



Cooperative Learning, Emotions, and Academic Performance in Physical Education: A Serial Multiple Mediation Model

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ABSTRACT

Based on the control-value theory, this study examined connections between the perceived in-class degree of cooperation and academic performance mediated through the students' negative and positive emotions in physical education. Students ($N = 620$, 55.5% girls; $M_{\text{age}} = 13.01$, $SD = 2.10$) reported on their perceptions of the degree of cooperation and the negative (shame, hopelessness, anxiety, boredom) and positive (confidence, pride, enjoyment, calmness) emotions in physical education classes. Academic performance was obtained from their school's administrators. Results from the multiple lineal regression analyses, considering the in-class degree of cooperation and the negative and positive emotions as predictor variables, showed a significantly positive link between the in-class degree of cooperation and the dependent variable academic performance, and between positive emotions and academic performance. These findings elucidate the impact of cooperative learning contexts and emotions on academic performance. Educational implications and future research are discussed.

El aprendizaje cooperativo, las emociones y el rendimiento académico en educación física: un modelo de mediación serial múltiple

RESUMEN

Basado en la teoría del control-valor, este estudio examinó las conexiones entre el grado de cooperación percibido en clase y el rendimiento académico mediado por las emociones negativas y positivas de los estudiantes en educación física. Los participantes ($N = 620$, 55.5% niñas; $M_{\text{edad}} = 13.01$, $DT = 2.10$) informaron sobre su percepción del grado de cooperación, emociones negativas (vergüenza, desesperanza, ansiedad, aburrimiento) y emociones positivas (confianza, orgullo, disfrute, tranquilidad) en las clases de educación física. El rendimiento académico se obtuvo de la dirección de los centros educativos. Los resultados de los análisis de regresión lineal múltiple, considerando el grado de cooperación en el aula y las emociones negativas y positivas como variables predictoras, mostraron un vínculo significativamente positivo entre el grado de cooperación en el aula y la variable dependiente rendimiento académico y entre las emociones positivas y el rendimiento académico. Estos resultados explican la repercusión de los contextos de aprendizaje cooperativo y las emociones en el rendimiento académico. Se discuten las implicaciones educativas y la investigación futura.

Probably, the main goal of any pedagogical approach is for students to learn in its fullest sense and, as a consequence, accomplish the academic performance that reflects the previously acquired skills. Teachers must decide which model, or combination, to implement in their classes to promote students' learning. In physical education, literature portrays different methodological options that can be framed within a continuum that goes from the more traditional approaches (focused on the teacher) to the more advanced (focused on the learner) (Casey, 2014; Metzler, 2011). Within the teaching-

learning process, a series of teacher-student and student-student interactions take place, and they should be carefully observed by every teacher.

Cooperative learning is a student-centered pedagogical model where students learn together in small heterogeneous groups (Casey, 2012). If correctly implemented, it must include five critical elements (Dyson & Casey, 2016; Johnson & Johnson, 2009): (1) positive interdependence – group members rely on each other to achieve the learning goals set; (2) individual accountability – each

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group member is responsible for one part of the group's work; (3) promotive interaction – group members work in direct contact to support each other learn; (4) group processing – the group reflects on its functioning to improve; and (5) interpersonal skills – students learn effective communication, trust-building, democratic leadership, etc. needed to function effectively as a group. Two more key elements have been highlighted (Kagan, 1994): (6) equal participation – students' active participation within their groups should be similar – and (7) simultaneous interaction – the number of students in a group that are overtly engaged at any moment. The educational potential of cooperative learning has been found elevated, since it allows physical education teachers to respond to the challenges faced in their classes (Casey & Quennerstedt, 2020).

Cooperative Learning and Academic Performance

Cooperative learning has a long tradition in different curricular subjects and several meta-analyses have highlighted its effectiveness on students' academic performance (Capar & Tarim, 2015; Johnson et al., 2014; Johnson et al., 1981; Roseth et al., 2008; Slavin, 2012; Slavin et al., 2014). Within the context of physical education, the last systematic reviews revealed the positive consequences of cooperative learning in the four learning domains: physical, cognitive, social, and affective (Bores-García et al., 2020; Casey & Goodyear, 2015; Dyson et al., 2020). Previous research found benefits in social/motor skills (Darnis & Lafont, 2015; O'Leary et al., 2015), social skills (Fernandez-Rio et al., 2017; Sánchez-Hernández et al., 2018; Wallhead & Dyson, 2017), motor skills (Altinkok, 2017; Lee, 2014), cognitive skills (Dyson et al., 2016; Gorucu, 2016), and affective skills (Goodyear et al., 2014).

Academic performance can be considered a global indicator of the students' learnings, which jointly represents the progress within the different domains. It can be represented using the final grade earned in the course (Elmore et al., 2017). To our knowledge, there are no published studies on the connections between cooperative learning and academic performance in physical education. Thus, the first aim of this study was to examine the associations between cooperative learning and academic performance, using the final grade obtained.

Achievement Emotions: Mediator Role

Scientific literature distinguishes between moods, emotions, and achievement emotions. While moods are not related to a particular situation and they can last longer, emotions are linked to more intense and specific responses connected to specific moments (Ekkekakis, 2013; Fontaine et al., 2013). Emotions have been defined as “coordinated processes of psychological subsystems including affective, cognitive, motivational, expressive, and peripheral physiological processes” (Pekrun, 2006, p. 316). Finally, achievement emotions refer to “emotions tied directly to achievement activities or achievement outcomes” (Pekrun et al., 2007, p. 15). In educational contexts, students experience emotions related to learning at different pedagogical moments such as carry an individual task in the classroom, solve a written exam, or submit an assignment on a certain date (Pekrun, 2014). Achievement emotions are present in every aspect of the teaching-learning process and it seems essential to understand them to maximize learning (Schutz & Lanehart, 2002). Faced with pedagogical moments like the ones previously mentioned, students experience more or less pleasant emotions that can condition their behavior when facing future challenges (Frenzel et al., 2009).

Important contributions to the understanding of emotions in the academic context have been derived from the control-value theory (Pekrun, 2006, 2018). It offers a social-cognitive integrated perspective that allows researchers and scholars to assess the antecedents and

consequences of achievement emotions (Pekrun et al., 2002). Under this approach, emotions are considered to be activated by subjective perceptions of control (i.e., confidence to answer properly exam questions) and by the value attributed (i.e., usefulness of the exam). An important element here is the environment, which will affect the emotions triggered through its impact on the control-value aspects (proximal antecedents). Contextual elements will largely determine the possibility to promote positive emotions or attenuate negative emotions (Pekrun, 2019a). Another important aspect of the theory is the reversible or retroactive nature (Pekrun et al., 2017): reciprocal effects (i.e., a bad result could activate interest in a specific subject). The implications for teaching are many, since several options can be activated through different channels (i.e., environment, appraisal). The teaching role, the planning and the classroom climate are some possible interventions on the environment (distal antecedents). Teaching interventions (i.e., feedback) can also help shape students' subjective appraisals and to regulate emotions. Indirectly, teaching actions aimed at improving certain learning competencies (i.e., comprehension strategies) and increasing cognitive resources can also be useful. Probably, the most outstanding aspect of this conceptual framework is that it invites researchers and scholars to open possibilities for intervention on the positive and negative emotions that take place before (i.e., anxiety, hopelessness), during (i.e., anger, enjoyment) and after (i.e., pride, shame) an academic task, thus offering opportunities to improve learning and achievement.

The control-value theory is supported by a three-dimensional taxonomy (Pekrun et al., 2007) that groups emotions based on the object focus (activity or outcome), the valence (positive vs. negative), and the degree of activation (activating vs. deactivating). For example, under the activity focus, enjoyment would be a positive, activating emotion, while boredom would be a negative, deactivating emotion. Different studies have emphasized the links between positive learning experiences and academic achievement (Loderer et al., 2018; Pekrun et al., 2017). For example, positive emotions like hopefulness and confidence were related to better academic outcomes (Asikainen et al., 2017). Conversely, negative emotions during learning, such as boredom (Pekrun et al., 2011; Simonton & Garn, 2019; Tze et al., 2016) or anxiety (Ketonen & Lonka, 2012; Pekrun et al., 2002), were associated to worse learning outcomes. Pleasant and unpleasant emotions seem to play an important role in the learning outcomes (Mattsson et al., 2020). Unfortunately, these links have not yet been assessed in physical education.

Important findings have been found about the non-generalization of achievement emotions in the academic context (Goetz et al., 2007). Emotions such as enjoyment, anxiety and boredom are dependent on the subject and they vary depending on the antecedents, appraisals and specific outcomes (Goetz et al., 2006). Recently, Shao et al. (2020) reported that perceived control and value related positively to positive emotions (pride, hope, enjoyment) and foreign language performance, and negatively to negative emotions (boredom, hopelessness, shame). Similarly, Putwain et al. (2020) found that higher control and value were related to a higher mathematics test score, directly, and indirectly mediated via higher enjoyment and lower anxiety. Another recent study in mathematics found that high boredom could occur in both low and high performing students and that bored low- and high performers showed similar behaviors and personality profiles (Schwartz et al., 2020). To our knowledge, no previous study has provided information on these emotional mechanisms that take place in the specific context of physical education under the control-value theory. A recent scoping review on social and emotional learning has revealed the positive contribution of cooperative learning to the development of the social and emotional aspects of learning (Dyson et al., 2020), but, unfortunately, the affective domain in cooperative learning is the one that has received less attention from researchers (Bores-García et al., 2020; Casey &

Goodyear, 2015). To our knowledge, no previous research has analyzed the associations or the effects of cooperative learning on achievement emotions in physical education. In this line of argumentation, and complementing both frameworks (control-value theory and cooperative learning), a second goal of this study was to explore the relationship between cooperative learning and achievement emotions.

Current Study

Previous research has showed that the reduction of negative emotions and the increase of positive ones during learning constitutes a major teaching challenge for students' overall learning and performance (Frenzel et al., 2020). The current study arose from the interest on assessing the associations between cooperative learning and academic performance in physical education, examining the possible mediating role of negative and positive emotions that appear in the physical education classes. Based on the control-value theory, the environment is a variable that is precursor of emotions during learning. In this study, the students' perceived in-class degree of cooperation was considered a methodological characteristic of the classroom context. The regulation of students' emotions while learning is determined by the particularities of the teaching intervention (distal antecedents). Due to the inherent characteristics of cooperative learning and previous studies, this pedagogical model could inhibit negative emotions and activate positive emotions. Considering that previous research has connected negative emotions with poorer learning and academic performance and the presence of positive emotions with better learning and academic performance (Shao et al., 2020), a multiple mediation model was proposed (Figure 1). Based on the aforementioned, the aim of this study was to explore the relationship between the perceived in-class degree of cooperation and academic performance mediated through the students' negative and positive emotions in the physical education class. It aimed to test a model where the independent variable was the perceived degree of cooperation in the classroom (X), the mediator variables were negative emotions (M1) and positive emotions (M2), and the dependent variable was academic performance (Y). Therefore, to examine the effects of the perceived degree of cooperation in the classroom (independent variable) on the students' academic performance (dependent variable) through negative (mediator variable 1) and positive emotions while learning in the physical education class (mediator variable 2), a serial multiple mediation analysis was conducted. In addition, eight simple mediation models were conducted, one for each mediator variable: shame, boredom, hopelessness, anxiety, confidence, pride, calm, and enjoyment.

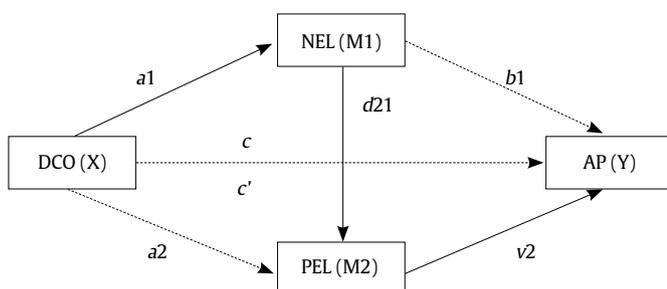


Figure 1. Hypothesized Theoretical Model.

Note. Diagram of the serial multiple mediational model with two mediating variables (M1 and M2). Indirect effect of the perceived in-class degree of cooperation (DCO) on academic performance (AP) through negative emotions (NEL) and positive emotions (PEL).

Method

Participants

An ex-post-facto, cross-sectional research design was followed to assess connections between variables with no direct intervention (Cohen et al., 2018). Participants were selected using stage cluster sampling among all the schools that included several year 6, 7 (primary education; 10-12 years), 8 and 9 (secondary education; 12-16 years) classes. It involved the random selection of 36 classes from seven schools. All schools were public, situated in urban, lower-middle socioeconomic level neighborhoods (located in southwest Spain). A total of 620 students, mean age 13.01 years ($SD = 2.10$, range 10-16), 55.5% ($n = 344$) females and 44.5% ($n = 276$) males, agreed to participate. Physical education classes were based on the Spanish national curriculum and all teachers declared that they had included cooperative learning in their physical education programs. The original sample consisted of 648 students but 28 were excluded because they returned blank questionnaires.

Measures

Cooperative Learning Questionnaire (Fernandez-Rio et al., 2017)

It is a short tool that assesses the critical elements of cooperative learning. It includes 20 items grouped around five factors or dimensions: interpersonal skills (i.e., "We listen to each other's ideas, opinions and points of view"), group processing (i.e., "We reach agreements within the group to make decisions"), positive interdependence (i.e., "We cannot finish the tasks without the groupmates' contributions"), promotive interaction (i.e., "We work face to face with our groupmates"), and individual accountability (i.e., "Every group member must strive to try hard in the group's activities"). Participants responded to the stem "In the physical education class..." in a five-point Likert scale ranging from 1 = *totally disagree* to 5 = *totally agree*. Confirmatory factor analysis (CFA) showed good fit of the data ($\chi^2 = 22.376$; $\chi^2/df = 2.62$; RMSEA = .05; SRMR = .03; CFI = .98; TLI = .99). Cronbach's alphas obtained were .74, .75, .72, .76, and .79, respectively. Furthermore, omega values were deemed acceptable (ω range = .70-.90). The instrument also provides a Global Cooperation Factor determined by the five dimensions or factors, which was renamed in this study: degree of cooperation (in the physical education classroom). CFA showed good fit of the data ($\chi^2 = 1279.245$; $\chi^2/df = 4.52$; RMSEA = .05; SRMR = .06; CFI = 0.93; TLI = 0.94). Cronbach's alpha and omega value were .81 and .83, respectively.

Emotional States in Physical Education Contexts Scale (Trigueros et al., 2019)

It is an instrument that assesses students' positive and negative emotions in the physical education class. It includes 34 items grouped in eight factors (four negative and four positive): shame (i.e., "My companions make me feel embarrassed"), boredom (i.e., "I am usually bored"), hopelessness (i.e., "I feel frustrated and useless"), anxiety (i.e., "I feel pressure in my chest when it is my turn to do the exercises"), confidence (i.e., "I know that I am capable of doing the exercises"), pride (i.e., "I feel proud when I do well in class"), calmness (i.e., "I feel a sense of calmness while doing the exercises"), and enjoyment (i.e., "I really enjoy the exercises"). Participants responded to the stem "In the physical education class..." in a five-point Likert scale ranging from 1 = *totally disagree* to 7 = *totally agree*. CFA showed good fit of the data ($\chi^2 = 184.63$; $\chi^2/df = 2.79$; RMSEA = .06; SRMR = .06; CFI = .97; TLI = .96). Cronbach's

Table 1. Correlations among All Variables

N = 620	1	2	3	4	5	6	7	8	9	10	11	12
1. DCO	-	.433**	-.586**	-.578**	-.559**	-.562**	-.485**	.626**	.607**	.557**	.538**	.597**
2. AP		-	-.573**	-.554**	-.558**	-.552**	-.468**	.606**	.594**	.545**	.523**	.566**
3. NE			-	.901**	.957**	.950**	.895**	-.913**	-.859**	-.890**	-.760**	-.836**
4. SHA				-	.851**	.828**	.706**	-.856**	-.837**	-.815**	-.724**	-.766**
5. BOR					-	.909**	.786**	-.887**	-.869**	-.860**	-.759**	-.770**
6. HOP						-	.783**	-.863**	-.824**	-.839**	-.753**	-.756**
7. ANX							-	-.786**	-.672**	-.783**	-.594**	-.802**
8. PE								-	.924**	.951**	.882**	.917**
9. CON									-	.854**	.785**	.769**
10. PRI										-	.785	.836
11. CAL											-	.730
12. ENJ												-
M	3.86	7.55	2.37	2.66	2.46	2.21	2.15	5.30	5.29	5.66	4.80	5.30
SD	0.37	1.18	0.83	0.73	0.96	0.89	1.01	0.73	0.77	0.89	0.64	0.89

Note. DCO = degree of cooperation; AP = academic performance; NE = negative emotions; SHA = shame; BOR = boredom; HOP = hopelessness; ANX = anxiety; PE = positive emotions; CON = confidence; PRI = pride; CAL = calmness; ENJ = enjoyment.

** $p < .01$.

alphas obtained were .84, .90, .85, .90, .85, .89, .91 and .84, respectively. Furthermore, omega values were deemed acceptable (ω range = .70-.90). These factors are also grouped in two subscales, negative emotions and positive emotions, whose Cronbach's alphas were .94 and .93 ($\omega = .89$ and $\omega = .88$, respectively).

Academic Performance

It was assessed using the students' physical education grades at the end of the school year. This is an objective measure (not perfect) that represents the learning outcomes and it was provided by the teachers. In the Spanish educational system, the same score scheme is used in all the educational stages observed (primary and secondary), consisting of a final grade in a 0 to 10 range.

Procedure

The ethical guidelines of the [American Psychological Association \(2010\)](#) were followed. The Bioethics and Biosafety Committee of the university gave approval for the study to be conducted. First, the research team contacted the schools to explain the whole project and to obtain permission to use the questionnaires and the students' final grades. Second, written consent was obtained from all the participating students' parents or legal guardians. Questionnaires were administered by different members of the research team during the school day. It lasted around 20 minutes and was conducted in a quiet room to prevent distractions. Anonymity and confidentiality were granted to the participating students. Data collection was conducted two months prior to the end of the school year and grades were accessed when the school ended.

Data Analysis

First, a correlational analysis of all variables under study was conducted. Second, the PROCESS macro for SPSS ([Hayes, 2013](#)) was used to conduct mediation analyses. This macro estimates the indirect effects, the standard errors, and confidence intervals on the distribution obtained using bootstrapping. This method, based on bootstrap confidence intervals, facilitates statistical inference independently of data normality and sample size, since it does not need large samples. The indirect effects were calculated for a multiple mediation model and two mediator variables (PROCESS, model six) and were compared to determine which indirect effect had a larger significant relevance. The indirect effects for

eight simple mediation models (PROCESS, model four) were also calculated. For both, the multiple mediation model (model six) and the eight simple mediation models (model four) 1,000 bootstrapping samples were used. The statistical significance of the indirect effects was proved checking that the confidence interval set (95% CI) did not contain the 0 score.

Results

Table 1 shows the correlations of all variables under study. The perceived in-class degree of cooperation was positively linked to academic performance and positive emotions, while it was negatively linked to negative emotions. Similarly, academic performance was positively linked to positive emotions and inversely with negative emotions. Globally, Pearson correlation indices were stronger in the correlations among the perceived in-class degree of cooperation and academic performance with positive emotions than with negative emotions. All correlations were significant at $p < .001$.

Multiple Mediation Model (PROCESS, Model Six)

Table 2 shows the results from the serial multiple mediation analysis using two variables. Those between the mediator variable negative emotions and the independent variable degree of cooperation showed a significantly negative relation ($a1: \beta = -1.322$, $SE = .1267$, $p < .001$). A significantly positive relation was found between the mediator variable positive emotions and degree of cooperation ($a2: \beta = .7432$, $SE = .0670$, $p < .001$), and a significantly negative relation between the mediator variables: negative and positive emotions ($d21: \beta = -.7363$, $SE = .0297$, $p < .001$). Results from the multiple regression analysis, considering degree of cooperation, negative emotions, and positive emotions as predictor variables showed a strong significant relation between degree of cooperation and the dependent variable academic performance ($c': \beta = .2749$, $SE = .2269$, $p < .005$), and between positive emotions and academic performance ($b2: \beta = .7287$, $SE = .2263$, $p < .005$).

The total effect of the independent variable degree of cooperation over the dependent variable academic performance was statistically significant ($c: \beta = 1.388$, $SE = .2005$, $p < .001$), explaining the model 20.74% of the variance of the dependent variable academic performance. The statistical significance of the indirect effect was assessed checking that the confidence interval (95% CI) did not included a 0 score, and two indirect effects

Table 2. Mediation A (PROCESS, Model Six)

Effects	Path	β	SE	<i>p</i>	
Effect DCO - NE	a1	-1.3220	.1267	.0000	
Effect DCO - PE	a2	.2743	.0670	.0001	
Effect NE - AP	b1	-.1543	.1927	.4243	
Effect PE - AP	b2	.7287	.2263	.0015	
Effect NE - PE	d21	-.7363	.0297	.0000	
Total effect DCO - AP	c	1.3880	.2005	.0000	
Direct effect DCO - AP	c'	.2749	.2269	.0025	
AP total effect model ($F = 47.959, p < .001; R^2 = .2074$)					
Indirect Effects	Path	β	BootSE	Boot 95% CI	
				LL	UL
Total indirect effect		1.113	.1797	.7330	1.4380
Indirect effect 1 DCO - NE - AP	a1b1	.2040	.2542	-.3272	.6850
Indirect effect 2 DCO - PE - AP	a2b2	.1999	.0844	.0639	.3944
Indirect effect 3 DCO - NE - PE - AP	a1d21b2	.7094	.2470	.2480	1.2240
Indirect Effects Contrast		β	BootSE	Boot 95% CI	
				LL	UL
C1: Contrast indirect effect 1 with indirect effect 2		.0041	.3178	-.6587	.6028
C2: Contrast indirect effect 1 with indirect effect 3		-.5054	.4708	-1.5060	.3783
C3: Contrast indirect effect 2 with indirect effect 3		-.5095	.2080	-.9491	-.1390

Note. DCO = degree of cooperation; AP = academic performance; NE = negative emotions; PE = positive emotions.

statistically significant were found: IE a2b2 ($\beta = .1999$, bootSE = .0844, boot 95% CI [.0639, .3944]) and IE a1d21b2 ($\beta = .7094$, bootSE = .2470, boot 95% CI [.2480, 1.224]). Last, the comparison of the significant indirect effects showed that the model's most powerful statistical route was "degree of cooperation-negative emotions-positive emotions-academic performance" ($\beta = -.5095$, bootSE = .2080, boot 95% CI [-.9491, -.1390]).

Simple Mediation Models (PROCESS, Model four)

To assess the effect of the degree of cooperation (independent variable) over the academic performance (dependent variable)

through the different negative and positive emotions, data from eight simple mediation models, one for each predictor variable (shame, boredom, hopelessness, anxiety, confidence, pride, calmness, and enjoyment) are presented.

Figure 2 portrays data from four simple mediation models, using different negative emotions (shame, boredom, hopelessness, and anxiety) as mediator variables. The four models met the requirements to conduct a simple mediation analysis: significant relations between the independent and the dependent variables, between the independent variable and the mediator, and between the mediator and the dependent variable. Additionally, the *b* score is larger than *c'*, and this is smaller than *c*. The indirect effects of the four models

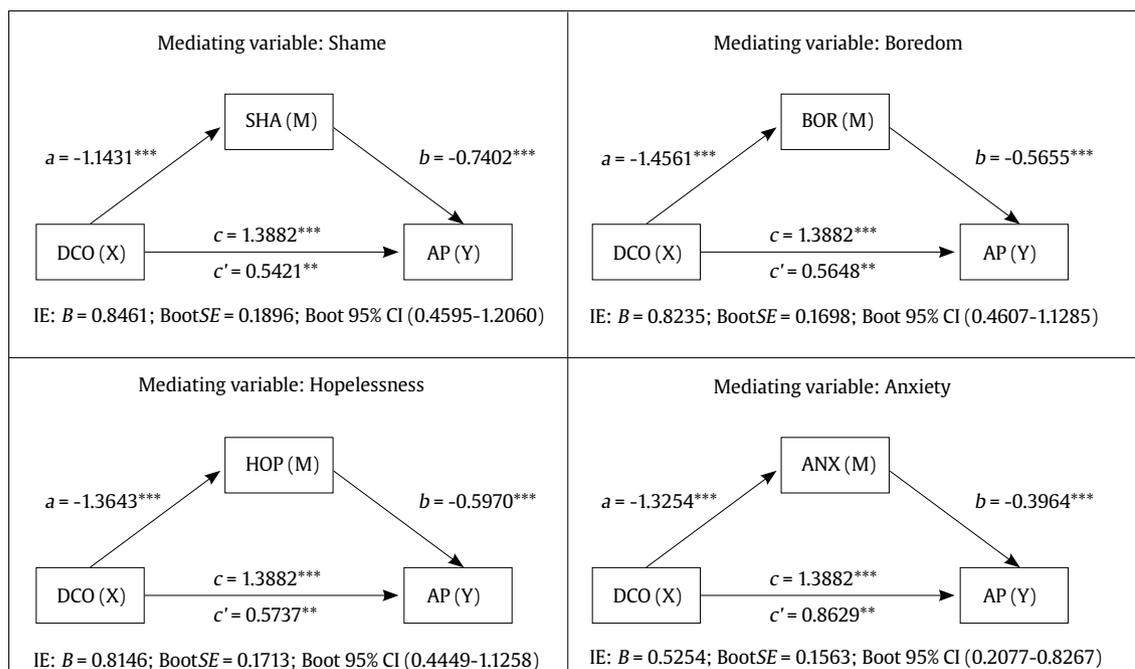


Figure 2. Diagrams and Results of the Simple Mediation Analyses (Process Four) Using Negative Emotions.

Note. Indirect effects of the degree of cooperation (DOC) on academic performance (AP) through several negative emotions: SHA = shame; BOR = boredom; HOP = hopelessness; ANX = Anxiety.

were statistically significant, because the confidence intervals did not contain a 0 score.

The indirect effect (*ab*) that best statistically quantified the effects of the independent variable degree of cooperation over the dependent variable academic performance was that corresponding to the mediator variables: shame ($\beta = .8461$, boot *SE* = .1896, boot 95% CI [.4595, 1.2060]) and boredom ($\beta = .8235$, boot *SE* = .1698, boot 95% CI [.4607, 1.1285]).

Finally, **Figure 3** portrays data from four simple mediation models, using different positive emotions (confidence, pride, calmness, and enjoyment) as mediator variables. Except the model whose mediator variable was confidence, where no significant relations between the independent variable and the dependent variable were found, the other models did meet the requirements to conduct a simple mediation analysis. The indirect effects of these three models were statistically significant, because the confidence intervals did not contain a 0 score.

The indirect effect (*ab*) that best statistically quantified the effects of the independent variable degree of cooperation over the dependent variable academic performance was that corresponding to the mediator variable: enjoyment ($\beta = .9146$, boot *SE* = .2140, boot 95% CI [.4888, 1.3269]).

Discussion

The main goal of this study was to explore the relationship between the perceived in-class degree of cooperation and academic performance mediated through the students' negative and positive emotions in physical education, and results reported a direct effect of the degree of cooperation on the students' academic performance. In line with the evidence provided by the latest meta-analyses conducted in school subjects other than physical education (Johnson et al., 2014; Slavin et al., 2014), data from the present study suggest that cooperative learning can be an effective methodological option for learning and acquiring skills in physical education. These findings

are also consistent with the latest synthesis of the literature on cooperative learning in physical education, which shows a positive effect on the four learning domains (physical, cognitive, social, and affective) which, as a whole, should reflect on the students' final grade (in the present study it was used as a sign of academic performance). Results from the present study reinforce the idea that cooperative learning is a pedagogical model that contributes to the improvement of teaching-learning processes in physical education, facilitating progress and improvements in academic performance, in line with the strong positive connection reported by the literature between cooperative learning and academic performance in other school subjects (Colak, 2015; Du, 2015; Slavin, 2014).

Results also revealed that negative emotions (shame, hopelessness, anxiety, and boredom) were negatively related to the perceived in-class degree of cooperation, while positive emotions (confidence, pride, enjoyment, and calmness) were positively related. This finding suggests that the use of cooperative learning in physical education is linked to positive emotions while students learn. From the point of view of instruction, this idea represents an important "advance" in the emotional attention that physical education can provide to the students (Simonton et al., 2017). Cooperative learning can be considered a perfect tool to keep students away from negative emotions and promote positive emotions while learning (Simonton & Garn, 2019). Previous research found this pedagogical model capable of creating school climates in physical education where positive emotions like enjoyment are developed among secondary education students (Fernandez-Rio et al., 2017). Cooperative learning, when it is correctly structured (Cecchini et al., 2020), forces students to work in groups, to interact, to develop interpersonal skills, which promotes positive interactions (relatedness), which, in turn, produce positive outcomes, in this case emotions.

Based on control-value theory, the methodological characteristics of learning activities (distal antecedents) seem to play an important role in the emotions that arise during students' performance. Results from the present study indicated that positive emotions had a significant connection with academic performance in physical

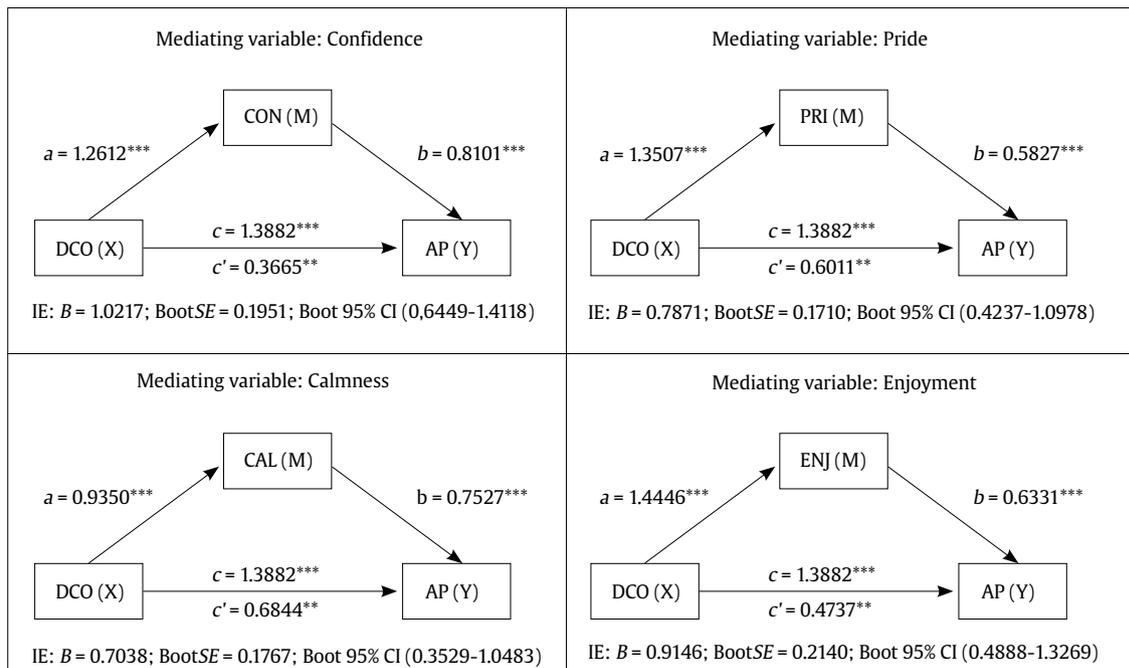


Figure 3. Diagrams and Results of the Simple Mediation Analyses (Process Four) Using Positive Emotions.

Note. Indirect effects of the degree of cooperation (DOC) on academic performance (AP) through several positive emotions: CON = confidence; PRI = pride; CAL = calmness; ENJ = enjoyment.

education. Recent studies found these same positive relationships in mathematics (Putwain et al., 2020) and foreign language (Shao et al., 2020), which again highlights the positive impact of cooperative learning on learning outcomes. The mediating role of positive emotions seems to explain students' academic success. However, the negative relationship between negative emotions and physical education performance was not significant. This result is partially in line with the study conducted by Schwartz et al. (2020), where boredom affected both high- and low-performing students in mathematics. Results from the present study indicate that negative emotions as a whole are not directly related to academic performance in physical education. However, when considered, results did find that boredom was one of the most significant negative emotions in the prediction of academic performance. Probably, elements related to the environment may explain these differences in emotions and their consequences in academic performance, but more studies are needed. The present study focused on students' emotions in physical education as a possible mediating variable between cooperative learning and academic performance in physical education. It is suggested that learning cooperatively facilitates the emergence of positive emotions, which is connected to effective learning and performance. These novel data in physical education have strong support in other school subjects (Putwain et al., 2020; Shao et al., 2020). All these findings suggest the importance of training pre-service physical education teachers in cooperative learning, given that cooperative contexts seem to promote positive emotions and academic benefits.

This study has several strengths. This is the first one to examine the connections between cooperative learning, achievement emotions, and academic performance in physical education. In addition, cooperative learning was assessed using an instrument that provides data on its five critical elements. However, the study also has some limitations that could help design future research to delve into the role of achievement emotions in learning and performance in physical education. First, the correlational nature of the study does not allow us to establish causal relationships. The positive associations found between positive emotions and academic performance should be confirmed with quasi-experimental studies (Peixoto et al., 2016). However, Schwartz et al. (2020) showed that boredom could appear in students with very different levels of academic performance. This question should be solved in future intervention studies, in addition to addressing the particularities of each subject (Goetz et al., 2006) and the specific role played by each emotion. Second, students' perceived control and value was not assessed. The lack of information on appraisals as proximal antecedents makes it difficult to extend the value-control theory in physical education and contribute to theoretical generalization. Future research should analyze the role of control-value appraisals as mediating variables between the environment and achievement emotions (Putwain et al., 2020; Shao et al., 2020). In addition, physical education performance was assessed using the grade obtained at the end of the course. This is a very global measure on the subject. Students may have different achievement emotions depending on the content (locomotor skills, sports-games, body expression). Studies with more specific measures of learning and at more defined moments (i.e., 2 units) could provide more specific information. Finally, elements like students' curiosity and interest should be investigated as possible antecedents of achievement emotions (Pekrun, 2019b).

Conclusions

The perceived degree of cooperation in physical education classes is presented as a relevant contextual variable that facilitates the presence of positive emotions during learning (confidence, pride, enjoyment, calmness) while attenuating the presence of negative

emotions (shame, hopelessness, anxiety, boredom). Furthermore, cooperation in the classroom showed a good connection with academic performance, where positive emotions intervene as mediators of successful learning. Thus, the use of cooperative structures for learning by physical education teachers is suggested. In the search for positive and successful teaching contexts, cooperative learning represents a methodological option of great interest.

Conflict of Interest

The authors of this article declare no conflict of interest.

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