model was considered, for which it was necessary to have a minimum number of participants. This was estimated using the formula:  $N \geq 50 + 8m$  (where "m" is the number of independent variables) (35), and thus, the minimum number of subjects required was 114. Ultimately, 191 participants filled out the survey.*

**Reviewer #3:** Mark as appropriate with an X: Yes [x]

Author response #3: thanks.

**Reviewer #4:** Mark as appropriate with an X: Yes [x]

Author response #4: thanks.

**Reviewer #5:** Mark as appropriate with an X: No [X]

Author response #5: The sampling mechanism was not mentioned specifically. The sample size was not calculated using appropriate statistical tools following the study design.

Comment accepted, we have rewritten this section for more clarity:

The sample size was determined with the STATA v.15 programs. According to the literature, a difference of 28.1% in the proportions of stress between those with high PA and low PA (20.4% and 48.5%)(34) and a ratio of 1 was assumed. Thus, considering a CI of 95% and statistical power of 80%, a minimum sample size of 102 participants was calculated.

Additionally, the entry of 8 confounding variables in the multiple regression model was considered, for which it was necessary to have a minimum number of participants. This was estimated using the formula:  $N \geq 50 + 8m$  (where "m" is the number of independent variables) (35), and thus, the minimum number of subjects required was 114. Ultimately, 191 participants filled out the survey.

4. Could the manuscript benefit from additional tables or figures, or from improving or removing (some of the) existing ones?

**Reviewer #1:** no

Author response #1: thanks

**Reviewer #2:** Tables and figures were written professionally. I would suggest changing "Masculine and Feminine" to "Males and Females"

Author response #2: Comment accepted. We have changed to "male" and "female" nouns in tables and figures.

**Reviewer #3:** no

Author response #3: thanks

**Reviewer #4:** Tables and figures are presented in adequate quantity and format.

Author response #4: thanks

**Reviewer #5:** Table 1 could be reformed. Because general characteristic is a vague term. It could be separated by socio-demographic characteristics, job-related characteristics, and personal characteristics. It could be better to conduct the study with two groups of participants following the analytical cross-sectional study design. Accordingly, the study findings could be presented by comparing between two groups either in tables or graphs.

Author response #5: *We partially agree. As the reviewer suggested in order to specify table n°1 description, we have restructured this one by adding up to 3 subheadings: socio-demographic, labour and personal characteristics of the participants. Nonetheless, we consider that comparison should be more appropriate in a second table, so Table #2 shows its differences according to the outcome of interest (PS).*

**5. If applicable, are the interpretation of results and study conclusions supported by the data?**

**Reviewer #1:** n/A

Author response #1: Thanks

**Reviewer #2:** Mark as appropriate with an X: Yes [X]

Interpretations of study results were good, but I would highly recommend Primary check on this manuscript for language refinement is mandatory as I see the English is not satisfactory, I suggest the authors to go with language and grammar check

Authors response #2: *Thanks for the suggestion. As we are non-native English speakers, we would check for language refinement and grammatical features with an expert native English speaker.*

**Reviewer #3:** Mark as appropriate with an X: No [x] see comments to the author's section.

Author response #3: We will respond to this later

**Reviewer #4:** Mark as appropriate with an X: Yes [x]

Author response #3: thanks.

**Reviewer #5:** Mark as appropriate with an X: No [X]

The study findings in respect of influencing factors are not presented appropriately between the two groups of participants. The conclusion is found as a duplication or repetition of the results. It must be rephrased based on the key study findings.

Author response #5: Comment accepted. We have rewritten this section:

*[The results support the association between the level of PA and PS in university professors who do RW within the context of the COVID-19 pandemic. Those presenting a high PA level were less likely to have high stress unlike those with low PA adjusted for sociodemographic, work and individual characteristics, with age, being head of household and having sleep problems being determining factors. Furthermore, the reality of public universities in low-and middle-income countries is marked by a lack of infrastructure, technological equipment, and multimedia platforms for RW and therefore, future studies must consider the influence of organizational, labour and support factors for Peruvian highland professors with similar features in the context of hybrid education and above all to ensure the implementation of occupational health surveillance programs in the education sector].*

#### **6. Have the authors clearly emphasized the strengths of their study/theory/methods/argument?**

**Reviewer #1:** yes

Author response #1: Thanks

**Reviewer #2:** Authors did not mention clearly study strengths, which should be written in detail in the appropriate section.

Author response #2: Comment accepted. we have added up some strengths statements in the correspondent section.

**Reviewer #3:** yes, I suggest improving: see comments to the author's section

Author response #3: We will respond to this later

**Reviewer #4:** The authors presented the limitations clearly; however, as a fortress, they did not make it clear.

Author response #4: Comment accepted. We have added up the next statement in the strength and limitation section:

*“On the other side, this is the first study among Peruvian rural professors during the COVID-19 pandemic that explores the relationship between PS and PA in the COVID-19 context, This information may help to design specific measures to prevent high-level stress and deterioration of PA during the remote work and hybrid education which are considered being permanent in higher education. Additionally, the occupational health in Peruvian teachers, in general, is one of the most relegated, there are no reports or evidence of the state of workers during this context, so this study is one of the first reports that seeks to show the university professor status in the pandemic context”.*

**Reviewer #5:** The strengths of the study are not well-explained and established. The authors must explain the strengths of the study in terms of design, method, findings and its applications. Policy implications are not portrayed with scientific arguments, shreds of evidence and logic.

Author response #5: Comment accepted. We have added up the next statement in the strength and limitation section:

*"...On the other side, this is the first study among Peruvian rural professors during the COVID-19 pandemic that explores the relationship between PS and PA in the COVID-19 context, This information may help to design specific measures to prevent high-level stress and deterioration of PA during the remote work and hybrid education which are considered being permanent in higher education. Additionally, the occupational health of Peruvian teachers, in general, is one of the most relegated, there are no reports or evidence of the state of workers during this context, so this study is one of the first reports that seeks to show the university professor status in the pandemic context".*

**7. Have the authors clearly stated the limitations of their study/theory/methods/argument?**

**Reviewer #1:** NO

Author response #1: No additional comments.

**Reviewer #2:** Limitations were mentioned clearly!

Author response: thanks.

**Reviewer #3:** no, I suggest improving: see comments to the author's section

Author response #3: We will respond this later

**Reviewer #4:** The authors presented the limitations clearly.

Author response #4: Thanks

**Reviewer #5:** The authors stated some limitations of their study

Author response #5: No additional comments.

**8. Does the manuscript structure, flow or writing need improving (e.g., the addition of subheadings, shortening of text, reorganization of sections, or moving details from one section to another)?**

**Reviewer #1:** The article needs to strengthen the exploration of the underlying causes

Author response #1: Along the discussion section we have explored underlying causes in relation to working, organisational and familiar issues which are based on updated references and current literature.

**Reviewer #2:** The manuscript structure is good and was written in a professionally known way.

Author response #2: thanks.

**Reviewer #3:** Yes. I suggest improving: see comments to the author's section

Author response #3: We will respond this later

**Reviewer #4:** The manuscript is of high quality and is written with methodological rigor and meeting the standards of scientific writing.

Author response #4: thanks.

**Reviewer #5:** The manuscript structure, flow or writing needs improving. Grammatical errors need to correct

Author response #5: Thanks for the suggestion. In regard to the structure, we followed the *Strengthening the Reporting of Observational Studies in Epidemiology* (STROBE) guidelines to guarantee the appropriate sequence and flow of this manuscript. So, we consider the structure well adequate. On the



other hand, as we are non-native English speakers, we have checked for language refinement and grammatical features with an expert native English speaker

### 9. Could the manuscript benefit from language editing?

**Reviewer #1:** Yes

Author response #1: We agreed. The manuscript has been checked for language refinement.

**Reviewer #2:** Yes

Author response #2: We agreed. The manuscript has been checked for language refinement.

**Reviewer #3:** Yes

Author response #3: We agreed. The manuscript has been checked for language refinement.

**Reviewer #4:** No

Author response #4: thanks

**Reviewer #5:** Yes

Author response #5: We agreed. The manuscript has been checked for language refinement.

### **EDITOR AND REVIEWER COMMENTS**

Reviewer #1: The theme of the article is meaningful, and the format and analysis are also good. However, it is far from enough to analyze the physical activity data of university professors. In fact, university professors belong to a group with relatively rich cultural capital. The article does not mention Bourdieu's cultural capital-related content, nor does it apply the cultural capital theory to explain and analyze the characteristics of university professors' physical activities. Therefore, this paper lacks theoretical depth. Secondly, there is a lack of discussion on how to promote the way and mechanism of college professors' physical activities in population analysis. Therefore, the article needs to further strengthen the depth and breadth of exploration.

*Author response #1:* we thank the author for suggesting another point of view and perspective to understand and comprehend this dynamic relationship between physical activity and perceived stress with other factors. So we added this paragraph in order to set a social perspective for this issue:

*Understanding of the social structure and working context of the professors is relevant to comprehend the factors that can modify their physical and mental status. From a sociological perspective, the Cultural Capital theory by Bordieu (8) describes the existence of a symbolic capital as a disputable possession within a social group. In the case of professors, this wealth is in the form of knowledge or ideas, which justify the maintenance of status and power through its forms: incorporated (knowledge), objectified (cultural goods) or institutionalized (capacity of the group to accredit knowledge) acquire great relevance to their motivation and struggles to the seeking for a status and habitus superior to others which creates an environment of constant competition.*

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**Reviewer #2:** Dear Authors, Thank you for your efforts. All my comments to this manuscript are attached above,

Overall, the manuscript is well written, and I could not find similar studies in your region, maybe mentioning this information will nourish the manuscript. The method utilized in this research is sound and the sample size is adequate. However, the generalizability of the results is questionable. The statistical analysis and statistical tests used seem appropriate. Finally, and as written above, I would highly

recommend a Primary check on this manuscript for language refinement is mandatory as I have seen the English is not satisfactory.

*Author response #2:* Thanks, as Reviewer #2 aforementioned, this is the first study among Peruvian rural professors during the COVID-19 pandemic. The research during the first and second year of COVID-19 in Peru was difficult to achieve, because of the sudden transition to the use of TICs. So, many professors remained reluctant to answer online surveys due to mistrust or lack of knowledge of device management. Added to this, the adverse context made it tough for teachers to dedicate extra time to participate given their high workload.

**Reviewer #3:** First of all, congratulations to the authors on this interesting paper. Below I make some comments in order to improve the quality of the manuscript.

### **GENERAL COMMENTS**

I consider that the paper often loses focus on the main objective, handicaps a bias, entering the association between stress and physical activity. I think there are poorly selected (such as head of household) or confounding (full-time or part-time) co-variables - do part-time professors at the University have another job outside?

*Author #3 response:* In Peru in 2019, the highest percentage of university teachers were hired hourly or part-time (58.6%), that is, they are teachers with less than 40 h/week in classrooms, without considering those dedicated to preparing educational material, and evaluations, among others other tasks. This characteristic of the teaching labour regime allows them to work in two or more universities in order to increase their economic income, even when there is a work overload.

*On the other hand, full-time and exclusive dedication teachers combine teaching, administrative and scientific research activities due to the importance of their role in the academy. Activities that are difficult to evaluate through an instrument given the multiplicity of tasks they perform. In both cases, we must add up the conditions and the role of being the head/head of the family, which implies a load of activities at home that can overlap with work, with the consequent impact on their health and work commitment.*

### **TITLE**

The title refers to all Peruvian university professors. Still, the sample is concentrated in a single university and although it meets the statistical power, it is only a small part of Peruvian university professors. I think they should modify it by changing "among Peruvian university professors..." to "among regional Peruvian university professors..." or "among Huánuco Peruvian university professors...". The key is not to confuse the reader by imagining a large study, or a large representative sample of a country when it really is not.

*Author #3 response:* We accepted the suggestion. We have changed the title of this manuscript as *Physical activity level and associated factors to perceived stress among regional Peruvian university professors during the COVID-19 pandemic.*

### **KEYWORDS**

"Teachers" I don't think is a keyword of the study, since teachers are non-university workers (educational levels with children).

*Author #3 response:* we did not find an exact MESH term so we have stated the following terms: *physical activity; psychological stress, occupational health; mental health; coronavirus, faculty (MeSH terms)*

### **ABSTRACT**

The wording of the conclusion in my opinion is not adequate. The results mainly identify an association between PS and the type of PA they perform. I think authors should add "some" or "few" eg. "These



findings help identify (a few/some) characteristics of teachers with a higher probability of having high stress."

Page 3 line 33. I do not know if the teacher is the best definition for these workers. Maybe professors.

*The term has been changed to the professor.*

*Author #3 response: We have rewritten this section:*

*Conclusion: Stress was associated with physical activity level, and family and individual factors. These findings help identify characteristics such as being head of household, age and quality of sleep among teachers with a higher probability of having high stress. Subsequent studies should consider the role of individuals and working conditions as part of occupational health surveillance, given the presence of hybrid education in the education sector.*

## INTRODUCTION

Page 4, lines 34 and 35. Can the authors provide any reference that supports the sentence they have written?

*Author #3 response: We added the reference.*

## METHOD

The paper has a fundamental limitation/bias, and that is that I have not found the previous or estimated values before the pandemic, so the PA effect or the co-factors cannot be attributed to PS. Although there is literature that reports this phenomenon, and I personally believe that the association is due to COVID, with the current data, and from a scientific perspective (unless some of the data or tables have not been correctly interpreted) we can write of associations, but not motivated by the pandemic. The authors may want to include it in the limitations section.

In some parts of the method (not discussion), the authors must define the data collection period (authors referring to the second wave in limitations but this information should provide in the method), but the period in which the questionnaire was open was 4 months. were workers in lockdown or not? Was there any significant change in working or epidemiological conditions in this period? Please include this information in the method, otherwise, it is not possible to temporarily locate this research.

Does the weekly work variable (30 hours) for part-time professors include any other work outside the university? Was this defined?

*Author #3 response: Comments accepted. Firstly, we have established associations for dependent and independent variables, not estimated causality, as this is a cross-sectional study design. Secondly, we specified in the method section the period and characteristics regarding lockdown and social restrictions for the population and professors.*

## RESULTS

Table 1. In the PA variable, there are three levels, HPA, MPA and LPA, this variable is defined by the IPAQ?, in METs?. I guess so. In Table 2, the variable "working hours per week" in teachers who have a high PS is 72%, very similar to the percentage found in PA, during high PS (76%). An analysis would be very interesting to find out if the workers who work > 30 hours are effectively those who belong to the LPA group of the PA variable.

*Author #3 response:*

*Physical activity levels are defined by IPAQ guidelines. Results can be interpreted as quantitative and qualitative data. We choose the categorised way: high, moderate and low physical activity. In addition, an extra analysis could be interesting to explore the association between the "≥ 30 hours per week worker"*

and the level of physical activity, perhaps as a secondary analysis. Nonetheless, the objectives of the study have been stated at the conception of this study. Thanks.

## DISCUSSION

Page 11, line 40. Can the authors provide any reference to support their statement. "compare to other reports" which ones?

*Author #3 response:*

*The references to this statement are referred to in the following sentences as follows: [... In this sense, the perception of high stress in this study is variable compared to other reports. On the one hand, it is lower than that reported worldwide(40) and nationwide(41), which exceeds 60%; and significantly higher than that experienced by teachers of Paraguayan basic education (0.24%)(42). However, it is similar to the reports of the Polish teaching population of elementary education (43) and Brazilian university professors (35).*

I strongly disagree with the statement

"reduction in PS in relation to age and the practice of PA could be linked to years of teaching experience. That is, those with a longer service time have a better performance, knowledge of educational strategies, a reflection of professional maturity and experience that, added to the appropriate management of time and responsibilities, would guarantee a balance between work and personal life, allowing leisure activities outside of work (15). This contradicts the idea raised in the conclusions "Those who had an HPA level were less likely to have high stress"

Older/senior teachers have had more difficulty adapting to technological change, and the use of new remote teaching systems. Their findings are age-related, real, but not generalizable in the global context of the pandemic and older professors.

*Author #3 response:*

*As the reviewer mentions, older teachers have had difficulties in the transition to remote work, mainly due to TICs. In this sense, given the time that has elapsed since the start of the pandemic and the change in work modality, he has been able to adapt satisfactorily to new technologies. This could be reinforced by experience and professional maturity, which can also be reinforced by healthy lifestyle habits such as the practice of recreational activities.*

*However, the generalizability of these findings is not possible, only under similar circumstances and population characteristics.*

Change the title of section 4.3. Strengths and limitations for 4.3 only. Study limitations

*Author #3 response: we have added some strengths to this study, so we decided to keep the original title.*

## CONCLUSIONS

I do not think that the phrase "The results support the association between the level of physical activity and perceived stress in university professors who migrated to RW" is related to the study findings, because it does not analyze the effect of migrating to RW, nor that it is the cause PE main. Perhaps it is the lockdown, the context of the pandemic or another, but the data does not support that it is due to RW. I suggest removing this conclusion, which is speculative.

*Author #3 response: We have rephrased this statement to avoid ambiguity:*

*[...The results support the association between the levels of physical activity and perceived stress in university professors who do RW in the context of the pandemic.]*

**Reviewer #4:** The manuscript is of high quality and is written with methodological rigour and meets the standards of scientific writing.

Author response #4: Thanks

### RESPONSE LETTER

Dear editor and reviewers Heliyon

journal

Cordial greetings. On behalf of the research team, I would like to thank for the received comments. Below you will find a detailed answer to every suggestion made.

Thanks for the provided time. Editor

and Reviewer comments:

**Reviewer #1:** The author still needs to distinguish the impact of relevant variables on physical activity, and the relevant variables presented in the article are not convincing. In fact, the current period of COVID-19 is basically past, and our research should pay more attention to the impact of the special period and the enlightenment to the future.

Response: the manuscript states the relevance of sociodemographic, familiar, work and individual characteristics involved in the **perceived stress** by professors during the remote work, especially the practice of **physical activity** closely related to familiar, sociodemographic, work and individual factors. So, we rewrote and updated the discussion section so it gives equal relevance to these variables. Moreover, the last paragraph states the purpose and contribution of this research and its impact to the future of education.

*[...Our study showed a higher figure of professors in full-time dedication than that reported in the 2nd National University Census (44). This difference is probably due to the response options of the questionnaire, which did not include the exclusive dedication option, thereby not allowing distinguishing the latter from full-time work. However in terms of workload the exclusive and full-time modalities are considered equivalent (9). In reference to the weekly working hours, the difference was greater, with more than 60% working more than 30 h/week versus the 18h average schooled-hours of teaching load by Peruvian university professors in the Highlands (9). We have to considered that this figure did not include non-schooled hours, it meant that this difference could be attributed to extra-worked hours (educational material, design of educative test, etc.) and mainly non- paid back hours; nonetheless, this percentage is similar to the average reported in Brazilian professors (42,43).*

*The context of the pandemic and RW in an atypical environment (13) have led to a set of greater workload (2) with the resulting increase in anxiety, depression and stress symptomatology (45). In this sense, the perception of high stress in this study varied*

*compared to other reports (45–47). On one hand, it is lower than that reported worldwide (45) and nationwide (46), which exceeds 60% while being significantly higher than that experienced by teachers of Paraguayan education (47). Whereas it is similar to the reports of the Polish teaching population of elementary education (48) and Brazilian university professors (40). These differences could be justified by the temporal disparity of the reports before and during different stages of the pandemic, in Huánuco the second wave was officially stated in 31<sup>th</sup> January inducing to mandatory isolation (40,43,45,48)*

*and indirectly extending the RW in education. In addition to the several factors as the representativeness of the population (46), cultural context, and educational level, which influence the perception of work stress (7). Preview literature recognizes the value and impact of PA on health (49). Although the levels of low and high PA found in this study are worrying, the results are consistent with the insufficiently active profile of university professors, even before the pandemic (42,43,50) while, at the same time, being better than that of inhabitants of the Peruvian highlands in which low and high PA levels reach 66.2% and 5.6%, respectively (51). In addition, if we compare the proportion of professors with high PA to that of professors from Lima (37%) (52), there are discrepancies possibly attributed to the requirement of the level of teaching and administrative load (53), characteristics that affect the availability of free time to carry out personal life activities (18,48)...*

*[...]*

*[...The relationship between gender, stress, and PA has been extensively studied, showing that women tend to have higher stress levels and poor PA (50). This relationship is maintained in professors (41–43) and is associated with concern for the fulfillment of work, and personal life, specifically in the performance of household chores (54) and maternal work (11). However, found no differences in stress levels and PA according to sex, which could be explained by shared parenting responsibilities, with greater partner support at home, which translates into a reduction in the gap between family and work obligations, reducing the family burden on women (43).*

*In addition, familiar factors as house demands a greater commitment for the head of household, who bears most of the economic burden, and thus, it is expected that those who assume this role will experience greater physical and mental wear, associated with the presence of children, economically dependents (elderly or people with disability) and even the reduction or little PA practice in non-working hours (40). This suggests that the differences observed for PS and PA in the heads/non-heads of households could be related to the role of the person in charge of the household, rather than gender per se.*

*Additionally, more than 84% of those surveyed presented some problem related to sleep quality, requiring attention and/or medical treatment, being well above that reported by López-García et al., Crepaldi et al. and Freitas et al. (5,6,47). Preliminary reports suggest that professors present sleep problems, such as daytime sleepiness (55) and insomnia (56), an issue that has been aggravated by the transition to RW, reduction in financial stability (13,57) and PA practice (57) due to confinement, which*

*obliges the professors to take several jobs, extending their working hours and workload, with the consequent affectation of their quality of life (55,56) and perceived stress (6).*

*Moreover, it is necessary to mention that the results observed in this study are likely to be influenced by the coincidence in information collection and the start of the 2nd wave of the pandemic in the department of Huanuco. This can be coupled with other factors related to the organization of work (58), instability contextual and truncated expectations as the main source of anxiety, stress (4), and alteration of sleep quality (5,6) which altogether deteriorate the mental health status of professors.*

*Finally, by the time of this publication the current period of COVID-19 is basically past all over the world, notwithstanding this research sustains the importance of maintaining healthy PA levels even under tough contexts which has a positive impact on the perception of stress in professors. It should be taken into account that the acceleration of the digital transformation to improve teaching processes, mentioned in the “National Policy for Higher Technical-Productive Education” by 2030 (59), indicates the continuity of blended and distance learning in addition to the implementation of telecommuting set by peruvian government which ensures the permanence of this labor modality. Consequently, adopting a culture of promotion and prevention of health through assistance and education programs for professors, as well as having policies to promote the extension of occupational health to telecommuting, are necessary to reduce psychosocial risks in this population.]*

**Reviewer #3:** Thank you for heeding this reviewer's suggestions. Now the article sounds much better.  
Response: Thanks



## VERSION EN ESPAÑOL.

### RESUMEN

**Introducción:** la pandemia COVID-19 aceleró la adopción temprana del trabajo remoto y propició así, junto a la inestabilidad del contexto, la variación en los niveles de actividad física y estrés.

**Objetivo:** identificar la asociación entre el estrés percibido (EP) y el nivel de actividad física (AF), así como explorar su relación con características sociodemográficas, familiares, laborales e individuales en docentes universitarios que hacen trabajo remoto en el contexto de la pandemia.

**Materiales y métodos:** estudio transversal. El resultado fue el nivel alto de EP evaluado con la Escala de estrés percibido (EEP-14). La AF se midió con el Cuestionario Internacional de Actividad Física (IPAQ). Se estimaron las razones de prevalencia ajustadas (PRa) con un IC de 95% usando modelos de regresión de Poisson con varianzas robustas. Se desarrollaron cinco modelos para evaluar asociaciones individuales entre el EP y AF con variables sociodemográficas, familiares, laborales e individuales.

**Resultados:** Participaron 191 docentes; 39.27% fueron mujeres, edad 52 (RIQ: 41-60). La prevalencia de alto estrés fue 47.12%. La asociación entre AF y EP, fue significativa en todos los modelos. El modelo global mostró que, en comparación con la AF moderada, hubo una asociación estadísticamente significativa entre EP y la AF alta (PRa=0,18; 0,06-0,59), AF baja (PRa=1,42; 1,01-1,99), influenciado principalmente por la edad, ser cabeza de familia y la calidad del sueño.

**Conclusión:** La AF mostró una asociación negativa con los niveles de EP, indicando que niveles más altos de AF se relacionan con niveles más bajos de EP. Además, características en docentes como el ser cabeza de familia, edad y calidad de sueño son factores asociados a una mayor probabilidad de tener alto estrés. Estudios posteriores podrían considerar el rol de condiciones individuales y familiares en el EP y AF dada la permanencia de la educación híbrida.

**Palabras clave:** ejercicio físico, estrés psicológico, salud laboral, salud mental, COVID- 19, docentes. Fuente DeCS (BIREME)

## ABSTRACT

**Introduction:** The COVID-19 pandemic led to the transition to remote work, triggering variations in stress and physical activity (PA), associated with context-specific instability. **Objective:** To identify the association between perceived stress (PS) and the level of physical activity (PA) and explore its relationship with the sociodemographic, work and individual characteristics of professors working remotely during the COVID-19 pandemic.

**Material and methods:** Cross-sectional analytical study based on a virtual survey of university professors. The outcome of interest was high PS, assessed using the Perceived Stress Scale (PSS-14). While PA used the International Physical Activity Questionnaire. The adjusted prevalence ratios (aPR) with 95% confidence interval (CI) were estimated using a Poisson regression analysis with robust variance. Five models were developed to assess individual associations of PS and PA with sociodemographic, family, work, and individual variables.

**Results:** The information of 191 professors was analyzed; 39.27% were women, aged 52 (IQR: 41-60), prevalence of high stress was 47.12%. The association between PS and PA remained significant through all the models. The global model shown that, comparing to moderate PA, there was a statistically significant association between PS and high PA (aPR=0,18; 0,06-0,59), low AF (aPR= 1,42; 1,01-1.99), mainly influenced by age, being head of household and sleep quality.

**Conclusion:** The PA showed a negative association with PS, indicating that higher levels of PA are related with lower levels of PE. These findings allow identifying characteristics, such as being head of household, age and quality of sleep among teachers, as being associated with a higher probability of having high stress. Subsequent studies should consider the role of individual and familiar conditions in the PS and PA, given the presence of hybrid education in the education sector.

**Keywords:** physical activity; psychological stress, occupational health; mental health; coronavirus; faculty (MeSH terms).



## 1. INTRODUCCIÓN

Los problemas de salud mental impactan en la economía mundial y generan un alto costo a nivel social y laboral. Se estima que, tan solo en el Reino Unido, se pierden 213 300 días de trabajo por año a causa de condiciones como ansiedad, depresión y estrés

(1) . En la población docente, el estrés ocupacional representa un riesgo psicosocial condicionado por diferentes factores como la carga de trabajo, actividad física (2,3), ausencia de apoyo(4), relaciones interpersonales, vida personal, pobre calidad de sueño (3,5,6) y la propia cultura (7). Sumado a la variabilidad de la estructura social y contexto laboral de los docentes universitarios, por lo que es relevante comprender los factores que modifican su estado mental y físico.

Desde una perspectiva sociológica, Bordieu describe en su teoría del *Capital Cultural* (8) la existencia de un capital simbólico concebido como una posesión disputable dentro de un grupo social. Esta visión destaca como recursos culturales y simbólicos de una persona (educación, conocimiento, valores y habilidades) pueden afectar su acceso a oportunidades y posición. En el caso de los docentes con un mayor capital cultural, como conocimientos especializados pueden tener mayores expectativas de dedicación a la enseñanza e investigación. Esto puede llevar a asumir una mayor carga laboral (más horas de trabajo), ya que se espera que estén más involucrados en actividades académicas y comprometidas con su profesión. De manera similar, los docentes que ejercen mayores horas de docencia (docencia exclusiva o a tiempo completo) pueden tener mayores demandas laborales en comparación con modalidades parciales. Lo cual podría relacionarse con la cantidad del capital cultural que poseen y cómo se valora su trabajo en la institución, Quienes tengan mayor dedicación enfrentan mayores expectativas en sus actividades, lo que puede influenciar en su percepción de estrés.

Desde el punto de vista ocupacional, en Perú para el 2020, los profesores contratados a tiempo parcial integraban el 58.6% de la fuerza laboral docente (9); usualmente, estos docentes realizan sus actividades en aula (horas lectivas). Esto significa que estos docentes no reciben un salario compensatorio por las horas dedicadas al desarrollo de

material educativo y tutoría, entre otras tareas (9,10). De manera similar, el régimen de docente a tiempo completo y dedicación exclusiva, quienes combinan actividades de docencia, administrativas e investigación científica sin embargo, el salario en este grupo incluye las horas no escolarizadas (9). Además, dada la complejidad de multitareas interdependientes y difícilmente desligables, hace que la evaluación de las mismas a través de instrumentos específicos sea complicada (10). Esta característica particular del régimen laboral docente incentiva la labor múltiple en diferentes instituciones, con el fin de lograr mayor solvencia económica, a pesar de la sobrecarga laboral.

A esto se le suma, en ambos casos, las condiciones de crianza y el rol de ser cabeza de familia (11), lo cual implica una carga de actividades domésticas que pueden sobreponerse con las laborales. Especialmente entre los padres de niños en edad escolar o económicamente dependientes, en los que la sintomatología estrés postraumático ha emergido como consecuencia del desbalance del binomio trabajo-familia y la inestabilidad financiera percibida (12). Junto a esto, la transición acelerada al trabajo remoto (TR) (2,11,13) y el tiempo de permanencia en promedio igual o mayor a 9 meses por año en la educación universitaria, junto con una mayor carga laboral en promedio con un ratio de 36.5 estudiantes por docente a tiempo completo en la universidades de la región sierra del Perú(9), han propiciado un ambiente hostil con repercusiones no solo en la percepción del estrés, sino también en la práctica de actividad física (AF) (14,15)

La AF es ampliamente reconocida como un factor protector frente a condiciones como la diabetes, hipertensión (16) y especialmente estrés (17). La Organización Mundial de la Salud, recomienda la práctica de al menos 150 minutos/semana de AF de intensidad moderada, o bien un mínimo de 75 minutos/semana de una combinación de AF de intensidad moderada y vigorosa para mantener un nivel de AF saludable (18). No obstante, de acuerdo con Bogaert et al. (19), las actividades deportivas, y no otro tipo de ejercicio físico durante el tiempo libre, previenen el estrés; esto es, no todo ejercicio realizado durante la ocupación laboral sería beneficioso. Dado que, el confinamiento ha restringido las opciones de AF, se espera un descenso en la práctica de la misma con un impacto negativo sobre el estrés. Durante la pandemia, la práctica de AF fue recomendada para prevenir o mitigar el impacto negativo en la salud mental (20). Sin embargo, reportes

recientes muestran que el trabajo (sobrecarga del TR) (21) y condiciones individuales como la inadecuada calidad de sueño en el contexto de la COVID-19 (7,21) están asociados a un descenso en la movilidad, caminata y el incremento del estilo de vida sedentario (22). En consecuencia, debido a que las restricciones sociales han restringido algunas opciones de AF, es esperable un descenso en su práctica, así como un impacto negativo en el estrés.

Este estudio, tuvo como objetivo identificar la asociación entre el estrés percibido (EP) en el último mes de trabajo y el nivel de AF en docentes universitarios que trabajan de forma remota en el contexto de la pandemia COVID-19. Como objetivo específico, se buscó explorar las diferencias de esta relación con características sociodemográficas (edad, género), familiares (ser jefe de hogar, hijos económicamente dependientes), laborales (horas laborales semanales, meses en trabajo remoto, tipo de dedicación universitaria) e individuales (calidad de sueño).

## 2. MATERIAL Y MÉTODOS

### 2.1. Diseño de estudio

Estudio transversal analítico basado en encuesta virtual. Se evaluó el EP y el nivel de AF en docentes universitarios de la Universidad Nacional Hermilio Valdizán institución universitaria pública ubicada en el departamento de Huánuco, Perú.

### 2.2. Selección de participantes

Se diseñó una encuesta virtual que se distribuyó entre el docente de las 14 escuelas académicas pertenecientes a Universidad Nacional Hermilio Valdizán.

2.2.1. Criterios de inclusión: se consideró a los docentes participantes que mantenían una relación laboral en la fecha de la encuesta y que habían desempeñado sus funciones por un periodo no inferior a un mes en la modalidad de TR. La aplicación de este criterio se materializó mediante una pregunta filtro incorporada antes de la administración de los cuestionarios.

2.2.2. Criterios de exclusión: se excluyeron a los participantes que reportaron datos atípicos en el cuestionario. Un caso atípico se definió como valores en la duración de AF  $\geq 18$  h/día.

El estudio se llevó a cabo durante el periodo comprendido entre los meses de marzo a junio de 2021, periodo en el cual la población se hallaba aún bajo medidas de aislamiento social, como consecuencia de las restricciones de salud pública. Es pertinente destacar que no se registraron datos incompletos, dado que se requería la respuesta a la pregunta previa para avanzar en el cuestionario.

### 2.3. Definición de variables

2.3.1. Estrés percibido: La variable de interés fue el EP en el último mes. Esta se midió a través de la Escala de estrés percibido de Cohen (EEP-14) (23), la cual está validada en castellano (24) y presenta buenas propiedades psicométricas en docentes universitarios ( $\alpha=0.82$ , IC 95% 0.76-0.87) (4). La EEP-14 consta de 14 preguntas que evalúan dos dimensiones del estrés: la *percepción de estrés en situaciones diarias* (dimensión negativa, que incluye las preguntas 1,2,3,8,11,12,14), relacionadas con experiencias y situaciones negativas, y el *control de estrés* (dimensión positiva, que incluye las preguntas 4,5,6,7,9,10,13). Cada pregunta se califica en una escala tipo Likert de 0 (nunca)

a 4 (muy a menudo). El puntaje total varía de 0-56 puntos, siendo un puntaje más alto indicativo de una mayor presencia de estrés y viceversa (23,25). Dado que diversos autores (26–29) no establecen un punto de corte exacto, se consideró la mediana 24 como punto de corte para establecer los niveles bajo y alto de estrés.

2.3.2. Actividad física: la variable independiente se evaluó mediante el Cuestionario Internacional de Actividad física-IPAQ, validado en más de 12 países, incluyendo los de habla hispana, con una confiabilidad  $r=0.76$  (IC 95% 0.73-0.77) (30). La versión corta del cuestionario evalúa tres tipos de actividades diarias de intensidad moderada, vigorosa y caminata. El puntaje total se calcula multiplicando la tasa metabólica basal (MET): 3.3; 4.0 y 8.0 MET respectivamente, por los minutos por semana de actividad. El resultado total se obtiene al sumando estas actividades según el algoritmo detallado en *Guidelines for data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ)-Short Form* (31).

2.3.3. Variables confusoras: se identificaron mediante grafos acíclicos dirigidos (DAG, disponible en material suplementario S1) (32), siguiendo un enfoque teórico y epidemiológico. Estas variables incluyen género (masculino, femenino)(33) , edad (33,34) , jefe de familia (si, no), hijos económicamente dependientes (no tiene hijos, no tiene hijos económicamente dependientes, tiene hijos económicamente dependientes) (6,35), meses en trabajo remoto (33), horas en trabajo remoto por semana (<30 horas/semana,  $\geq$  30 horas/semana) (15), dedicación universitaria (tiempo parcial, tiempo completo) (34) y calidad de sueño (36). La calidad de sueño se evaluó utilizando el Cuestionario de calidad de sueño de Pittsburgh de Buysse (37), que consiste de 19 preguntas y clasifica los resultados en 4 categorías: un puntaje menor a 5 puntos indica “sin problemas de sueño”, de 5-7 puntos “merece atención medica”, de 8-14 “merece atención médica y tratamiento” y de 15 puntos a más “problemas severos de sueño”.

## 2.4. Procedimiento y recolección de información

Se creó un cuestionario en la plataforma Typeforms (<https://www.typeform.com/es/>) y se distribuyó a los docentes a través de correos electrónicos institucionales proporcionados por la unidad de informática de la universidad. Previo a esta distribución, se obtuvo la autorización de la oficina de Rectorado mediante el proveído digital N°1798-2020-R/UNHEVAL. Para reducir el sesgo de selección por sobrerreporte, se filtraron las respuestas por Network Id para evitar duplicados. Se enviaron recordatorios cada dos semanas durante un periodo de cuatro meses para aumentar la tasa de respuesta. Los datos se exportaron a una hoja de Excel y fueron revisados en busca de valores atípicos de manera independiente por dos investigadores: LCA y LRT. Mayor detalle en **Fig. n° 1**.

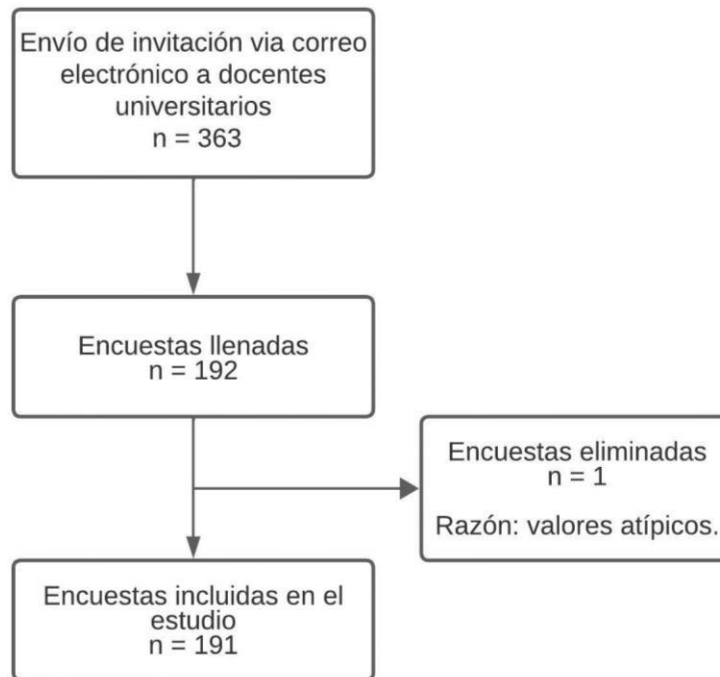


Fig.1 Flujograma de selección de participantes

## 2.5. Muestreo y tamaño de muestra

Se utilizó un muestreo no probabilístico por conveniencia. El tamaño de la muestra se determinó con el programa STATA v.15. Siguiendo la literatura, se asumió una diferencia de 28.1% en las proporciones de estrés entre los participantes con alto y

bajo nivel de AF (20.4%, 48.5%) (38) y un a razón de 1. Se consideró un IC 95% y poder estadístico de 80%. El tamaño mínimo de la muestra se estimó en 102 participantes. Además, se incluyeron 8 variables confusoras en el modelo de regresión múltiple, por lo que fue necesario establecer un número mínimo de participantes. Este se estimó mediante la fórmula  $N \geq 50 + 8m$ , donde “m” es el número de variables independientes (39), lo que resultó en un número mínimo de sujetos requeridos de 122. Finalmente, 191 participantes completaron la encuesta.

## 2.6. Análisis estadístico

Las variables cuantitativas se resumieron mediante la mediana y el rango intercuartílico (IQR), dado que no cumplían con el supuesto de normalidad. Por otro lado, las variables cualitativas se describieron a través de frecuencias absolutas y relativas. Se aplicaron pruebas de Chi-cuadrado  $\chi^2$  de Pearson, test exacto de Fischer y U-Mann Whitney para comparar grupos de bajo y alto estrés, siempre que las variables fueran categóricas o cuantitativas, respectivamente. Para el análisis de múltiples variables se utilizaron modelos de regresión de Poisson para calcular las razones de prevalencias (RP) y controlar el efecto de variables confusoras, a través del programa STATA Corp, College Station, TX, US. Se elaboraron cuatro modelos de regresión basados en el enfoque por bloques (*blockwise regression analysis*) o sets de variables. Este enfoque se implementó con el propósito de examinar la relación entre potenciales variables confusoras y la variable resultado, dividiendo los confusores en bloques temáticos, estructurales o funcionales (conceptualmente relacionados) (40). Con el objetivo de entender mejor la contribución de cada bloque de variables al modelo, se introdujo un conjunto específico de variables confusoras en cada modelo de la siguiente manera, modelo 1: se exploraron asociaciones individuales de factores sociodemográficos (edad, género), modelo 2: variables familiares (jefe de hogar e hijos económicamente dependientes), modelo 3: factores laborales (meses en teletrabajo, dedicación profesional, horas de trabajo a la semana) y modelo 4: factores individuales (calidad del sueño). Cada modelo evaluó asociaciones únicas de los factores con el EP y AF. Finalmente, se construyó un quinto modelo que incorporó todas las variables mencionadas. Se evaluaron los



supuestos del modelo, la multicolinealidad de las variables mediante el factor de inflación de la varianza ( $VIF > 10$ ), y la bondad de ajuste de Pearson, asimismo como indicador de la calidad del modelo se tomó en cuenta el criterio de información de Akaike (AIC). Un valor de  $p < 0.05$  se consideró estadísticamente significativo.

## 2.7. Consideraciones éticas

Este estudio se llevó a cabo de acuerdo con las directrices de la “Declaración de Helsinki” y fue aprobado por el Comité de Investigación y Ética Institucional de la Universidad Científica del Sur (UCSUR), en Lima, Perú con el código: N°299-CIEI-CIENTIFICA- 2020. La aceptación del consentimiento informado (virtual) fue un requisito previo para continuar con el llenado de la encuesta. Además, el Instituto Nacional de Salud del Perú, a través de la plataforma PRISA, registra investigaciones en salud a nivel nacional. Por lo tanto, este estudio fue registrado bajo el código: EI00000001535 el 27/10/2020.

## 3. RESULTADOS

### 3.1. Características de la muestra de estudio

Se recolectó la información de 191 participantes de los cuales la prevalencia de AF baja fue casi el doble de la proporción de participantes con AF alta (29.32%). Entre los hallazgos de características sociodemográficas el 39.27% fueron mujeres, con una mediana de edad de la muestra de 52 (41-60) años. Además, una gran cantidad de participantes reportó ser jefe de familia (81.68%) y tener hijos económicamente dependientes (60.73%). Otras características importantes de mencionar fueron la proporción de docentes que realizan docencia a tiempo completo (69.11%) y las características de sueño como “merece atención y tratamiento médico” en más del 50% de docentes. Otros resultados disponibles en la **tabla 1**.

**Tabla 1:** características generales de los participantes (n=191).

	n	%
<b><i>Características sociodemográficas</i></b>		
Genero		
Masculino	116	60.73
Femenino	75	39.27
Edad †		52 (41-60)
<b><i>Características familiares</i></b>		
Jefe de familia		
Si	156	81.68
No	35	18.32
Hijos económicamente dependientes		
No tiene hijos	33	17.28
No tiene hijos económicamente dependientes	39	20.42
Tiene hijos económicamente dependientes	119	62.3
<b><i>Características laborales</i></b>		
Meses en trabajo remoto †		10 (8-12)
Horas laborales por semana		
< 30 horas	75	39.27
≥ 30 horas	116	60.73
Dedicación universitaria		
Tiempo parcial	59	30.89
Tiempo completo	132	69.11
<b><i>Características individuales</i></b>		
Calidad de sueño		
Sin problemas de sueño	29	15.18
Merecen atención médica	57	29.84
Merece atención y tratamiento médico	97	50.79
Problemas severos de sueño	8	4.19
Estrés percibido		
Bajo estrés percibido	101	52.88
Alto estrés percibido	90	47.12
Actividad física		
AFB <sup>1</sup>	93	48.69
AFM <sup>2</sup>	42	21.99
AFA <sup>3</sup>	56	29.32

† Mediana y rango intercuartílico

1 Actividad física baja

2 Actividad física moderada

3 Actividad física alta

### 3.2. Asociaciones bivariadas entre el estrés percibido y actividad física

La mediana de bajo estrés fue 19(RIQ: 15-22, rango: 4-24) y 32 (RIQ:28-38, rango:25-50) para alto estrés. Las características de los participantes de acuerdo al nivel de estrés se resumen en la **tabla 2**, en esta se aprecia que las horas laborales por semana, calidad de sueño y actividad física mostraron asociaciones estadísticamente significativas con el EP.

Adicionalmente, la **figura 1** muestra la distribución de respuestas para los 14 ítems del EP. La primera dimensión “percepción en situaciones estresantes” (preguntas: 1, 2, 3, 8, 11, 12, 14), evaluado mediante la pregunta n°1 *¿Con qué frecuencia te ha afectado algo que te ha sucedido de forma inesperada?* y n°12

*¿Con qué frecuencia ha pensado en las cosas que le quedan por hacer?*, identificó que el 32,4

% y el 39,26 % de los profesores se sintieron afectados muchas veces. Mientras que en la segunda dimensión “control subjetivo” (preguntas: 4, 5, 6, 7, 9, 10,13), evaluada por la pregunta n°6 *¿Con qué frecuencia se ha sentido seguro de su capacidad para manejar sus problemas personales?* El 47,64% de los profesores manifestaron sentirse seguros.

**Tabla 2.** Análisis bivariado del estrés percibido en el último mes (n=191)

Características	Estrés percibido				Valor p
	Bajo		Alto		
	n=101		n=90		
	n	%	n	%	
<b>Características Sociodemográficas</b>					
Género †					
Masculino	62	53.45	54	46.5	0.845
Femenino	39	52.00	36	48.0	
Edad ¥	51 (41-60) †		52 (43-60) †		0.955
<b>Características familiares</b>					
Jefe de familia †					
Si	81	51.92	75	48.08	0.576
No	20	57.14	15	42.86	
Hijos económicamente dependientes †					
No tiene hijos	17	51.52	16	48.48	0.694
No tiene hijos económ. dependientes	23	58.97	16	41.03	
Tiene hijos económ. dependientes	61	51.26	58	48.74	
<b>Características laborales</b>					
Meses en trabajo remoto ¥	10 (8-12) †		10 (8-12) †		0.854
Horas laborales por semana †					
< 30 horas	50	66.67	25	33.33	<b>0.002</b>
≥ 30 horas	51	43.97	65	56.03	
Dedicación universitaria †					
Tiempo parcial	36	61.02	23	38.98	0.132
Tiempo completo	65	49.24	67	50.76	
<b>Características individuales</b>					
Calidad de sueño §					
Sin problemas de sueño	28	96.55	1	3.45	<b>&lt; 0.001</b>
Merece atención médica	43	75.44	14	24.56	
Merece atención y tratamiento médico.	29	29.90	68	70.10	
Problemas de sueño severos	1	12.50	7	87.50	
Actividad física †					
AFB <sup>1</sup>	24	25.81	69	74.19	<b>&lt; 0.001</b>
AFM <sup>2</sup>	24	57.14	18	42.86	
AFA <sup>3</sup>	53	94.64	3	5.36	

† Mediana y rango intercuartílico

‡ prueba Chi-cuadrado de Pearson

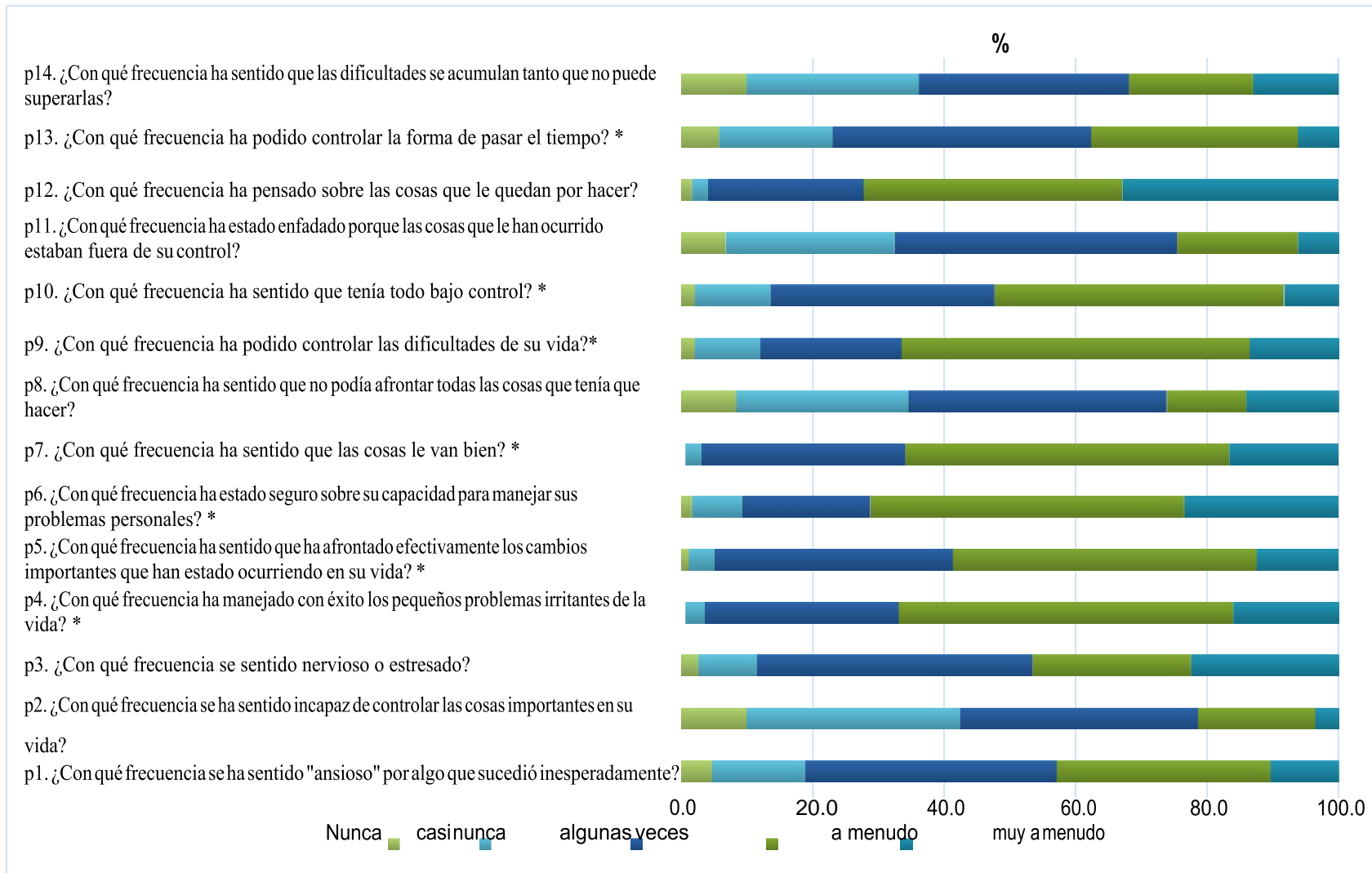
¥ Prueba U de Mann-Whitney

§ Prueba exacta de Fischer

1 actividad física baja

2 actividad física moderada

3 actividad física alta



\*ítems de puntuación inversa

**Figura 1.** Distribución de respuestas para la escala de estrés percibido EEP-14.

### 3.3. Análisis de regresión múltiple para el estrés percibido y actividad física

Los resultados del modelo de regresión que evaluaron asociaciones independientes de los factores sociodemográficas, familiares, laborales e individuales con el estrés percibido y el nivel de actividad física se presentan en la **tabla 3**. Después de ajustar por variables sociodemográficas y familiares (modelo 1 y 2), se observa que el efecto del nivel de actividad física incrementa y se mantiene significativo. Para el modelo 3, se realizaron ajustes según variables laborales, obteniendo una RP= 1.64 (1.14-2.35, IC 95%)  $p=0.008$ , para el nivel de AF bajo, y RP=0.12 (0.04-0.39, IC 95%)  $p<0.001$  para AF alto, comparado con el nivel de AF moderado. Además, se identificó que los docentes que trabajaron más de 30 h/sem tenían un 50% más de probabilidades de experimentar alto estrés en comparación con quienes trabajaban menos de 30 h/sem. En el modelo 4, ajustado por características individuales, se mantuvo un nivel de AF significativo. Asimismo, se observó que aquellos con una pobre calidad de sueño (“merece atención médica” y “merece atención médica más tratamiento”) presentan entre 94% a 98% más probabilidades de tener alto estrés, comparado con aquellos que solo merecen atención médica.

Adicionalmente, para el ajuste por grupos de variables, se evaluó la multicolinealidad para cada modelo a través del factor de inflación de la varianza VIF. Un valor  $VIF \geq 10$  fue usado como punto de corte. Se detectó multicolinealidad en el modelo 5 para las variables edad y meses en trabajo remoto por lo que, basados en un enfoque epidemiológico, se retiró esta última. El VIF del modelo global fue 4.82. Se encontró que, las personas con un nivel de AF bajo tienen 42% más probabilidades de percibir alto estrés en comparación con las personas que realizan AF moderada ( $p=0.043$ ). Además, entre los docentes que son jefes de familia la probabilidad de tener alto estrés se incrementó en más del 50% en comparación a quienes no tienen el rol de jefe. La edad se identificó como factor protector para alto estrés, por cada año de edad esta se redujo en 2%. Por otro lado, requerir atención médica más tratamiento y tener problemas severos de sueño casi duplica y triplica la probabilidad de tener alto estrés frente a quienes solo requieren atención médica. Finalmente, de entre los 5 modelos presentados, el modelo 4 mostró mejor capacidad de ajuste a los datos (AIC=268.17).

**Tabla 3.** Razones de prevalencia ajustadas de estrés percibido.

Variables	R <sub>Pc</sub>	(IC 95%)	p	Modelo 1			Modelo 2			Modelo 3			Modelo 4			Modelo 5		
				R <sub>Pa</sub>	(IC 95%)	p	R <sub>Pa</sub>	(IC 95%)	p	R <sub>Pa</sub>	(IC 95%)	p	R <sub>Pa</sub>	(IC 95%)	p	R <sub>Pa</sub>	(IC 95%)	p
Actividad física																		
AFA	0.13	(0.04-0.40)	<0.001	0.12	(0.04-0.40)	<b>&lt;0.001</b>	0.13	(0.04-0.41)	<b>0.001</b>	0.12	(0.04-0.39)	<b>&lt;0.001</b>	0.19	(0.06-0.61)	<b>0.005</b>	0.18	(0.06-0.59)	<b>0.004</b>
AFM	ref.			ref.			ref.			ref.			ref.			ref.		
AFB	1.73	(1.20-2.51)	0.004	1.74	(1.20-2.52)	<b>0.003</b>	1.78	(1.23-2.58)	<b>0.002</b>	1.64	(1.14-2.35)	<b>0.008</b>	1.47	(1.03-2.09)	<b>0.032</b>	1.42	(1.01-1.99)	<b>0.043</b>
Edad	1.00	(0.99-1.01)	0.956	1.00	(0.99-1.01)	0.511										0.98	(0.97-0.99)	<b>0.024</b>
Género																		
Masculino	ref.			ref.													ref.	
Femenino	1.03	(0.76-1.40)	0.845	0.92	(0.71-1.19)	0.533										0.94	(0.74-1.19)	0.582
Jefe de familia																		
No	ref.						ref.										ref.	
Si	1.12	(0.74-1.70)	0.589				1.27	(0.86-1.87)	0.225							1.56	(1.04-2.33)	<b>0.031</b>
Hijos económicamente dependientes.																		
No tiene hijos	ref.						ref.										ref.	
No tiene hijos eco. depend.	0.85	(0.50-1.42)	0.526				0.88	(0.58-1.34)	0.562							0.90	(0.58-1.40)	0.653
Si tiene hijos eco. depend.	1.01	(0.68-1.50)	0.979				0.84	(0.59-1.21)	0.349							0.82	(0.59-1.12)	0.207
Meses en trabajo remoto <sup>b</sup>	1.00	(0.94-1.05)	0.916							0.98	(0.94-1.03)	0.480				-	-	-
Dedicación																		
Tiempo parcial	ref.									ref.							ref.	
Tiempo completo	1.30	(0.91-1.87)	0.153							0.96	(0.69-1.34)	0.803				0.95	(0.63-1.44)	0.803
Horas laborales por semana																		
<30 h/semana	ref.									ref.							ref.	
≥30 h/semana	1.68	(1.17-2.41)	0.005							1.50	(1.05-2.13)	<b>0.025</b>				1.46	(0.98-2.19)	0.066
Calidad de sueño																		
Sin problemas de sueño	0.14	(0.02-1.02)	0.052										0.23	(0.03-1.54)	0.128	0.25	(0.04-1.73)	0.161
Merece atención médica	ref.												ref.			ref.		
Merece atención y tto. médico	2.85	(1.78-4.59)	<0.001										1.94	(1.24-3.04)	<b>0.004</b>	1.93	(1.25-2.97)	<b>0.003</b>
Problemas severos de sueño	3.56	(2.10-6.03)	<0.001										1.98	(1.19-3.30)	<b>0.009</b>	2.61	(1.51-4.53)	<b>0.001</b>
Criterio de información de Akaike (AIC) <sup>a</sup>				279.02			280.62			278.58			268.17			278.69		
Test de bondad de ajuste de Pearson				1.000			1.000			1.000			1.000			1.000		

p < 0.05 valor significativo, **R<sub>Pc</sub>**: razón de prevalencia cruda, **R<sub>Pa</sub>** razón de prevalencia ajustada, **AFA**: actividad física alta, **AFM** actividad física moderada, **AFB**: actividad física baja, a Se consideró el AIC inicial: 275.26, b variable retirada por multicolinealidad en el modelo 5.



## 4. Discusión

### 4.1. Hallazgos principales

Nuestros resultados muestran que cerca de la mitad de participantes tenían nivel de AF bajo, y más del 74% de estos presentaron un nivel de estrés alto. En este estudio, se encontró que los docentes universitarios de la UNHEVAL tienen mayores probabilidades de experimentar alto estrés al tener niveles bajos de AF, mientras que el tener niveles más bajos de EP aumenta con niveles más altos de actividad. Además, al explorar su asociación con otras variables, efecto de la actividad física se mantuvo significativo. Estos resultados son consistentes con los realizados en docentes que cuentan con un perfil insuficientemente activo y son más propensos a tener estrés (41–43) .

### 4.2. Comparación con estudios previos

Los participantes de este estudio fueron mayoritariamente varones, lo cual está en línea con lo informado a nivel nacional (44) e internacional (45,46), aunque es menor en comparación con los registros de Leire *et al.*, Freitas *et al.* y Camargo *et al.*, en los cuales las mujeres representaban más del 50% de los participantes. Además, la mediana de edad observada es mayor que la reportada para docentes a nivel nacional (44) y en otros estudios (15, 42,46), en los cuales la edad promedio ronda la cuarta década de vida. Estos resultados eran previsibles y pueden explicarse en parte por las actuales exigencias de la docencia universitaria, que requiere una mayor experiencia y trayectoria, características que se adquieren con el tiempo, especialmente entre los docentes de las universidades públicas (9).

Nuestro estudio reveló una proporción de profesores con dedicación a tiempo completo superior a la que se reporta en el *II Censo Nacional Universitario* (47). Esta discrepancia podría deberse a las opciones de respuesta del cuestionario, que no incluía la alternativa de dedicación exclusiva, lo que dificultaría distinguirla de la dedicación a tiempo completo. Sin embargo, en términos de carga de trabajo, las modalidades de dedicación exclusiva y tiempo completo se consideran equivalentes (9). En cuanto a la jornada laboral semanal, la diferencia fue más marcada, con más del 60% de los docentes trabajando más de 30 h/sem, en contraste con las 18 h de carga docente promedio de los docentes universitarios en la Sierra peruana (9). Es importante tener en cuenta que esta cifra no incluía las

horas no escolarizadas, por lo que esta diferencia podría atribuirse a las horas extra trabajadas, como la preparación de material didáctico y pruebas educativas, en su mayoría no remuneradas. No obstante, este porcentaje se asemeja al promedio reportado para profesores brasileños (41,42).

El contexto de pandemia y TR en un entorno atípico (13) ha propiciado una mayor carga laboral (2) con el consiguiente aumento de la sintomatología ansiosa, depresiva y estresante (33). En este sentido, la percepción de un alto nivel de estrés en este estudio varió en comparación con otros informes (33, 34,48). Por un lado, es inferior a la reportada a nivel mundial (33) y nacional (48), donde supera el 60% pero superior a la experimentada por colegas paraguayos (34). También se asemeja a lo reportado por docentes polacos de educación primaria (49) y profesores universitarios brasileños (45). Estas diferencias podrían explicarse por la variabilidad temporal de los informes, que abarcan distintas etapas de la pandemia (33, 42, 45,49). Un ejemplo de ello se observa en Huánuco, donde se declaró oficialmente la segunda ola el 31 de enero, lo que llevó al aislamiento obligatorio e indirectamente prolongó el TR en el ámbito educativo. Además, otros factores metodológicos, como la representatividad de la población (48), factores culturales y contextuales, así como el nivel de docencia, pueden influir en la percepción del estrés laboral (7).

La literatura previa reconoce el valor e impacto de la AF en la salud (50). Si bien los niveles de AF baja y alta encontrados en este estudio son preocupantes, los resultados son consistentes con el perfil escasamente activo de los docentes, incluso antes de la pandemia (41–43). Sin embargo, al compararlos con el perfil de los habitantes de la sierra peruana, donde los niveles de AF baja y alta alcanzan el 66,2% y el 5,6%, respectivamente (51), observamos una mejoría en la población docente. Por otro lado, en comparación con la proporción de profesores limeños con alta AF (37%) (52), nuestros hallazgos son menores (29.32%). Estas discrepancias posiblemente se deban a la exigencia del nivel de docencia y carga administrativa (53), características que podrían afectar la disponibilidad de tiempo libre (19,49).

En relación a las características sociodemográficas, los hallazgos sugieren que tanto los niveles de AF bajo como alto están directa e inversamente asociados a la

presencia de un elevado nivel de estrés, incluso después de ajustar por edad. En este estudio, la edad desempeña un papel protector en docentes con un buen nivel de AF a diferencia de los docentes portugueses cuya tendencia al estrés incrementa en relación a la edad (46). La reducción en el EP en relación a la edad y la práctica de AF en docentes universitarios podría vincularse a los años de experiencia docente; es decir, aquellos con un mayor tiempo de servicio, tendrían un mejor desempeño y conocimiento de estrategias educativas, producto de la madurez profesional y experiencia, lo cual, sumado a una correcta gestión del tiempo, permitiría la inclusión de actividades de recreación fuera del horario laboral (19).

Por otra parte, la dinámica entre el género, el nivel de AF y el EP ha sido extensamente estudiado, y demuestra que las mujeres tienden a experimentar niveles altos de EP y tener un nivel de AF deficiente (43). Esta relación se mantiene en los docentes (41,42,46) y se asocia con la preocupación por el equilibrio entre la vida laboral y personal, especialmente en lo que concierne a las responsabilidades en el hogar, como las tareas domésticas (54) y la maternidad (11). Sin embargo, en este estudio no se encontraron diferencias significativas en los niveles de estrés y AF según el género. Esto podría explicarse por la existencia de responsabilidades parentales compartidas y un mayor apoyo por parte de la pareja en las tareas del hogar, lo que se traduce en una reducción de la brecha entre las obligaciones familiares y laborales, aliviando la carga familiar en las mujeres (42).

Además, los factores familiares como el ser jefe de familia, requieren un mayor compromiso, ya que la persona a cargo debe asumir la mayor parte de la carga económica. Se espera que aquellos que desempeñen este rol experimenten un mayor desgaste físico y psicológico, especialmente si tienen hijos o dependientes (ancianos o personas con discapacidad). También es común que tengan menos tiempo para realizar AF durante las horas no laborales (45). Esto sugiere que las diferencias observadas en el EP y la AF entre jefes y no jefes de familia podrían estar más relacionadas con el rol de la persona a cargo del hogar, más que con el género en sí.

Además, es relevante destacar que más del 84% de los encuestados presentó

algún problema relacionado con la calidad del sueño, requiriendo atención y tratamiento médico, muy por encima de lo informado por López-García et al., Crepaldi et al. y Freitas et al. (5,6,34). Informes preliminares sugieren que los docentes presentan problemas de sueño, como somnolencia diurna (55) e insomnio (36). Esta situación se ha visto agravada por la transición al TR, la reducción en la estabilidad financiera (13,56) y la disminución en la práctica de AF (56,57) debido al confinamiento. Esto ha llevado a que los profesores tomen múltiples trabajos, prolongando su jornada y carga de trabajo, lo que, a su vez, ha tenido un impacto negativo en su calidad de vida (36,55) y su EP (6).

Es relevante mencionar que los resultados observados en este estudio probablemente estén influenciados por la coincidencia en la recolección de la información y el inicio de la 2° ola de la pandemia en el departamento de Huánuco. Esto se suma a otros factores relacionados con la organización del trabajo (58), la inestabilidad contextual y las expectativas frustradas, que son una fuente principal de ansiedad y estrés (4), y afecta negativamente la calidad del sueño (5,6). Estos factores en conjunto deterioran el estado de salud mental de los profesores.

Finalmente, al momento de esta publicación, el período actual de COVID-19 prácticamente ha remitido en todo el mundo, esta investigación subraya la importancia de mantener niveles saludables de AF incluso en contextos adversos lo que tiene un impacto positivo en la percepción del estrés en los profesores universitarios. Es esencial considerar que la aceleración de la transformación digital para mejorar los procesos de enseñanza, contemplada en la *“Política Nacional de Educación Superior Técnico Productiva”* al 2030 (59) indica la continuidad de la educación semipresencial y a distancia, además de la implementación del teletrabajo impulsado por el gobierno Peruano. Esto garantiza la permanencia de esta modalidad laboral. En consecuencia, es necesario promover una cultura de atención y prevención de la salud a través de programas destinados a los profesores, así como establecer políticas que promuevan la extensión de la salud ocupacional al teletrabajo, con el fin de reducir riesgos psicosociales.

#### 4.3. Fortalezas y limitaciones

Se reconocen cuatro limitaciones sustanciales en el presente estudio. En primer

lugar, dada la naturaleza observacional transversal del diseño, se restringe a la mera estimación de asociaciones, sin la posibilidad de establecer relaciones causales definitivas.

En segundo lugar, la recolección de datos abarcó el periodo comprendido entre marzo y junio de 2021, durante el cual la población experimentó medidas de cuarentena en respuesta al incremento de casos positivos de COVID-19. Este contexto adverso puede haber ejercido una influencia sustancial en las respuestas relativas a la salud mental.

En tercer lugar, no se tuvo en cuenta la posibilidad de que los docentes participantes desempeñaran roles asistenciales simultáneamente, especialmente en áreas de primera línea, o presentaran antecedentes de patologías de salud mental diagnosticados. Por ende, la asociación identificada no únicamente puede atribuirse a la actividad física y los factores mencionados previamente, sino también a la presencia de comorbilidades preexistentes. Asimismo, dada la medida de aislamiento social esta podría haber limitado las oportunidades para llevar a cabo actividades al aire libre, en virtud de las restricciones de acceso a espacios públicos y centros de entretenimiento. En este contexto, es plausible que el instrumento empleado no haya capturado de manera exhaustiva las diversas formas de ejercicio en ambientes cerrados, lo que posiblemente conduzca a una subestimación del nivel efectivo de actividad física.

En cuarto lugar, resulta imperativo considerar la posibilidad de que surjan problemas de causalidad inversa debido a la diferencia temporal y al sesgo de recuerdo inherentes a la naturaleza de las respuestas. En particular, la variable de exposición (EP) hace referencia al último mes de trabajo, mientras que la variable de resultado (AF) aborda la actividad física en la última semana. No obstante, es esencial destacar que otros estudios respaldan la dirección de la asociación propuesta. (38).

Finalmente, dado que la muestra se restringe a docentes universitarios de una entidad pública la generalización de los resultados a la totalidad de docentes universitarios en el país, no sería adecuado. No obstante, se postula que los resultados son extrapolables a docentes que laboran en contextos y bajo características similares, enfatizando así la aplicabilidad condicional de las conclusiones obtenidas. A la fecha,

este es uno de los pocos estudios en población docente universitaria cuya procedencia mayoritaria pertenece a la región sierra del Perú, y que explora la asociación entre el nivel de AF, EP y otros factores durante la pandemia COVID-19. Esta información sería útil en el diseño medidas específicas en la prevención de altos niveles de estrés y el deterioro de AF durante el TR y la educación híbrida, la cual es considerada permanente al menos en la educación superior. Adicionalmente, la salud ocupacional en los docentes peruanos, en general, es una de las más relegadas, no existen reportes o evidencias de fuentes oficiales sobre el estado de los trabajadores durante este contexto, por lo que este estudio brinda mirada inicial al estado y condiciones del profesorado durante la pandemia.

## 5. Conclusión

Los hallazgos señalan que docentes universitarios con un nivel alto de AF presentan menos propensión a percibir niveles elevados de estrés, en contraste con aquellos caracterizados por un nivel bajo de AF, quienes presentaron mayores niveles de estrés percibido. Cabe destacar que esta asociación se mantuvo significativa en el contexto, incluso tras ajustar por características sociodemográficas, familiares, laborales e individuales. Entre los factores determinantes, se identificaron la edad, la condición de ser jefe de hogar y la presencia de dificultades relacionadas con el sueño.

La realidad de las universidades públicas en países de bajos y medianos ingresos está marcada por la falta de infraestructura, equipamiento tecnológico, plataformas multimedia para el TR por lo que, estudios futuros deben considerar la influencia de factores organizacionales, laborales y de apoyo en profesores

peruanos con características similares en el contexto de la educación híbrida o el teletrabajo, además de asegurar la implementación de programas de vigilancia de la salud ocupacional en este sector.

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## ABREVIATURAS

**AF:** actividad física.

**AFA:** actividad física alta.

**AFB:** actividad física baja.

**AFM:** actividad física moderada.

**AIC:** Criterio de información de Akaike.

**DeCS:** descriptor de Ciencias de la Salud

**EEP-14:** escala de estrés percibido de 14 ítems.

**EP:** estrés percibido

**HED** hijos económicamente dependientes

**HNED:** hijos no económicamente dependientes

**IC:** intervalo de confianza

**IPAQ:** international physical activity questionnaire

**MET:** metabolic equivalent task

**NTH:** no tiene hijos

**PA:** physical activity

**PS:** perceived stress

**RIQ:** rango intercuartílico

**RPa:** razón de prevalencia ajustada

**RPc:** razón de prevalencia cruda.

**TR:** trabajo remoto

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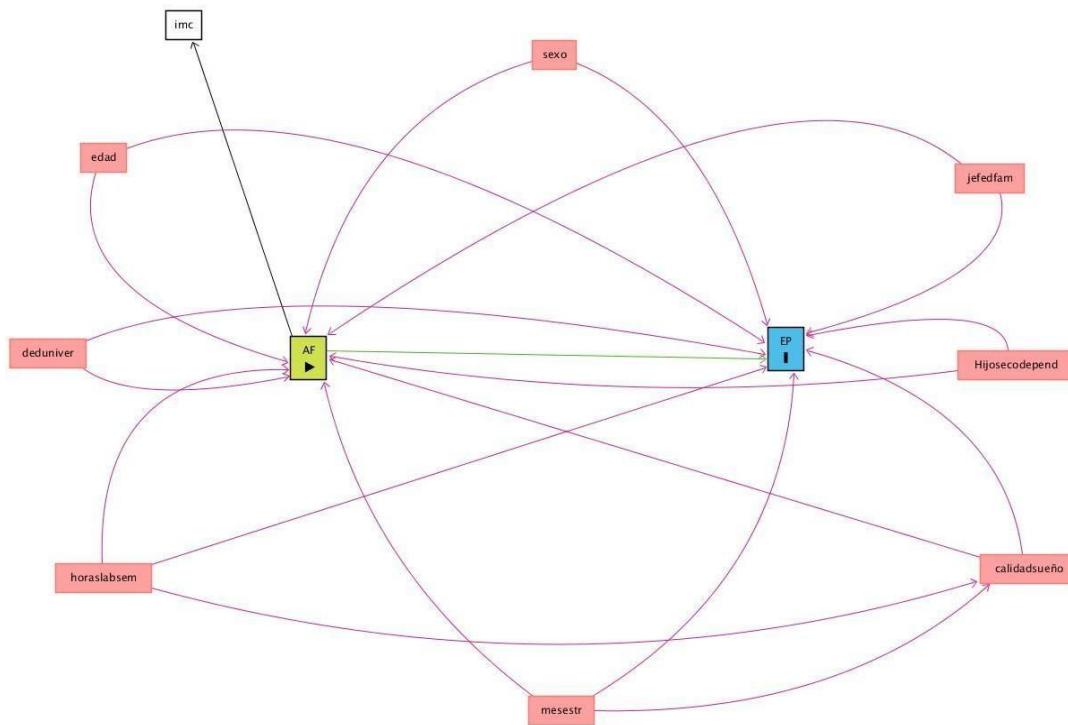
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**MATERIAL SUPLEMENTARIO S1**

Grafo acíclico dirigido





## Referencias de DAG

variable	Referencias
Variable exposición y outcome	
Actividad física y estrés percibido	<i>Aperribai et.al</i> (15) (la cantidad AF realizada en casa es un predictor del estado de salud mental de los docentes). <i>Bogaert et.al</i> (19) (la AF practicada en tiempo libre y no en educi laboral contribuye a la reducción del estrés en educi).
Variables confusoras	
Edad	<i>Kang Ma, Luyao Liang. Et.al</i> (33)(la edad se asoció positiva y negativamente con la percepción de estrés en docentes). <i>López-García et al</i> (34)(la edad media fue mayor en el grupo de docentes sin estrés)
Sexo	<i>Kang Ma, Luyao Liang</i> (33) (se ha reportado que las docentes mujeres expresan mayores puntajes de estrés en comparación a sus colegas varones).
Ser jefe de hogar, Tener hijos	<i>Freitas et.al</i> (6)(el tener hijos es un factor asociado a la pobre practica de AF, calidad de sueño con impacto en la carga laboral y con consecuencias psicosociales). <i>Limbers et.al</i> (35)(las madres con niños menores –especialmente menores de 5 años y los más dependientes-, generan mayor demanda de atención, lo que supone mayor percepción de estrés y educación de tiempo libre).
Dedicación universitaria	<i>López-García</i> (34)(la fuerza de asociación para el estrés con el trabajo semanal, la frecuencia de actividad física, así como tipo de actividad-docente, administrativa- explicaron en 41.9% la variabilidad de estrés percibido).
Horas laborales	<i>Aperribai et.al</i> (15)(las horas laborales dedicadas al trabajo docente son considerados predictor del estado de salud mental de los docentes).
Meses en trabajo remoto	<i>Kang Ma, Luyao Liang. Et.al</i> (33)(El tiempo de experiencia en docencia se asocio positivamente con la intensidad de estrés percibido)
Calidad de sueño	<i>De Souza JC</i> (36)(docentes de escuela secundaria muestran señales de privación de sueño, somnolencia diurna y 51% presenta una pobre calidad de sueño). <i>Fontana et.al</i> (57)(los docentes con niveles mas altos de AF , reportaron mejor calidad de sueño y en consecuencias menores niveles de estrés percibido).

ANEXO N°1

Carta de aceptación

**Date:** May 16, 2023  
**To:** "Liliana Cruz-Ausejo" rcruzausejo@gmail.com  
**From:** "Heliyon" info@heliyon.com  
**Subject:** Decision on submission to Heliyon

Manuscript Number: HELIYON-D-22-24555R2  
 Title: Physical activity level and factors associated with perceived stress among Peruvian university professors during the COVID-19 pandemic  
 Journal: Heliyon

Dear Miss Cruz-Ausejo,

Thank you for submitting your manuscript to Heliyon.

I am pleased to inform you that your manuscript has been accepted for publication.

Your accepted manuscript will now be transferred to our production department. We will create a proof which you will be asked to check, and you will also be asked to complete a number of online forms required for publication. If we need additional information from you during the production process, we will contact you directly.

We appreciate and value your contribution to Heliyon. We regularly invite authors of recently published manuscript to participate in the peer review process. If you were not already part of the journal's reviewer pool, you have now been added to it. We look forward to your continued participation in our journal, and we hope you will consider us again for future submissions.

We encourage authors of original research papers to share the research objects – including raw data, methods, protocols, software, hardware and other outputs – associated with their paper. More information on how our open access Research Elements Journals can help you do this is available at [https://www.elsevier.com/authors/tools-and-resources/research-elements-journals?ogcid=ec\\_em\\_research\\_elements\\_email](https://www.elsevier.com/authors/tools-and-resources/research-elements-journals?ogcid=ec_em_research_elements_email).

Kind regards,  
 Apoorva Singh  
 Editorial Section Manager  
 Heliyon

**Embargo**  
 Embargos are not automatically set for papers published in Heliyon. Papers appear online a few days after acceptance. To request a media embargo and/or publication on a specific date to assist an institutional press release, please reach out to the Heliyon team ([info@heliyon.com](mailto:info@heliyon.com)) as soon as possible and we will do our best to accommodate your request.

**Editorial office comments:**

Ready to accept

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1/2

## ANEXO N°2

### Escala de Estrés Percibido (Perceived Stress Scale, PSS-14)

Esta escala es un instrumento de auto informe que evalúa el nivel de estrés percibido durante el último mes, consta de 14 ítems con un formato de respuesta de una escala de cinco puntos (0 = nunca, 1 = casi nunca, 2 = de vez en cuando, 3 = a menudo, 4 = muy a menudo). La puntuación total de la PSS se obtiene invirtiendo las puntuaciones de los ítems 4, 5, 6, 7, 9, 10 y 13 (en el sentido siguiente: 0=4, 1=3, 2=2, 3=1 y 4=0) y sumando entonces los 14 ítems.

#### Escala de Estrés Percibido

Versión española (2.0) de la *Perceived Stress Scale (PSS)* de Cohen, S., Kamarck, T., & Mermelstein, R.(1983), adaptada por el Dr. Eduardo Remor.

Escala de Estrés Percibido - *Perceived Stress Scale (PSS)* – versión completa 14 ítems.

Las preguntas en esta escala hacen referencia a sus sentimientos y pensamientos durante el **último mes**. En cada caso, por favor indique con una “X” cómo usted se ha sentido o ha pensado en cada situación.

	Nunca	Casi nunca	De vez en cuando	A menudo	Muy a menudo
1. En el último mes, ¿con qué frecuencia ha estado afectado por algo que ha ocurrido inesperadamente?	0	1	2	3	4
2. En el último mes, ¿con qué frecuencia se ha sentido incapaz de controlar las cosas importantes en su vida?	0	1	2	3	4
3. En el último mes, ¿con qué frecuencia se ha sentido nervioso o estresado?	0	1	2	3	4
4. En el último mes, ¿con qué frecuencia ha manejado con éxito los pequeños problemas irritantes de la vida?	0	1	2	3	4
5. En el último mes, ¿con qué frecuencia ha sentido que ha afrontado efectivamente los cambios importantes que han estado ocurriendo en su vida?	0	1	2	3	4
6. En el último mes, ¿con qué frecuencia ha estado seguro sobre su capacidad para manejar sus problemas personales?	0	1	2	3	4
7. En el último mes, ¿con qué frecuencia ha sentido que las cosas le van bien?	0	1	2	3	4

8. En el último mes, ¿con qué frecuencia ha sentido que no podía afrontar todas las cosas que tenía que hacer?	0	1	2	3	4
9. En el último mes, ¿con qué frecuencia ha podido controlar las dificultades de su vida?	0	1	2	3	4
10. En el último mes, ¿con qué frecuencia se ha sentido que tenía todo bajo control?	0	1	2	3	4
11. En el último mes, ¿con qué frecuencia ha estado enfadado porque las cosas que le han ocurrido estaban fuera de su control?	0	1	2	3	4
12. En el último mes, ¿con qué frecuencia ha pensado sobre las cosas que le quedan por hacer?	0	1	2	3	4
13. En el último mes, ¿con qué frecuencia ha podido controlar la forma de pasar el tiempo?	0	1	2	3	4
14. En el último mes, ¿con qué frecuencia ha sentido que las dificultades se acumulan tanto que no puede superarlas?	0	1	2	3	4

---

Para mayor información contactar con:

Prof. Dr. Eduardo Remor

Dpto. de Psicología Biológica y de la Salud. Facultad de Psicología. Universidad Autónoma de Madrid. 28049 Madrid, España  
 e-mail: [eduardo.remor@uam.es](mailto:eduardo.remor@uam.es)

## ANEXO N°2

### IPAQ – Cuestionario de actividad física (versión corta)

#### ACTIVIDAD FÍSICA DEL ADULTO

Estamos interesados en saber acerca de la clase de actividad física que realiza como parte de su vida diaria. No considere solo el deporte o ejercicio como actividad física, sino a cualquier movimiento que se realiza por cualquier tipo de actividad. Por favor responda a cada pregunta aún si usted no se considera una persona activa. Piense en aquellas actividades que usted hace como parte del trabajo, en el jardín y en la casa, para ir de un sitio a otro y en su tiempo libre de descanso, ejercicio o deporte.

#### Actividad física vigorosa

Piense en todas aquellas actividades vigorosas que usted realizó en los últimos 7 días. Tenga en cuenta que por actividades vigorosas nos referimos a las que siguen un gran esfuerzo físico y aumentan mucho la frecuencia cardíaca.

1. Durante la últimos 7 días ¿cuántos días realizó usted actividades físicas vigorosas como levantar objetos pesados, excavar, tareas de construcción, aeróbicos o pedaleas rápido en bicicleta?

Días por semana.....

Ninguna actividad física vigorosa ..... **(pase a la pregunta 3)**

2. ¿Cuánto tiempo en total usualmente le tomó realiza actividades físicas vigorosas en uno de esos días que las realizó?

Horas por día .....

Minutos por día .....

#### Actividad física moderada

Piense acerca de todas aquellas actividades moderadas que usted realizó en los últimos 7 días. Actividades moderadas causan un pequeño aumento de las frecuencias respiratorias y cardíaca.

3. Durante los últimos 7 días ¿Cuántos días hizo usted actividades físicas moderadas tal como cargar objetos livianos, pedalear en bicicleta a paso regular? No incluye caminatas.

Días por semana.....

Ninguna actividad física moderada **(pase a la pregunta 5)**

4. ¿Cuánto tiempo en total usualmente le tomó realiza actividades físicas moderadas en uno de esos días que las realizó?

Horas por día .....

Minutos por día .....

#### Actividad física caminando

5. Durante los últimos 7 días ¿cuántos días camino usted por al menos 10 minutos continuos?

Días por semana.....  
No camino..... (pase a la pregunta 7).

6. Usualmente ¿cuánto tiempo gastó usted en uno de esos días caminando?  
Horas por día.....  
Minutos por día.....

### Actividad física sedentaria

La última pregunta se refiere al tiempo que usted permaneció sentado (a) en la semana en los últimos 7 días. Incluya el tiempo sentado en el trabajo, la casa, estudiando y en su tiempo libre. Esto puede incluir tiempo sentado(a) en un escritorio, visitando amigos (as), leyendo o permanecer sentado(a) mirando televisión.

7. Durante los últimos 7 días ¿cuánto tiempo permaneció sentado(a) en un día en la semana?  
Horas por día.....  
Minutos por día.....

---

Encuesta de actividad física (IPAQ versión corta) Empleada en la Encuesta Nacional de Hogares (ENAH)- Vigilancia Alimentario Nutricional por Etapas de vida (VIANEV) 2017-2018, Centro Nacional de Alimentación Nutricional (CENAN)-Instituto Nacional de Salud.

### ANEXO N°3

### Registro de protocolo en PRISA

## Registro Nacional de Investigaciones en Salud

[Versión para Imprimir](#)


**Sección I - Resumen de la Investigación**  
 Código: E100000001535

1. Tipo de Investigación

1.1. Área de estudio

2. Cuenta con Aprobación o Exoneración de un Comité de Ética en Investigación

-Adjuntar autorización emitida por el comité de ética (obligatorio).

Autorización emitida por el comité de ética	
CONSTANCIA N° 299-CIEI-CIENTÍFICA-2020[329].pdf	

3. Estado de la Investigación

4. Fecha Inicio de Ejecución

5. Fecha Fin de Ejecución

6. Título de la Investigación y redacte

7. Resumen. Objetivos, materiales y métodos. (765 de 10000 caracteres permitidos)

La adopción de medidas sanitarias para el resguardo de salud en la población peruana modificó de manera imprevista el lugar de prestación laboral, restringió los espacios de circulación y alteró hábitos de convivencia en ese sentido docentes universitarios laboran desde el hogar en un contexto atípico y extendido lo cual podría mermar sus niveles de actividad física y estrés percibido. objetivo:Determinar la asociación entre actividad física y estrés percibido en docentes universitarios que adoptaron la modalidad laboral de trabajo remoto en el contexto de la pandemia por SARS-CoV-2.Estudio Observacional, transversal, analítico mediante encuesta virtual en type forms enviada vía correo electrónico a la población docente de una universidad pública peruana

8. Institución(es) Financiadora(s). En caso no haya recibido financiamiento, colocar autofinanciado.

Instituciones Financiadoras	País
1 Universidad Científica del Sur S.A.C	Perú

9. Palabras Clave. Debe proponer un mínimo de tres y un máximo de cinco.

[https://www.ins.gob.pe/prisa/ver\\_investigacion.asp?43CB0F23-38FD-4C06-B014-EB1C248E1B34](https://www.ins.gob.pe/prisa/ver_investigacion.asp?43CB0F23-38FD-4C06-B014-EB1C248E1B34)
1/2



21/5/23, 11:57

PRISA

Palabras Clave de la investigación
COVID-19
Physical Fitness
Stress, Psychological

**Sección II - Equipo de Investigación**

Investigador	RUC Institución de filiación	Institución de filiación	Obs
<a href="#">RUTH LILIANA CRUZ AUSEJO</a>	20421239275	UNIVERSIDAD CIENTÍFICA DEL SUR S.A.C.	IP
<a href="#">LENIN VLADIMIR RUEDA TORRES</a>	20131283130	INSTITUTO NACIONAL DE SALUD	
<a href="#">NATALY BRIGGETE INGUINZA LASTRA</a>	20155945860	PONTIFICIA UNIVERSIDAD CATOLICA DEL PERU	

**Sección III - Artículos Científicos de la Investigación**

- El registro de investigaciones en COVID-19 es obligatorio (DS N° 014-2020-S.A., segunda disposición complementaria final).
- El registro de proyectos de investigación en este sistema, busca fomentar la Investigación en Salud a nivel Nacional e Institucional, conforme a lo dispuesto en el artículo 23° del DS N° 001-2003-SA y en el artículo 39° de la Ley de Prevención y Control de la Tuberculosis (TBC) en el Perú, Ley Nro. 30287, el Instituto Nacional de Salud (INS) se encarga de implementar un registro de investigaciones científicas referentes a TBC, resultando su registro indispensable para el fomento e investigación de TBC.
- El registro en este sistema no supone la revisión, aprobación o autorización por parte del Instituto Nacional de Salud.
- Los ensayos clínicos con productos farmacológicos o dispositivos se rigen por el Reglamento de Ensayos Clínicos aprobado por Decreto Supremo Nro.017-2006-SA y deben registrarse el Registro Peruano de Ensayos Clínicos – REPEC.

Versión para imprimir

**ANEXO N°4**

**COMITÉ INSTITUCIONAL DE ÉTICA EN INVESTIGACIÓN**



**CONSTANCIA N° 299-CIEI-CIENTÍFICA-2020**

El presidente del Comité Institucional de Ética en Investigación de la Universidad Científica del Sur (CIEI-CIENTÍFICA) da constancia que el proyecto de investigación, cuyos datos se registran a continuación, ha sido **aprobado** por el CIEI-CIENTÍFICA.

Código de registro: **481-2020-POS99**  
 Título: **Actividad física y estrés percibido en docentes universitarios que laboran de forma remota en el contexto de la pandemia por SARS-CoV-2**  
 Investigador(a): **Ruth Liliana Cruz Ausejo**

La aprobación del proyecto de investigación implica que el documento presentado a evaluación cumple con los lineamientos de Universidad en materia de investigación y ética, los cuales se sustentan en la normativa internacional vigente. Adicionalmente, en el contexto de la pandemia de enfermedad por COVID-19, le recomendamos cumplir con las normas publicadas por el estado peruano (accesos, medidas de bioseguridad, etc.) y tener los permisos de las instituciones en las que realizará el estudio antes de ejecutarlo.

En tal sentido, esta aprobación carecerá de valor si es que el proyecto de investigación arriba indicado es modificado de cualquier forma. Toda enmienda, añadido, eliminación o eventualidad (eventos adversos, etc.) posterior a la fecha de aprobación debe ser reportado al CIEI-CIENTÍFICA.

La vigencia de la aprobación de este documento es de dieciocho (18) meses (**hasta el 21 de abril del 2022**), periodo en el que puede desarrollarse el proyecto. Cualquier trámite para su renovación deberá ser enviado antes del término de la vigencia de este documento, debiendo suspenderse todo desarrollo hasta que la renovación sea aprobada. La presentación aprobación será ratificada en la sesión del CIEI más próxima.

Villa El Salvador, 22 de octubre de 2020

  
 Mg. Fulton Paul Rivera Albinagora  
 Presidente  
 Comité Institucional de Ética en Investigación



## ANEXO N°5

COMITÉ INSTITUCIONAL DE ÉTICA EN  
INVESTIGACIÓN



### Constancia

Luego de la revisión de la solicitud, el presidente del Comité Institucional de Ética en Investigación de la Universidad Científica del Sur (CIEI-CIENTÍFICA) hace constar que el CIE-CIENTÍFICA ha aprobado de forma expedita la enmienda/modificación del proyecto de Investigación que se detalla continuación:

Código de registro: 481-2020-PO399

Título: **Actividad física y estrés percibido en docentes universitarios que laboran de forma remota en el contexto de la pandemia por SARS-CoV-2**

Investigador(es): Ruth Liliana Cruz Ausejo

Constancia de aprobación: 299-CIEI-CIENTÍFICA-2020

Periodo de aprobación: 22/10/2020 al 25/04/2022

La enmienda/modificación corresponde a los siguiente:

1. Proyecto de Investigación, versión recibida el día 26 de octubre del 2022. Se detalla lo siguientes cambios:
  - a. Ampliación de vigencia del periodo de aprobación ética. Vista la solicitud, se da la renovación de la aprobación ética, que tiene vigencia desde el 24 de noviembre del 2022 al 23 de mayo del 2023. El proyecto solo podrá ejecutarse entre los periodos detallado tanto en la constancia 299-CIEI-CIENTÍFICA-2020 como en esta enmienda.

Todas las demás características de la Investigación descritas en el proyecto original permanecen; por lo que cualquier otra modificación deberá informarse a este Comité, para su evaluación.

Lima, 24 de noviembre de 2022




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Mg. Cinthya Ruth Chipana Herquinio  
Presidente  
Comité Institucional de Ética en Investigación

**ANEXO N°6**



**RESOLUCIÓN DIRECTORAL ACADÉMICA DE CARRERA No. 439 - DACMH-DAFCS-U. CIENTIFICA-2020**

Lima, 11 de noviembre del 2020

**VISTO:**

El informe de revisión independiente académica y la aprobación de un Comité de Ética del proyecto de tesis titulado: "ACTIVIDAD FÍSICA Y ESTRÉS PERCIBIDO EN DOCENTES UNIVERSITARIOS QUE LABORAN DE FORMA REMOTA EN EL CONTEXTO DE LA PANDEMIA POR SARS-CoV-2".

**CONSIDERANDO:**

Que, de acuerdo al Reglamento General de la Universidad Científica del Sur y el reglamento y Procedimientos de trabajos de Investigación para obtener el Grado de Maestro.

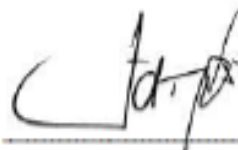
Que, de acuerdo a la normativa vigente de la Universidad Científica del Sur, en uso de las atribuciones conferidas al Director Académico de la Carrera.

**SE RESUELVE:**

ART. 1º Aprobar, en vías de regularización e inscribir el proyecto de tesis titulado: "ACTIVIDAD FÍSICA Y ESTRÉS PERCIBIDO EN DOCENTES UNIVERSITARIOS QUE LABORAN DE FORMA REMOTA EN EL CONTEXTO DE LA PANDEMIA POR SARS-CoV-2", presentado por la alumna RUTH LILIANA CRUZ AUSEJO con N° de registro: 181-2020-POS99.

ART. 2º Nombrar a la Docente JORGE ENRIQUE OSADA LIY, como asesor para el desarrollo de la tesis en cuestión.

Regístrese, comuníquese y archívese.

  
Mg. JORDI GRAU MONGE  
Director Académico  
Carrera de Medicina Humana



c.c. Archivo

ANEXO N°7



**RESOLUCIÓN DIRECTORAL ACADÉMICA DE CARRERA No. 009 - DACMH-DAFCS-U. CIENTIFICA-2023**

Lima, 05 de enero del 2023

**VISTO:**

El informe de revisión independiente académica y la aprobación de un Comité de Ética del proyecto de investigación titulado: "ACTIVIDAD FÍSICA Y ESTRÉS PERCIBIDO EN DOCENTES UNIVERSITARIOS QUE LABORAN DE FORMA REMOTA EN EL CONTEXTO DE LA PANDEMIA POR SARS-CoV-2".

**CONSIDERANDO:**

Que, de acuerdo al Reglamento General de la Universidad Científica del Sur y el reglamento y Procedimientos de trabajos de Investigación para obtener el Grado de Maestro.

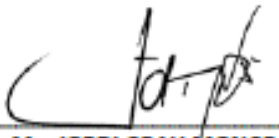
Que, de acuerdo a la normativa vigente de la Universidad Científica del Sur, en uso de las atribuciones conferidas al Director Académico de la Carrera.

**SE RESUELVE:**

**ART. 1°** Aprobar, en vías de regularización e inscribir el proyecto de tesis titulado "ACTIVIDAD FÍSICA Y ESTRÉS PERCIBIDO EN DOCENTES UNIVERSITARIOS QUE LABORAN DE FORMA REMOTA EN EL CONTEXTO DE LA PANDEMIA POR SARS-CoV-2", presentado por la alumna Ruth Liliana Cruz Ausejo con N° de registro: 481-2020-POS99.

**ART. 2°** Nombrar al Docente Jorge Enrique Osada Lij , como asesor para el desarrollo de la tesis en cuestión.

Regístrese, comuníquese y archívese.

  
**Mg. JORDI GRAU MONGE**  
 Director Académico (e)  
 Carrera de Medicina Humana

