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# Relationship between motivational climate, anxiety and average mark in pre-service physical education teachers: a cross-sectional study based on structural equation modelling approach

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## Abstract

**Background** Motivation is a variable that directly influences task orientation. Within the motivational sphere, the motivational climate determines whether a task is performed with an intrinsic or extrinsic.

**Purpose** It has been observed that depending on motivational orientations, anxiety levels and task performance can be increased. Likewise, there are differences in interests depending on the gender of individuals.

**Methods** This research aims (a) To elaborate and adjust a theoretical model of the causal relationship of motivational climate on anxiety and academic performance and (b) To analyse the causal relationship between the motivational climate on anxiety and the average mark of the participants. Regarding the design, a comparative, cross-sectional and descriptive study was carried out on a sample of 558 trainee physical education teachers. The sample for this study is from southern Spain. Likewise, the branch of study of the sample is related to university degrees in education sciences and physical activity and sport sciences. The Beck Anxiety Inventory (BAI), Perceived Motivational Climate in Sport-2 and an ad hoc socio-demographic questionnaire were used to collect the data.

**Results** It is observed that the male sex presents a greater causal relationship of task climate ( $\beta = -0.259$ ;  $p \leq 0.05$ ) and ego climate ( $\beta = 0.324$ ;  $p \leq 0.001$ ) on anxiety. A stronger causal relationship of task climate ( $\beta = 0.340$ ;  $p \leq 0.001$ ) and ego climate ( $\beta = 0.241$ ;  $p \leq 0.05$ ) on mean score is also observed for the male population. The sample presents a negative causal relationship of anxiety on the average mark. This is higher for the male population ( $\beta = -0.126$ ).

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**Conclusions** Male students show a greater causal effect of motivational climate on anxiety and grade point average. Likewise, the causal relationship of task climate on the development of anxiety is negative for the study sample. In contrast, the ego climate exerts a positive causal relationship on the development of anxiety.

**Keywords** Motivational climate, Anxiety, Physical education, Academic performance

## Introduction

The university population is currently immersed in a period of physical and psychosocial change [1, 2]. Psychosocial changes include changes and preferences when carrying out different tasks [3]. One of the most worrying changes during the university stage is the increase in the sedentary time of young people [1, 3]. This is regulated by the motivation of students towards different physical-sport activities [4, 5]. Motivation is defined as a series of internal or external factors that regulate the attitude towards a task [6]. It has been observed that there are variables that condition attitude towards certain activities, such as gender [7].

Gender has been found to be a variable that determines motivation to undertake specific tasks [8]. Studies conclude that adolescence conditions adequate motivation towards an active lifestyle [8]. Young people who do not develop a favorable attitude towards physical activity in adolescence are more sedentary in adulthood [9]. Specifically, research shows that women are more sedentary than men [10]. The main conditioning factors when it comes to developing a positive attitude towards a certain activity are the academic environment together with the family area [10].

A factor that has been widely studied in the area of psychology sport is the motivational climate [11]. This concept comes from the Achievement Goals Theory [12]. It is defined as internal or external indicators from the environment that determine success or failure when undertaking a given task [13]. Farrel and Walker [14] proposed a 2×2 goal model in which goals are subdivided, with a total of four possibilities:

- **Approach-mastery:** A task orientation is adopted with a high perception of competence on the part of the subject.
- **Avoidance-mastery:** A task orientation is matched with a perception of incompetence.
- **Approach-performance:** Based on a normative feeling of competence.
- **Avoidance-performance:** The subject perceives his or her incompetence with respect to other subjects.

Contextualising the previous theory to the physical sport context, when motivation of the subjects is oriented towards the process and the task, the success of the practice is associated with intrinsic motivations such as personal satisfaction and the improvement of social relations

[15]. Conversely, when motivation is ego-oriented, values like competitiveness become more relevant [16], fostering stress and anxiety levels when competitive objectives are not achieved [16]. Depending on gender, males are more oriented towards the ego-climate, showing a higher level of competitiveness than the female sex [17]. Research affirms that when sport practice is guided by extrinsic factors and these are not achieved, sport abandonment is encouraged [6, 15, 16, 18].

Likewise, another of the most studied elements within the physical sports field is anxiety. This psycho-emotional state is defined as a negative state where symptoms like nervousness and worry are associated with a direct impact on the functioning of the somatic and cognitive areas of the person [19, 20]. Numerous studies affirm that the orientation towards which the physical-sports practice takes place can help to channel or increase the levels of anxiety [21]. When sport motivation is task-climate oriented, a decrease in anxiety levels is observed due to the secretion of neurotransmitters and the lack of extrinsic motivations [21]. On the contrary when physical activity practice is oriented towards the ego-climate, extrinsic factors are present, leading to an increase in anxiety levels when goals are not achieved [21]. Increased levels of anxiety can also be increased by the academic environment. Given such results, female gender tends to show better academic performance as they practice disruptive state channeling techniques [22].

The academic environment has been shown to be a factor that generates physical and mental discomfort in students [22]. This is mainly due to the high degree of competition for the highest possible rating [22]. In view of such statements, research carried out by Núñez-Pena & Bono [23] affirms that when a student begins the exam period, stress and anxiety levels increase and the time spent on any physical sporting activity decreases. This may result in students' poorer academic performance, as it has been shown that students who are less physically active perform less well and are less motivated to tackle different academic tasks [24].

The proposed research objectives (a) To elaborate and adjust a theoretical model of the causal relationship of motivational climate on anxiety and academic performance and (b) To analyse the causal relationship between the motivational climate on anxiety and the average mark of the participants.

Finally, the next research hypotheses are proposed:

**H.1.** Differences in the effect of motivational climate on academic performance and anxiety are expected to be found.

**H.2.** The effect of motivational climate on academic performance and anxiety will differ according to the gender of the participants.

**H.3.** It is expected that males will have a stronger effect of ego-climate on anxiety.

## Materials and methods

### Participants and design

A quantitative, cross-sectional comparative and non-experimental (ex post facto) research has been proposed. The sample for this study consisted of 558 physical education teachers in training ( $M=24.07$ ;  $S.D=4.70$ ). The gender distribution shows that 418 participants are female (74.9%) and 140 are male (25.1%). The sample is made up of students from the university degrees of Education Sciences and Sports Sciences in the south of Spain. Specifically, the sample is made up of students from the University of Granada. For data collection, simple random sampling was used. In order to meet the inclusion criteria, participants were required to be in the final year of a university degree in primary education and to be specialising in physical education. Participants who did not meet the inclusion criteria did not participate in the study. With regard to the sampling error for a confidence interval of 95%, a value of less than 5.0% was obtained. In this research it has been received the written informed consent from participants of our study.

### Instruments

The instruments used have been previously validated and show a high degree of internal reliability. Also, these have been adapted to the population of this study. The authors have permission to use this instrument from the copyright holders. Details of the instruments are given below:

- **Socio-demographic questionnaire:**

This instrument has been used to collect sociodemographic and academic variables. Specifically, it has been used to collect the variables age and sex (male / female). To collect data related to the average grade, the next categorization has been used: pass (5 to 6.99), remarkable (7-8.99) and excellent (9–10) [25].

- **Perceived Motivational Climate in Sport**

**Questionnaire-2** [26]: The version of González-Cutre et al. [27] has been used for this research. This is formed by 33 questions that are measured through a Likert scale. This questionnaire allows the collection of motivational climate values under a dual perspective, offering data related to task climate and ego climate. The internal consistency

obtained in the version of González-Cutre et al. [27] was  $\alpha=0.900$  for ego climate. For the variables that make up this variable, the following values were obtained: Punishment for errors ( $\alpha=0.770$ ), Unequal recognition ( $\alpha=0.870$ ) and rivalry between group members ( $\alpha=0.610$ ). For task climate a value of  $\alpha=0.900$  was obtained. For each of the sub-variables the following values were obtained: Cooperative learning ( $\alpha=0.650$ ), effort/improvement ( $\alpha=0.700$ ) and important role ( $\alpha=0.700$ ). For this study, a value of  $\alpha=0.840$  was obtained for task climate. For each of the sub-variables the following values were obtained: Cooperative learning ( $\alpha=0.830$ ), effort/improvement ( $\alpha=0.829$ ) and important role ( $\alpha=0.827$ ). A value of  $\alpha=0.921$  was obtained for ego climate. For the variables that make up this variable, the following values were obtained: Punishment for errors ( $\alpha=0.776$ ), Unequal recognition ( $\alpha=0.899$ ) and member rivalry ( $\alpha=0.702$ ).

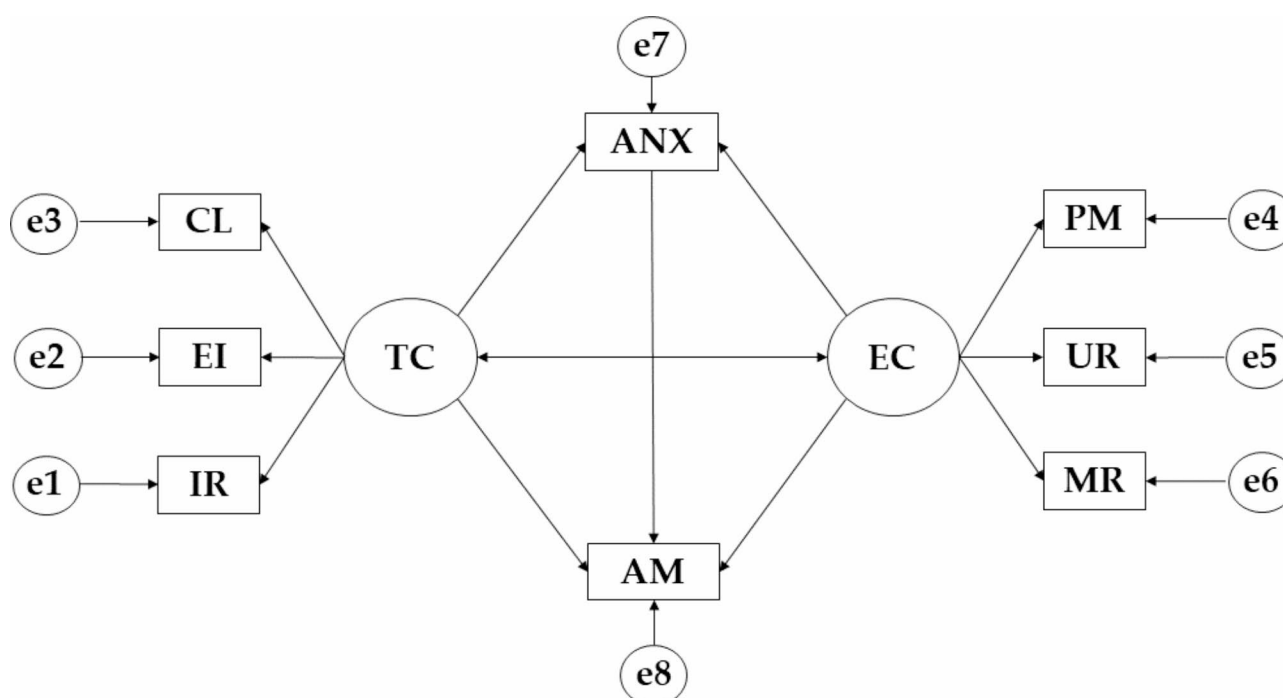
- **Beck Anxiety Inventory (BAI)** [28]: The version adapted by Sanz and Navarro [28] to Spanish has been used. This is formed by 21 items measured through a Likert scale. The internal consistency of the version of Sanz and Navarro [29] obtained a value of  $\alpha=0.911$ . For this research, a value of  $\alpha=0.936$  was obtained.

### Procedure

Data collection was carried out according to a data collection plan. The researchers prepared an information letter with the objectives of the study. Since the participants in this study were located in two faculties, this letter was sent to their institutional e-mail address. In this letter, the inclusion criteria were specified: to be students of physical activity and sport sciences or of the university degree in primary education with a major in physical education. Once the young people had received this information, they contacted the research team. With regard to ethical principles, the participants decided to complete the questionnaire on a voluntary basis. They were also guaranteed anonymity and the exclusivity that the data would be processed for scientific purposes. They were also assured that if they wanted to leave during data collection, they were free to do so. To ensure that all answers were given consciously and not randomly, three questions were repeated. All questionnaires that did not match these questions were eliminated. A total of 591 responses were obtained, but 33 questions were eliminated because of mismatches. This left a final sample of 558 participants. In terms of ethics, this research followed the various criteria set out in the Declaration of Helsinki. Furthermore, it has been supervised and approved by an ethics committee belonging to the University of Granada with code 2966/CEIH/2022.

**Table 1** Skewness and kurtosis values for the variables forming the theoretical model

	AM	TC	CL	EI	IR	EC	PM	UR	MR	ANX
Mean	1.9068	3.7632	4.0246	3.9500	4.0520	2.5820	2.3865	2.6882	2.7252	0.7933
Standard Deviation	0.5702	0.6798	0.8714	0.7170	0.8433	0.8056	0.7981	0.8242	0.9095	0.6351
Skewness	-0.009	-0.381	-0.273	-0.635	-0.425	-0.015	0.249	-0.043	-0.079	0.253
Kurtosis	0.006	0.265	0.524	0.261	0.409	-0.313	-0.158	-0.018	-0.363	0.352
Minimum	1.00	0.94	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00
Maximum	3.00	4.71	5.00	5.00	5.00	4.69	5.00	5.00	5.00	2.95

**Fig. 1** Developed theoretical model

Note: Important Role (IR); Cooperative Learning (CL); Task Climate (TC); Effort/Improvement (EI); Unequal Recognition (UR); Punishment for Mistakes (PM); Rivalry between group members (MR); Ego Climate (EC); Average Mark (AM); Anxiety (ANX)

### Data analysis

Initially, the statistical programme IBM SPSS Statistics was used. This programme was used to analyse normality. For this research, the values of skewness of the variables were between  $-0.440$  and  $0.647$ . The kurtosis values were between  $-0.365$  and  $1.042$ . For normal distribution, skewness and kurtosis values within  $\pm 2$  range are considered acceptable [30]. These values are considered acceptable for a normal distribution [30]. Once these values were known, we proceeded to make the theoretical model. Table 1 presents the values obtained for the skewness and kurtosis for each of the variables.

In order to meet the objectives and hypotheses of the study, a multigroup structural equation analysis was developed and adjusted. The IBM Statistical Package for Social Sciences Amos 26.0 programme was used to carry out the analyses. In terms of the variables that make up each of the different models, these are made up of two unobserved variables (exogenous) and eight observed

variables (endogenous). For the observed variables, causal explanations have been made. These were based on the observed associations and the degree of reliability of the measurement of the indicators. Once this had been done, the error caused by the measurement process could be included. As for the direction of the arrows, the unidirectional arrows symbolise the lines of influence between the latent variables. These are interpreted from the regression weights. To study the level of significance, two degrees of significance were established, one at  $p \leq 0.05$  and  $p \leq 0.001$  (Fig. 1).

In order to carry out an adequate adjustment of each of the models, the steps established by Kyriazos [31] and Maydeu-Olivares [32] have been followed. Likewise, following the fit criteria of these authors [31, 32], the goodness of fit should be assessed on the basis of the value obtained in the Chi-square test. When the values show a non-significant value, a good fit is obtained. Following Loehlin & Beaujean [33] and Kline [34], there are a

**Table 2** Standardised regression weights for the study sample

Effect line	R.W.				S.R.W. $\beta$
	Stimations	S.E.	C.R.	P	
ANX $\leftarrow$ TC	-0.095	0.043	-2.233	$\leq 0.05$	-0.115
ANX $\leftarrow$ EC	0.163	0.050	3.277	$\leq 0.001$	0.173
IR $\leftarrow$ TC	1.000				0.907
EI $\leftarrow$ TC	0.793	0.030	24.147	$\leq 0.001$	0.846
CL $\leftarrow$ TC	0.983	0.036	17.194	$\leq 0.001$	0.863
PM $\leftarrow$ EC	1.000				0.845
UR $\leftarrow$ EC	1.344	0.069	19.352	$\leq 0.001$	0.886
MR $\leftarrow$ EC	0.773	0.057	13.630	$\leq 0.001$	0.573
AM $\leftarrow$ TC	-0.075	0.039	-1.933	0.053	-0.084
AM $\leftarrow$ EC	0.109	0.046	2.377	$\leq 0.05$	0.129
AM $\leftarrow$ ANX	0.138	0.039	3.534	$\leq 0.001$	0.186
EC $\leftrightarrow$ TC	-0.255	0.028	-9.009	$\leq 0.001$	-0.494

number of other indices that should be assessed. These are the comparative fit index (CFI), the goodness-of-fit index (GFI) and the incremental reliability index (IFI). When scores above 0.900 are obtained, a good fit is obtained. In addition, Loehlin & Beaujean [33] and Kline [34], establish the need to consider the root mean square approximation (RMSEA), showing a good fit when scores below 0.100 are obtained.

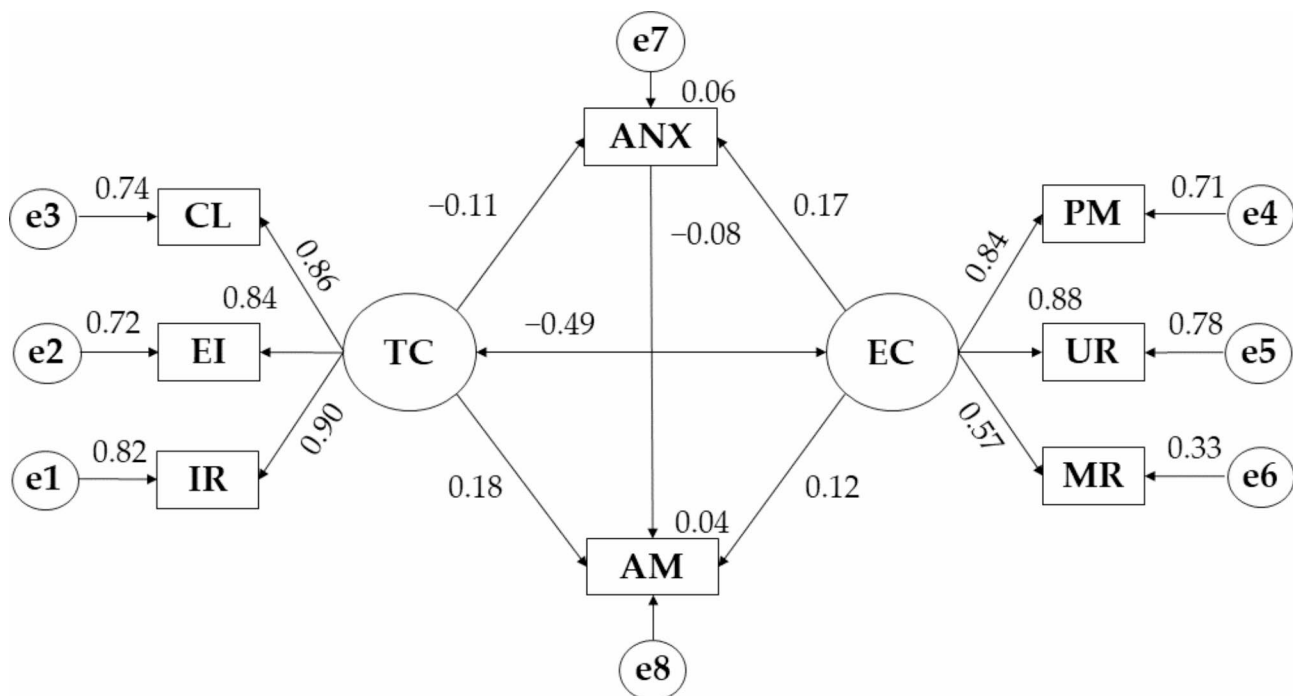
A good fit has been obtained for the proposed theoretical model ( $X^2=64.185$ ;  $df=16$ ;  $pl=0.000$ ). According to Tenembaun & Eklund [35], although a good fit has been obtained, these data cannot be interpreted independently. This is due to the size of the study sample and the degree of susceptibility of the sample [35]. Therefore,

other fit indices have been considered. Specifically, the following have been used: Comparative Fit Index, Normalised Fit Index, Incremental Fit Index together with the Tucker Lewis Index. The values obtained were 0.975, 0.967, 0.975 and 0.956 respectively. The Mean Squared Error of Approximation Analysis has also been considered. This index obtained a value of 0.074.

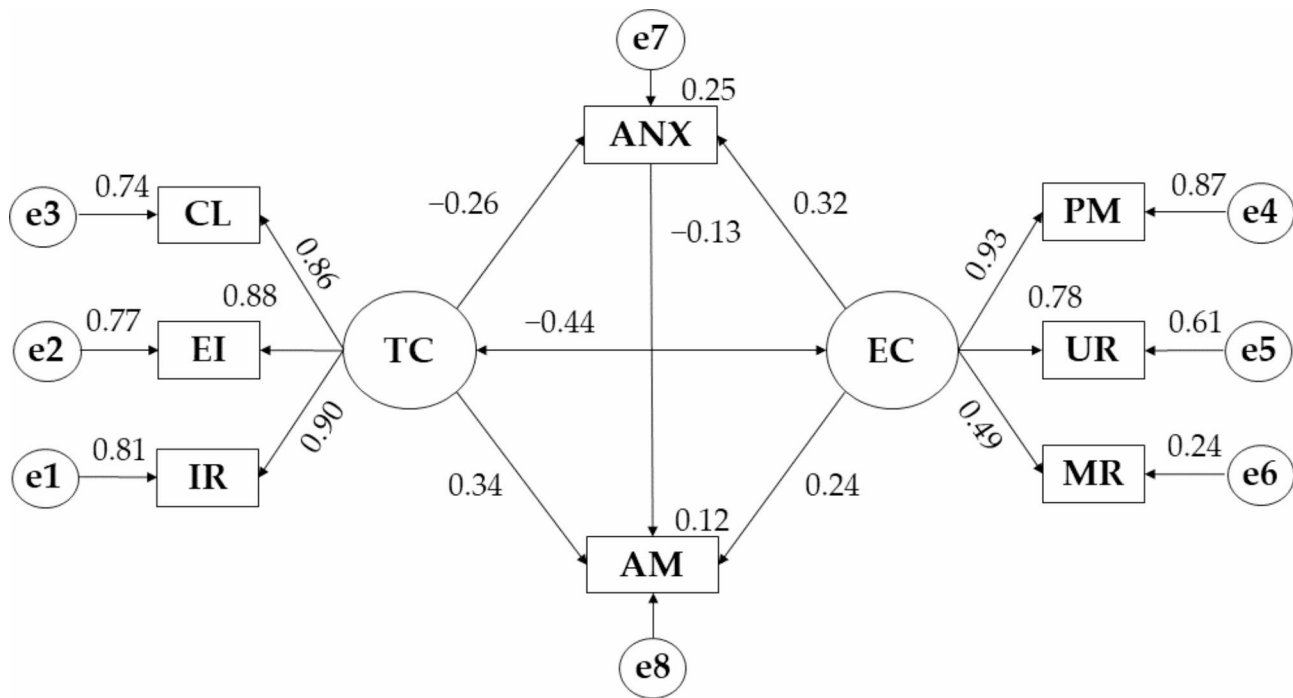
## Results

Table 2; Fig. 2 present the standardised regression weights for the sample forming this study (Hypothesis 1). A negative causal relationship was found for task climate on anxiety ( $p \leq 0.05$ ;  $\beta = -0.115$ ). On the contrary, a positive causal relationship of ego-climate on anxiety was obtained ( $p \leq 0.001$ ;  $\beta = 0.173$ ). A negative effect of task climate on the average mark is observed ( $\beta = -0.084$ ). On the other hand, a positive causal relationship of ego climate on the average grade is evident ( $p \leq 0.05$ ;  $\beta = 0.129$ ). A positive causal relationship is also obtained for anxiety on the average grade ( $p \leq 0.001$ ;  $\beta = 0.186$ ). A negative reciprocal effect is obtained between both motivational climates ( $p \leq 0.001$ ;  $\beta = -0.494$ ).

The results shown in Fig. 3; Table 3 show the effects of the variables for the male students (Hypothesis 2 and Hypothesis 3). In this case, a negative effect of task climate on anxiety is shown ( $p \leq 0.05$ ;  $\beta = -0.259$ ). On the contrary, a positive effect of ego-climate on anxiety is shown ( $p \leq 0.001$ ;  $\beta = 0.324$ ). Regarding the motivational climate effect on the mean score, a positive effect of ego-climate and task-climate was observed ( $p \leq 0.001$

**Fig. 2** Theoretical model with standardised regression weights for the whole sample





**Fig. 3** Theoretical model with standardised regression weights for the male population

**Table 3** Standardised regression weights for the male sample

Effect line	R.W.				S.R.W. $\beta$
	Stimulations	S.E.	C.R.	P	
ANX $\leftarrow$ TC	-0.255	0.089	-2.878	$\leq 0.05$	-0.259
ANX $\leftarrow$ EC	0.345	0.100	3.445	$\leq 0.001$	0.324
IR $\leftarrow$ TC	1.000				0.899
EI $\leftarrow$ TC	0.888	0.063	14.200	$\leq 0.001$	0.879
CL $\leftarrow$ TC	0.953	0.069	13.768	$\leq 0.001$	0.862
PM $\leftarrow$ EC	1.000				0.930
UR $\leftarrow$ EC	1.041	0.119	8.747	$\leq 0.001$	0.782
MR $\leftarrow$ EC	0.631	0.113	5.606	$\leq 0.001$	0.488
AM $\leftarrow$ TC	0.293	0.086	3.395	$\leq 0.001$	0.340
AM $\leftarrow$ EC	0.225	0.098	2.300	$\leq 0.05$	0.241
AM $\leftarrow$ ANX	-0.110	0.082	-1.347	0.178	-0.126
EC $\leftrightarrow$ TC	-0.198	0.046	-4.291	$\leq 0.001$	-0.442

$\beta = 0.340$ ;  $p \leq 0.05$ ;  $\beta = 0.245$ ). Considering the effect of anxiety on the mean score, a negative effect is obtained ( $\beta = -0.126$ ). Finally, a negative effect is observed between the task climate and the ego climate ( $p \leq 0.001$ ;  $\beta = -0.442$ ).

Figure 4; Table 4 evidence the results for the female population (Hypothesis 2). A negative effect of task climate on anxiety is observed ( $\beta = -0.068$ ). A positive effect of ego climate on anxiety is obtained ( $p \leq 0.05$ ;  $\beta = 0.150$ ). Regarding the effect of the motivational climate on the mean score, a positive effect of task climate and ego climate was observed ( $p \leq 0.05$ ;  $\beta = 0.134$ ;  $\beta = 0.109$ ). Considering the effect of anxiety on the mean score, a negative effect is observed ( $\beta = -0.073$ ). Finally, a negative effect

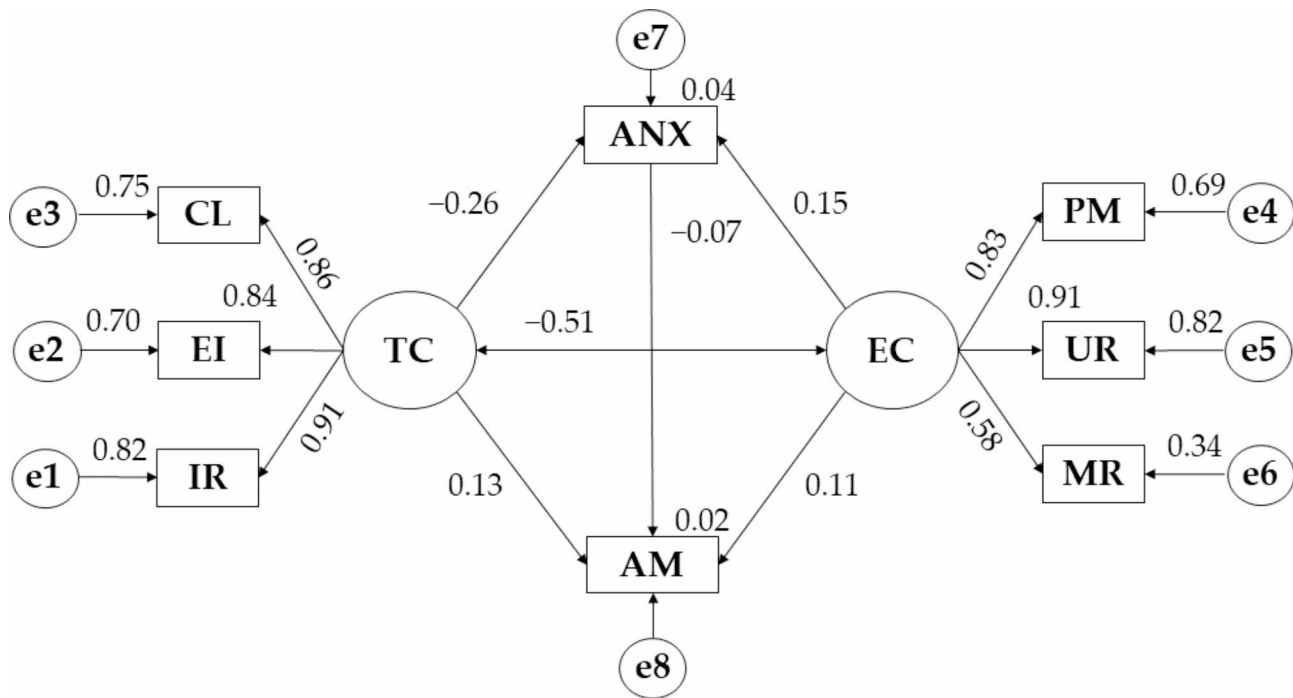
is observed between the two motivational climates ( $p \leq 0.001$ ;  $\beta = -0.511$ ).

## Discussion

Once the results of the research have been analysed, the main findings are contextualised below. It should be noted that depending on the motivational climate, there is a positive or negative causal effect on anxiety. It is also obtained that both motivational climates exert a positive causal relationship on the average mark.

The results obtained for the study population show a negative causal effect of task climate on anxiety. In contrast, the causal relationship of ego-climate on anxiety is positive. It has been observed that young people who orient their learning towards intrinsic motivation are more committed to learning [36, 37]. This leads to the promotion of meaningful learning [37]. When learning is oriented towards extrinsic factors, it is observed that if the desired outcome is not achieved, stress and anxiety levels increase [38]. This can lead to a perception of low self-efficacy, directly affecting task performance [39].

Analysing the effect of motivational climate on the average grade, a greater positive causal effect is observed for task climate. In contrast, the causal effect of ego climate is positive, but smaller. Given these findings, studies suggest that the orientation of learning towards task climate positively favours affective-behavioural control and cognitive variables [40, 41]. This results in adequate control of emotions together with full functioning of cognitive functions leading to higher task performance [41]. In



**Fig. 4** Theoretical model with standardised regression weights for the female population

**Table 4** Standardised regression weights for the female population

Effect line	R.W.				S.R.W.
	Stimulations	S.E.	C.R.	P	$\beta$
ANX $\leftarrow$ TC	-0.053	0.048	-1.123	0.261	-0.068
ANX $\leftarrow$ EC	0.134	0.055	2.427	$\leq 0.05$	0.150
IR $\leftarrow$ TC	1.000				0.907
EI $\leftarrow$ TC	0.772	0.034	22.452	$\leq 0.001$	0.839
CL $\leftarrow$ TC	0.995	0.042	23.420	$\leq 0.001$	0.863
PM $\leftarrow$ EC	1.000				0.828
UR $\leftarrow$ EC	1.413	0.083	17.001	$\leq 0.001$	0.908
MR $\leftarrow$ EC	0.785	0.065	12.052	$\leq 0.001$	0.581
AM $\leftarrow$ TC	0.096	0.044	2.169	$\leq 0.05$	0.134
AM $\leftarrow$ EC	0.089	0.051	1.728	0.084	0.109
AM $\leftarrow$ ANX	-0.067	0.045	-1.475	0.140	-0.073
EC $\leftarrow$ TC	-0.274	0.034	-7.945	***	-0.511

addition, when tasks are oriented towards ego-climate, a decrease in the performance of attention and information processing variables is observed [41]. This results from increased levels of anxiety and stress, which negatively affect cognitive performance [40, 41].

Looking at the multi-group analysis according to gender, the male population shows a greater effect of motivational climate on anxiety. A negative causal effect of task climate on anxiety is observed, being greater for the male population. These results were very different from those obtained by Abrahamsen et al. [43]. The results obtained suggest that motivational climate is important for both sexes. The results found by Abrahamsen et al. [43] state

that motivational climate on the development of anxiety is higher for the female population.

Authors have considered that the development of a certain motivational climate towards a task is derived from various socialisation processes [42]. The effect of gender on anxiety and perceived competence should be considered as a mediating effect of the motivational climate [42]. Motivational learning climates created by the male population have been found to have a greater effect on the development or decrease of anxiety [43]. In contrast, learning climates for the female population show a smaller effect on the development or decrease of anxiety [43]. This is due to the specific interests of the groups to which the learning is oriented [40, 42, 43].

The multi-group analysis carried out to analyse the causal relationship of motivational climate on the average grade shows a greater effect for the male population. The creation of a certain motivational climate towards learning is preceded by interest in learning the content [44]. The results of this study show a smaller causal effect for ego climate for both groups. Ego orientation affects the intensity of cognitive and somatic anxiety symptoms through self-confidence [45, 46]. Continued exposure over a period of time results in decreased levels of confidence and competence [39, 45]. Research suggests that for successful academic performance the two variables above play a key role [39, 45–47].

## Limitations and future perspectives

It should be noted that this study is not without its limitations. The first one is related to the design of the study. As this was a cross-sectional study, the results were only studied at one point in time. This does not allow us to analyse the evolution of the variables analysed. Likewise, the variables were collected with reliable instruments. Despite this, self-reported instruments are not free from intrinsic error during data collection. In addition, variables that could act on the variables under study have been omitted. This may have affected the results obtained.

In terms of future perspectives, this study is a step forward in its field of study. Motivation is a key factor in the response to many human behaviours. It would be useful to carry out a study with a retrospective perspective in order to analyse the factors that have conditioned the different motivational climates of the participants.

With regard to the pedagogical perspectives of this study, the need to take care of mental health should be highlighted. The educational environment sometimes increases the stress and anxiety levels of young people. This can lead to mental disorders that act negatively on people's health. This study presents a view that young people's previous interests can act on their academic performance. It is often necessary to educate young people that it is not the end result but the process that is most important. Through the creation of a motivational climate focused on learning (homework), it is possible to act in order to take care of the mental health of young people and to favour their academic performance.

## Conclusions

The main findings are that for both sexes there is a negative effect between task climate and the psycho-emotional state of anxiety. On the other hand, there is a positive effect between ego climate and anxiety. The effect of both motivational climates on anxiety is greater for the male sex. In terms of the effect of motivational climate on the mean score, a positive effect of ego-climate and task-climate is observed. In terms of gender, a greater effect of the motivational climate on the average mark was observed for the male sex. Focusing attention on the effect of anxiety on the average score, a negative effect is found for both sexes, with a higher score for the male sex.

Finally, this study shows that there are differences between the motivational climate developed towards sport and the effect of sport on anxiety and average academic grade.

### Author contributions

Conceptualization, E.M-I., G.G-V.; methodology, J.M.A.-V., P.P.-M. and E.M-I.; formal analysis, G.G-V, G.B., J.M.A.-V., P.P.-M.; data curation, E.M-I; writing—original draft preparation, E.M-I., G.G-V, J.M.A.-V., P.P.-M; writing—review and editing, E.M-I., G.G-V, J.M.A.-V., P.P.-M, G.B., F.H.Y, L.P.A, supervision., P.P.-M

and L.P.A. All authors have read and agreed to the published version of the manuscript.

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NLA University College, Oslo, Norway.

### Data availability

Data can be provided from the corresponding author upon request.

## Declarations

### Ethics approval and consent to participate

This research has followed the various criteria set out in the Declaration of Helsinki. Furthermore, it has been supervised and approved by an ethics committee belonging to the University of Granada with code 2966/CEIH/2022. Written informed consent was obtained from the participants.

### Consent for publication

NOT APPLICABLE.

### Competing interests

The authors declare no competing interests.

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## References

1. Velasco V, Gragnano A, Ghelfi M, Gruppo Regionale HBSC, Vecchio LP. Health lifestyles during adolescence: clustering of health behaviours and social determinants in Italian adolescents. *J Public Health*. 2023;45(1):218–28. <https://doi.org/10.1093/pubmed/fdab371>
2. Levante A, Quarta S, Massaro M, Calabriso N, Carluccio MA, Damiano F, et al. Physical activity habits prevent psychological distress in female academic students: the multiple mediating role of physical and psychosocial parameters. *Heliyon*. 2024;10(4):e26626. <https://doi.org/10.1016/j.heliyon.2024.e26626>
3. Meeus W. The study of adolescent identity formation 2000–2010: a review of longitudinal research: adolescent identity 2000–2010. *J Res Adolesc*. 2011;21(1):75–94. <https://doi.org/10.1111/j.1532-7795.2010.00716.x>
4. Van Dyck D, De Bourdeaudhuij I, Deliens T, Deforche B. Can changes in psychosocial factors and residency explain the decrease in physical activity during the transition from high school to college or university? *Int J Behav Med*. 2015;22(2):178–86. <https://doi.org/10.1007/s12529-014-9424-4>
5. Carpena-Lucas PJ, Sánchez-Cubo F, Vargas-Vargas M, Mondéjar-Jiménez J. Influence of lifestyle habits in the development of obesity during adolescence. *Int J Environ Res Public Health*. 2022;19(7):4124. <https://doi.org/10.3390/ijerph19074124>
6. Melguizo-Ibáñez E, González-Valero G, Puertas-Molero P, Zurita-Ortega F, Ubago-Jiménez JL, Alonso-Vargas JM. Explanatory model based on the type of physical activity, motivational climate and adherence to the Mediterranean diet of anxiety among physical education trainee teachers. *Appl Sci*. 2022;12(24):13016. <https://doi.org/10.3390/app122413016>
7. Kljajević V, Stanković M, Đorđević D, Trkulja-Petković D, Jovanović R, Plazibat K, et al. Physical activity and physical fitness among university students-A systematic review. *Int J Environ Res Public Health*. 2021;19(1):158. <https://doi.org/10.3390/ijerph19010158>
8. Camacho A, Alves RA, Boscolo P. Writing motivation in school: a systematic review of empirical research in the early twenty-first century. *Educ Psychol Rev*. 2021;33(1):213–47. <https://doi.org/10.1007/s10648-020-09530-4>



9. Aira T, Vasankari T, Heinonen OJ, Korpelainen R, Kotkajuuri J, Parkkari J, et al. Physical activity from adolescence to young adulthood: patterns of change, and their associations with activity domains and sedentary time. *Int J Behav Nutr Phys Act*. 2021;18(1):85. <https://doi.org/10.1186/s12966-021-01130-x>
10. Schulze C, Bucksch J, Demetriou Y, Emmerling S, Linder S, Reimers AK. Considering sex/gender in interventions to promote children's and adolescents' leisure-time physical activity: a systematic review and meta-analysis. *Z Gesundh Wiss*. 2022;30(11):2547–60. <https://doi.org/10.1007/s10389-021-01625-8>
11. González-Valero G, Ubago-Jiménez JL, Ramírez-Granizo IA, Puertas-Molero P. Association between motivational climate, adherence to Mediterranean diet, and levels of physical activity in Physical Education students. *Behav Sci*. 2019;9(4):37. <https://doi.org/10.3390/bs9040037>
12. Nicholls JG. The competitive ethos and democratic education. Harvard University Press; 1989.
13. Claver F, Martínez-Aranda LM, Conejero M, Gil-Arias A. Motivation, discipline, and academic performance in Physical Education: a holistic approach from achievement goal and self-determination theories. *Front Psychol*. 2020;11:1808. <https://doi.org/10.3389/fpsyg.2020.01808>
14. Farrell N, Walker BR. Reinforcement sensitivity theory and the 2 × 2 stand-points model of achievement goals. *Pers Individ Dif*. 2019;139:317–20. <https://doi.org/10.1016/j.paid.2018.11.035>. Disponible en: <https://doi.org/10.1016/j.paid.2018.11.035>
15. Melguizo-Ibáñez E, Zurita-Ortega F, Ubago-Jiménez JL, López-Gutiérrez CJ, González-Valero G. An explanatory model of the relationships between sport motivation, anxiety and physical and social self-concept in educational sciences students. *Curr Psychol*. 2023;42(18):15237–47. <https://doi.org/10.1007/s12144-022-02778-9>
16. González-Valero G, Zurita-Ortega F, Martínez-Martínez A. Motivational and physical activity outlook in students: a systematic review. *ESHPA- Educ Sport Health Phys Activity*. 2017;1(1):41–58. <http://hdl.handle.net/10481/48961>
17. Gao W, Ping S, Liu X. Gender differences in depression, anxiety, and stress among college students: a longitudinal study from China. *J Affect Disord*. 2020;263:292–300. <https://doi.org/10.1016/j.jad.2019.11.121>
18. Ntoumanis N. In: Bong M, Reeve J, Kim SI, editors. The good, the bad, and the ugly of motivation. *Motivation Science: Controversies and Insights*; Oxford University; 2023. pp. 117–22.
19. Weinberg RS, Gould D. *Fundamentos De psicología del deporte y del ejercicio físico*. Ariel; 1996.
20. Gómez-López M, Chicau Borrego C, Marques da Silva C, Granero-Gallegos A, González-Hernández J. Effects of motivational climate on fear of failure and anxiety in teen handball players. *Int J Environ Res Public Health*. 2020;17(2):592. <https://doi.org/10.3390/ijerph17020592>
21. Melguizo-Ibáñez E, Zurita-Ortega F, Ubago JL, González-Valero G. Study of the relationship between motivation towards physical activity and its relationship with anxiety and self-concept in the educational setting. A systematic review. *Ansiedad estrés*. 2023;29(1):34–44. <https://doi.org/10.5093/anyes2023a5>
22. Li G, Li Z, Wu X, Zhen R. Relations between class competition and primary school students' academic achievement: learning anxiety and learning engagement as mediators. *Front Psychol*. 2022;13:775213. <https://doi.org/10.3389/fpsyg.2022.775213>
23. Núñez-Peña MI, Bono R. Academic anxieties: which type contributes the most to low achievement in methodological courses? *Educ Psychol*. 2019;39(6):797–814. <https://doi.org/10.1080/01443410.2019.1582756>
24. Visier-Alfonso ME, Álvarez-Bueno C, Sánchez-López M, Cervero-Redondo I, Martínez-Hortelano JA, Nieto-López M, et al. Fitness and executive function as mediators between physical activity and academic achievement: mediators between physical activity and academic achievement. *J Sports Sci*. 2021;39(14):1576–84. <https://doi.org/10.1080/02640414.2021.1886665>
25. Ubago-Jimenez JL, Zurita-Ortega F, Ortega-Martin JL, Melguizo-Ibáñez E. Impact of emotional intelligence and academic self-concept on the academic performance of educational sciences undergraduates. *Heliyon*. 2024;10(8):e29476. <https://doi.org/10.1016/j.heliyon.2024.e29476>
26. Newton M, Duda JL, Yin Z. Examination of the psychometric properties of the Perceived Motivational Climate in Sport Questionnaire-2 in a sample of female athletes. *J Sports Sci*. 2000;18:275–90.
27. González-Cutre D, Sicilia A, Moreno J. Modelo cognitivo-social de la motivación de logro en educación física. *Psicothema*. 2008;20(4):642–51.
28. Beck AT, Epstein N, Brown G, Steer RA. An inventory for measuring clinical anxiety: psychometric properties. *J Consult Clin Psychol*. 1988;56(6):893–7. <https://doi.org/10.1037/0022-006X.56.6.893>
29. Sanz J, Navarro ME. Propiedades psicométricas de una versión española del Inventario De Ansiedad De Beck (BAI) en estudiantes universitario. *Ansiedad Estrés*. 2003;9:59–84.
30. George D, Mallery P. *SPSS for Windows Step by Step: a simple study guide and reference*. Routledge; 2010.
31. Kyriazos TA. Applied psychometrics: sample size and sample power considerations in factor analysis (EFA, CFA) and SEM in general. *Psychology*. 2018;09(08):2207–30. <https://doi.org/10.4236/psych.2018.98126>
32. Maydeu-Olivares A. Maximum likelihood estimation of structural equation models for continuous data: standard errors and goodness of fit. *Struct Equ Model*. 2017;24(3):383–94. <https://doi.org/10.1080/10705511.2016.1269606>
33. Loehlin JC, Beaujean AA. *Latent variable models: an introduction to factor, path, and structural equation analysis*. Taylor & Francis; 2017.
34. Kline RB. *Principles and practice of structural equation modeling*. Guilford Press; 2016.
35. Gunzler DD, Perzyski AT, Carle AC. *Structural Equation Modeling for Health and Medicine*. Routledge; 2022.
36. Tenenbaum G, Eklund RC. *Handbook of sport psychology*. Wiley; 2007.
37. Dawe H. Learning achievement goal theory and teaching students legal problem solving. *Law Teach*. 2020;54(2):249–60. <https://doi.org/10.1080/03069400.2019.1657733>
38. Chazan DJ, Pelletier GN, Daniels LM. Achievement goal theory review: an application to school psychology. *Can J Sch Psychol*. 2022;37(1):40–56. <https://doi.org/10.1177/08295735211058319>
39. Robinson KA. Motivational climate theory: disentangling definitions and roles of classroom motivational support, climate, and microclimates. *Educ Psychol*. 2023;58(2):92–110. <https://doi.org/10.1080/00461520.2023.2198011>
40. Sökmen Y. The role of self-efficacy in the relationship between the learning environment and student engagement. *Educ Stud*. 2021;47(1):19–37. <https://doi.org/10.1080/03055698.2019.1665986>
41. Laxdal A, Mjåtveit A, Leibinger E, Haugen T, Giske R. Self-regulated learning in physical education: an analysis of perceived teacher learning support and perceived motivational climate as context dependent predictors in upper secondary school. *Scand J Educ Res*. 2020;64(7):1120–32. <https://doi.org/10.1080/00313831.2019.1689164>
42. Whitmarsh L, Player L, Jiongco A, James M, Williams M, Marks E, et al. Climate anxiety: what predicts it and how is it related to climate action? *J Environ Psychol*. 2022;83(101866):101866. <https://doi.org/10.1016/j.jenvp.2022.101866>
43. Abrahamsen FE, Roberts GC, Pensgaard AM. Achievement goals and gender effects on multidimensional anxiety in national elite sport. *Psychol Sport Exerc*. 2008;9(4):449–64. <https://doi.org/10.1016/j.psychsport.2007.06.005>
44. Wu X, Gai X, Yu T, Yu H, Zhang Y. Perceived motivational climate and stages of exercise behavior change: mediating roles of motivation within and beyond physical education class. *Front Psychol*. 2021;12:737461. <https://doi.org/10.3389/fpsyg.2021.737461>
45. Erentaitė R, Vosylis R, Sevalneva D, Melnikė E, Raižienė S, Daukantaitė D. Profiles of achievement motivation and performance in middle school: links to student background and perceived classroom climate. *Front Psychol*. 2022;13:820247. <https://doi.org/10.3389/fpsyg.2022.820247>
46. Zysberg L, Schwabsky N. School climate, academic self-efficacy and student achievement. *Educ Psychol*. 2021;41(4):467–82. <https://doi.org/10.1080/01443410.2020.1813690>
47. Robson DA, Allen MS, Howard SJ. Self-regulation in childhood as a predictor of future outcomes: a meta-analytic review. *Psychol Bull*. 2020;146(4):324–54. <https://doi.org/10.1037/bul0000227>

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