Original Article

Physical activity as a mediator of stress, anxiety and depression on well-being in physical education teachers

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ABSTRACT

The teaching profession is currently at high psychological risk, with a large number of teachers showing high levels of anxiety, depression and stress. It has been shown that through the practice of physical activity the occurrence of these disruptive states can be prevented. The main purpose of this research is to develop and evaluate a multi-group equation model of the effect of anxiety, depression and stress on psychological well-being as a function of weekly physical activity time. An ex post facto, descriptive and comparative study is presented in a sample of 4117 teachers. The instruments used for data collection were the Depression, Anxiety and Stress Scale, the Psychological Well-being Scale and a questionnaire to collect socio-demographic variables. The results show that leading an active lifestyle helps to reduce the effect of anxiety, depression and stress on well-being. The conclusion is that being physically active helps to reduce the effect of disruptive states on well-being.

Keywords: Physical education, Negative emotional states, Early childhood education, Elementary education, Secondary education, Teachers.

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INTRODUCTION

It has now been shown that the teaching profession generates the occurrence of a number of negative emotions that influence the quality of the teaching-learning process (An et al., 2022) and job satisfaction (Li et al., 2023). Job satisfaction can be defined as a positive emotional state that results from valuing one's own work and work experiences (Madigan & Kim, 2021). Within the field of work psychology, studies have developed in which the incidence of job satisfaction on a person's well-being has been investigated (Luque-Reca et al., 2022). Research by Luque-Reca et al. (2022) found that a positive attitude towards the work environment generates a positive transmission of emotional states outside the work environment. Furthermore, Seroni (2019) found that a positive attitude towards the work environment has a positive impact on the psychological well-being of the employee.

Studies have pointed out that well-being is characterised as a phenomenon that encompasses behavioural, affective, and cognitive elements (Tsurumi et al., 2021).

In the field of psychology, the study of well-being has focused on two aspects: subjective well-being and psychological well-being (Joshanloo, 2019). Within subjective well-being it is developed under the concept of hedonism (Kuan & Zhang, 2022) although eudaimonic aspects such as self-fulfilment and autonomy are also involved (Jia et al., 2021). The study of psychological well-being is developed within the eudaimonic aspect of well-being (Maricutoiu et al., 2023). One of the most studied theories to explain the realisation of psychological well-being is Self-Determination Theory (Ryan & Deci, 2017). This theory concludes that there are three basic psychological needs: relatedness, autonomy, and competence (Ryan & Deci, 2017). When these three dimensions are satisfied, a positive increase in the level of well-being takes place (Ryan & Deci, 2017).

In the field of teaching, teacher well-being has been found to have a direct impact on learners (McCallum, 2021). The study by McCallum (2021) found that there is a positive correlation between teacher well-being and student achievement. The research by Jennings and Greenberg (2009) states that teacher well-being acts directly on students' happiness and motivation. Despite this, numerous studies have cited the presence of teacher emotional exhaustion (Ansari et al., 2020). Failure to carry out the relevant channelling techniques can lead to increased levels of stress, anxiety, and depression (Martínez-Monteagudo et al., 2019).

Early childhood, elementary and secondary teachers face a number of stressors in the classroom (Hoogendijk et al., 2022). It has been shown that teachers are confronted with class control, continuous educational reforms that modify the educational curriculum, continuous pressure from society and parents (Capone & Petrillo, 2020). These examples highlight the ongoing stress faced by teachers. The term stress is defined as a negative state that causes the onset of fatigue and mental exhaustion resulting from overachievement that exceeds the subject's level of competence (Zhao et al., 2022). If these stresses are not controlled, an overload or exhaustion phase can occur (Zhao et al., 2022). Regardless of this definition, Kyriacou (2001) defines teacher stress as "*a negative experience where teachers experience negative emotional states such as anxiety and depression as a result of their teaching work*" (p.28).

Depression is characterised as a mental disorder in which low mood and aversion to any activity is experienced, acting directly on the subject's behaviours, thoughts, and sense of well-being (Ghasemi, 2022). Studies highlight that many teachers suffer from depression compared to other professions (Ghasemi, 2022). Some longitudinal studies found that increased job burnout predicted increased depressive symptoms and increased levels of anxiety (Hung et al. 2016). Anxiety is also an emotion associated with feelings of tension,

thoughts of worry and physiological variations such as increased palpitations (Mutz et al., 2022). It has been observed that work anxiety can act negatively on everyday aspects of the subject's life (Hung et al. 2016). Furthermore, it has been observed that the psychological impact of anxiety can significantly affect emotional, mental, and physical functioning (Mohsin et al., 2022).

Being physically active has been found to help decrease levels of emotional exhaustion (Taylor et al., 2022) and to prevent the onset of anxiety, depression, and stress (Taylor et al., 2022). An active lifestyle has been shown to support the release of neurotransmitters such as serotonin, dopamine (Arazi et al., 2022) and to a lesser extent noradrenaline (Chen & Nakagawa, 2023). These neurotransmitters help prevent the development of negative emotional states (Arazi et al., 2022). To this end, there are a number of recommendations that at least 150 minutes of moderate-intensity aerobic physical activity per week should be undertaken (WHO, 2020).

The following research questions are proposed:

- Are there differences in the effect of anxiety, depression, and stress on psychological well-being as a function of weekly physical activity time?

With regard to the research hypotheses, it is established that:

- H.1. Participants who engage in more than 150 minutes of physical activity per week will show a better effect of anxiety, depression, and stress on psychological well-being.
- H.2. Participants who engage in less than 150 minutes of physical activity per week will show a worse effect of anxiety, depression, and stress on psychological well-being.

Finally, the following research objectives are proposed:

- To study levels of anxiety, depression, stress, and psychological well-being as a function of weekly physical activity time.
- To correlate the variables anxiety, depression, stress, and psychological well-being.
- To develop and evaluate a multi-group equation model of the effect of anxiety, depression, and stress on psychological well-being as a function of weekly physical activity time.

MATERIAL AND METHOD

Sample and Design

This study presents a descriptive, cross-sectional, and ex post facto (non-experimental) design as there is no manipulation of variables. Data collection was only applied to one group. A convenience sampling was used to collect the data, and the final sample consisted of 4117 teachers from the Spanish public sector. The ages of the participants ranged from 24 to 61 years (M = 32.7881; SD = 11.78760). With regard to the educational stage where the teachers were teaching, 13.8% of the sample (n = 568) worked in early childhood education, 56.2% (n = 2318) in elementary education, while 30% (n = 1231) in secondary education. Regarding the geographical distribution of the sample, Table 1 shows the distribution of the population according to Autonomous Community.

With respect to the inclusion criteria, two criteria were established. The first criterion was to be a public teacher in the Spanish education system. The second criterion was that the teachers taught the subject of physical education.

Table 1. Distribution of the sample according to autonomous community.

	N	%
La Rioja	14	0.3
Basque Country	30	0.7
Balearic Islands	31	0.8
Navarre	39	0.9
Cantabria	69	1.7
Aragon	73	1.8
Extremadura	110	2.7
Asturias	113	2.7
Canary Islands	126	3.1
Catalonia	158	3.8
Region of Murcia	213	5.2
Castille and Leon	254	6.2
Castille La Mancha	359	8.7
Galicia	401	9.7
Valencian Community	576	14.0
Community of Madrid	629	15.3
Andalusia	922	22.4
Total	**4117**	**100.0**

A total of 4327 responses were collected, but 193 were eliminated as these participants did not meet the inclusion criteria. Similarly, to ensure that questions were not randomly answered, two questions were duplicated. When the results of these two questions did not match, participants were eliminated. A total of 17 participants were eliminated. In relation to the sampling error, a confidence level of 95% was established, obtaining a margin of error of less than 5.0%.

Instruments

The instruments described below were used to collect the data:

- Socio-demographic questionnaire: This self-developed instrument was used to collect socio-demographic variables such as sex, age, autonomous community, and the speciality in which the teachers carry out the teaching-learning process (Early Childhood Education, Primary Education, Secondary Education). Likewise, it has also been used to collect the weekly physical activity time (Do you practice more than 150 minutes of physical activity per week?) (WHO, 2020).
- Depression, Anxiety and Stress Scale (Lovibond & Lovibond, 1995): The version adapted to Spanish by Daza et al. (2022) has been used. This instrument is made up of a total of 21 items that are evaluated using a Likert scale. In the reliability analysis, the questionnaire obtained an overall value of $\alpha = 0.917$. With respect to Depression, Anxiety and Stress, values of $\alpha = 0.903$, $\alpha = 0.890$ and $\alpha = 0.915$ were obtained respectively.
- Psychological Well-being Scale (Ryff, 1989): For this research we used the version adapted to Spanish by Díaz et al. (2006). This questionnaire is made up of 39 items that are assessed using a 7-point Likert scale. Cronbach's Alpha obtained a value of $\alpha = 0.893$.

Procedure

Before starting data collection, a literature review was carried out in order to find the most reliable and consistent instruments. This review process was carried out in Scopus, Web of Science and PubMed. Once the instruments had been defined, the questionnaire was developed using the Google Forms platform. The

research group then sent an information letter to different schools inviting physical education teachers to collaborate. This questionnaire was also uploaded to different social networks, which made it possible to increase the number of participants. Regarding the ethical principles of the research, all participants were assured that their data would be treated anonymously and exclusively for scientific purposes. In addition, the two ethical principles mentioned above are also reflected in the Declaration of Helsinki. This study was supervised and approved by an ethics committee belonging to the University of Granada with the identification code 2966/CEIH/2022.

Data analysis

Initially, the normality of the data was studied. For this purpose, the Kolmogorov-Smirnov test was used, applying the Lillieforts correction. It was also studied homoscedasticity using Levene's test.

After observing that the variables did not show a normal distribution, the data were analysed using the Mann-Whitney U test. Spearman's correlation coefficients were used to perform the correlational analysis, establishing the level of significance at $p \leq .01$. To carry out both the descriptive analysis and the relational analysis, the IBM SPSS Statistical software version 25.0 was used. The significance level was set at $p \leq .05$.

The IBM Statistical Package for Social Sciences Amos 26.0 (IBM Corp, Armonk, NY, United States of America) was used to develop and propose the structural equation models. The theoretical model (Figure 1) shows that it is made up of four variables. Regarding their characteristics, three show an exogenous character (Anxiety; Depression; Stress) and one an endogenous character (Psychological Well-Being). P For this last variable, causal explanations have been carried out on the basis of the different associations observed between the indicators and the degree of measurement reliability. This is why the errors of the different measurement processes have been included. The direction of the arrows symbolises the direction of the effect and these are interpreted as regression coefficients. The significance level was set at $p \leq .05$ and $p \leq .001$.

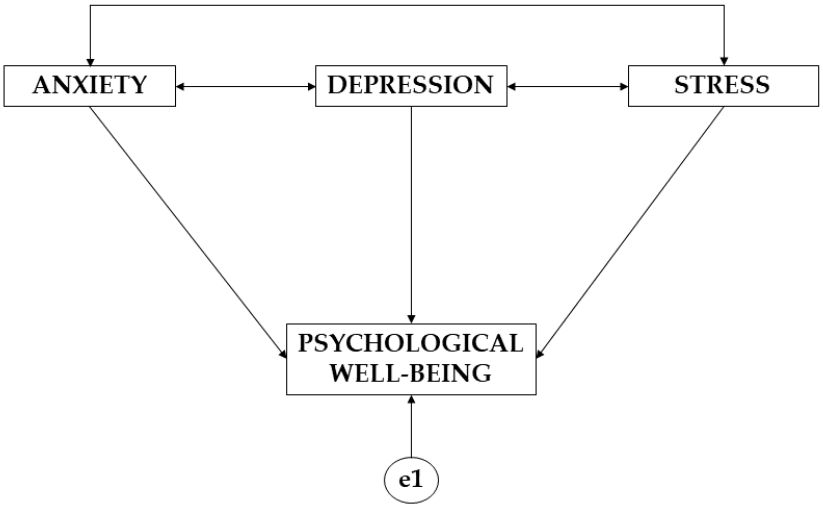

Figure 1. Theoretical structural equation model.

The recommendations proposed by Kyriazos (2018), and Maydeu-Olivares (2017) have been followed to fit the models. The Chi-Square test when it shows a non-significant value evidences a good fit (Maydeu-Olivares, 2017). Likewise, with respect to the specific fit indices Kyriazos (2018) establishes the need to

obtain values above 0.900 for the Increasing Fit Index (IFI), Comparative Fit Index (CFI) and the Normalised Fit Index (NFI). The need also arises to assess the fit of the Root Mean Square Error of Approximation (RMSEA), obtaining a good fit when values are below 0.100 (Bentler, 1990). Likewise, Tenenbaum and Eklund (2007) establish the need to evaluate the Tucker Lewis Index (TLI) due to the size and susceptibility of the sample.

Regarding the fit of the proposed model for participants who practice more than 150 physical activity per week, the model obtained a good fit for each of the indices. The Chi-Square value obtained a non-significant p-value (X^2 = 76.870; df = 16; pl = 0.016). The values obtained for the IFI, CFI, NFI, TLI and RMSEA were 0.915, 0.968, 0.940, 0.921 and 0.065 respectively. Considering the fit of the proposed model that do not meet this physical-sport criterion, a good fit was obtained. The Chi-Square value obtained a non-significant p-value (X^2 = 75.250; df = 16; pl = 0.008). The values obtained for the IFI, CFI, NFI, TLI and RMSEA were 0.900, 0.945, 0.965, 0.990 and 0.039 respectively.

RESULTS

Table 2 shows the results obtained for the comparative analysis. For depression (DP) it is observed that the more physically active participants show lower scores (3.9884 ± 0.55549) than the more sedentary ones (4.0589 ± 0.51954). Continuing with anxiety (ANX), the more physically inactive participants show higher scores (3.7616 ± 0.55529) than the more active ones (3.7185 ± 0.56657). Moving on with stress variable (STR), the more physically active participants show lower scores (4.2325 ± 0.62357) than the more sedentary ones (4.3923 ± 0.57656). Finally, for Psychological Well-Being (PSWB), better scores are evident for more physically active participants (4.2325 ± 0.62357).

Table 2. Comparative analysis.

		N	%	M ± SD	*p*
DP	More than 150 minutes	2049	49.76%	3.9884 ± 0.55549	≤ .05
	Less than 150 minutes	2068	50.24%	4.0589 ± 0.51954	
	Total	4117	100.0%	4.0163 ± 0.54257	
ANX	More than 150 minutes	2049	49.76%	3.7185 ± 0.56657	≤ .05
	Less than 150 minutes	2068	50.24%	3.7616 ± 0.55529	
	Total	4117	100.0%	3.7446 ± 0.56010	
STR	More than 150 minutes	2049	49.76%	4.2325 ± 0.62357	≤ .05
	Less than 150 minutes	2068	50.24%	4.3923 ± 0.57656	
	Total	4117	100.0%	4.2957 ± 0.61034	
PSWB	More than 150 minutes	2049	49.76%	2.1540 ± 0.41168	≤ .05
	Less than 150 minutes	2068	50.24%	2.0485 ± 0.40973	
	Total	4117	100.0%	2.1122 ± 0.41408	

Note: Depression (DP); Anxiety (ANX); Stress (STR); Psychological Well-Being (PSWB).

Table 3 shows the correlational analysis of the variables. For depression, a positive relationship is observed with anxiety (r = 0.161; $p \leq .01$) and stress (r = 0.583; $p \leq .01$). In contrast, a negative relationship is observed between depression and psychological well-being (r = -0.185; $p \leq .01$). Continuing with anxiety, it shows positive relationships with stress (r = 0.135; $p \leq .01$) and psychological well-being (r = 0.283; $p \leq .01$)). Finally, stress was negatively related to psychological well-being (r = -0.258; $p \leq .01$).

Table 3. Correlational study of the variables.

	DP	ANX	STR	PSWB
DP	1			
ANX	0.161**	1		
STR	0.583**	0.135**	1	
PSWB	-0.185**	0.283**	-0.258**	1

*Note: Depression (DP); Anxiety (ANX); Stress (STR); Psychological Well-Being (PSWB); Note: ** p ≤ .01.*

Table 4. Effects of variables obtained for participants doing more than 150 minutes of physical activity per week.

Direction of the effect	R.W.				S.R.W.
	Estimations	S.E.	C.R.	*p*	Effect
PSWB ←ANX	0.299	0.017	17.404	***	0.221
PSWB ←DP	-0.068	0.023	-2.969	**	-0.291
PSWB ←STR	-0.184	0.020	-8.997	***	-0.261
ANX ←→DP	0.052	0.008	6.528	***	0.122
DP ←→STR	0.174	0.009	18.864	***	0.490
ANX ←→STR	0.049	0.009	5.601	***	0.081

Note: Depression (DP); Anxiety (ANX); Stress (STR); Psychological Well-Being (PSWB).

Table 4 and table 5, show the results obtained for the two models of equations established. It is observed that the effect of anxiety on psychological well-being is greater for participants who practice less than three hours of physical activity per week ($p \leq .001$; $\beta = 0.410$). Participants who are more active show a smaller effect of anxiety on psychological well-being ($p \leq .001$; $\beta = 0.221$). Continuing with the effect of depression on psychological well-being, participants who practice more than three hours of physical activity show a greater effect ($p \leq .001$; $\beta = -0.291$) than those who do not meet this criterion ($p \leq .001$; $\beta = -0.101$). Regarding the effect of stress on psychological well-being participants who practice more than three hours of physical activity show a greater effect ($p \leq .001$; $\beta = -0.261$) than those who do not meet this criterion ($p \leq .001$; $\beta = -0.222$). Regarding the effect of depression on anxiety the more inactive participants show a greater effect between the two ($p \leq .001$; $\beta = 0.161$). Regarding the effect of stress on depression, more inactive teachers show a greater effect between the two ($p \leq .001$; $\beta = 0.582$). Finally, regarding the effect of anxiety on stress, it is observed that the most inactive teachers show a greater effect between the two ($p \leq .001$; $\beta = 0.143$).

Table 5. Effects of variables obtained for participants with less than 150 minutes of physical activity per week.

Direction of the effect	R.W.				S.R.W.
	Estimations	S.E.	C.R.	*p*	Effect
PSWB ←ANX	0.204	0.015	13.565	***	0.410
PSWB ←DP	-0.074	0.018	-4.068	***	-0.101
PSWB ←STR	-0.148	0.016	-9.129	***	-0.222
ANX ←→DP	0.048	0.007	7.186	***	0.161
DP ←→STR	0.201	0.009	23.380	***	0.582
ANX ←→STR	0.047	0.008	6.263	***	0.143

Note: Depression (DP); Anxiety (ANX); Stress (STR); Psychological Well-Being (PSWB).

DISCUSSION

The results obtained from the comparative analysis show that participants who engage in more than 3 hours of physical activity per week show lower levels of anxiety, depression, and stress. Numerous studies have pointed out that being physically active helps to decrease the mild and moderate effects of negative emotional states (Schultchen et al., 2019). Some research claims that this is mainly due to the release of neurotransmitters derived from the activation of different brain areas (De Bruijn et al., 2021). It is also noted that in order to mitigate the effects of these emotional states, sports practice should be rhythmic and should last 5-30 minutes with an intensity between 30%-60% of the person's maximum intensity (De Bruijn et al., 2021). It has also been observed that three hours of weekly physical activity helps to prevent the onset of negative emotional states (Windt et al., 2015). It is also evident that more active people show better scores on psychological well-being. These results show that physical activity helps to improve a person's well-being (Borland et al., 2021). It has also been shown that regular physical activity helps to improve cognitive functions and therefore to carry out work or academic tasks with a better attitude (Ghasemi, 2022).

Continuing with the correlational analysis, it is observed that depression is positively related to anxiety and stress. In this case, research by Dettman et al. (2022) states that anxiety may present as a symptom of depression. It is also possible that depression is caused by anxiety disorders such as generalised anxiety disorder, panic disorder or separation anxiety disorder (Dettman et al., 2022). Within the educational environment, burnout syndrome has been found to act as a catalyst in promoting levels of anxiety and depression (Martínez-Monteagudo et al., 2019). A negative relationship of stress and depression on psychological well-being is also obtained. Given such findings Ghasemi, (2022) states that negative emotional states have a negative impact on emotional well-being. Continuous exposure to levels of depression and stress affects mood and cognitive functioning in a direct way on a person's daily life and thus on their well-being (Hoogendijk et al., 2022). Meditation-based techniques such as yoga have been shown to help channel negative emotional states generated by the work environment (Moszeik et al., 2022).

With respect to the proposed equation models, a positive effect of anxiety on well-being is observed. In this case, this effect is greater for the more sedentary participants. In the face of such findings, very distant results have been obtained by Pu et al. (2017) establishing that anxiety has a negative effect on people's well-being. Likewise, it has been stated that low emotional competence has a negative effect on different areas of the person, such as social, physical, and family (Pu et al., 2017). Given the results obtained in this research, Evran & Es (2020) state that anxiety can be used as a positive element to get to know oneself better and therefore to know one's personal strengths and weaknesses.

The effect of depression and stress on well-being was negative, with a greater negative effect for participants who are more physically active. These results are consistent with those of research conducted by Seroni (2019). Depression and stress have been found to act negatively on well-being and job performance. Research by González-Valero et al. (2021) states that workers with symptoms related to depression and stress lead to a decrease in work levels. Furthermore, it has been observed that teachers are a population that is highly related to living with symptoms related to depression and stress (González-Valero et al., 2021). This is mainly due to the pressure they are under from society and from the parents of their students with regard to their children's learning (Li et al., 2023).

Regarding the effect of stress, depression and anxiety on each other, positive effects are observed. These are greater for participants who practice less than 150 minutes of physical activity per week. These results coincide with those obtained by Ghasemi et al. (2023) stating that these three emotional states, if not treated

correctly, can have a negative impact on people's health. It has also been shown that stress can act as a catalyst for the onset of anxiety and depression (Parson et al., 2022). Similarly, regular physical activity can be used as an element to help prevent a negative effect of these emotional states on people's health (Parson et al., 2022).

Limitations and future perspectives

Once the research questions, objectives and hypotheses have been answered, it is necessary to highlight the limitations of this research. As this is a cross-sectional study, it is only possible to establish cause-effect relationships at the time when the data were collected. Although a nationally representative sample has been obtained, it would be interesting to obtain a larger study population.

Regarding future perspectives, it would be interesting to carry out a physical-sports programme in teachers and to study the effect of the characteristics of physical activity practice (intensity, time) on anxiety, depression, and stress.

CONCLUSIONS

This study highlights the need for teachers to be physically active to mitigate the effects of anxiety, depression, and stress on well-being.

The comparative study shows that three hours of physical activity per week helps to show lower levels of anxiety, depression, and stress. On the other hand, it is observed that doing 150 minutes of physical activity per week helps to increase levels of well-being in teachers.

Regarding the correlational analysis, it is observed that anxiety, depression, and stress correlate positively with each other. On the contrary, they correlate negatively with well-being.

The multi-group structural equation models show a smaller effect of the variables anxiety, depression, and stress on each other when more than 150 minutes of physical activity are practised per week. Furthermore, a smaller effect of anxiety, depression and stress on well-being is observed when more than three hours of physical activity per week are practised.

As a general conclusion, it can be stated that three hours of physical activity per week helps to mitigate the effects generated by the work environment.

AUTHOR CONTRIBUTIONS

Conceptualisation: Eduardo Melguizo-Ibáñez and Rubén Fernández-García. Methodology: Felix Zurita-Ortega and José Luis Ubago-Jiménez. Analysis of results: Félix Zurita-Ortega and Eduardo Melguizo-Ibáñez. Drafting of the article: Rubén García-Fernández and José Luis Ubago-Jiménez. Translation of the article: José Luis Ubago-Jiménez.

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No potential conflict of interest was reported by the authors.

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