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Effects of an autonomy-support intervention on motivation and academic competence in physical education.

Efectos de una intervención educativa con apoyo a la autonomía en la motivación y competencia académica en educación física

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Abstract

The aim of the study was to test the effect of an autonomy support teaching style on subject interest, academic competence, basic psychological needs and autonomous motivation in adolescent students in physical education classes. The sample consisted of 142 students aged 12 to 14, out of whom 84 students were in the intervention group and 58 in the control group. After an intervention with autonomy support for 22 classes, differences were found in favour of the intervention group in satisfaction of basic psychological needs, autonomous motivation, interest and academic competence in physical education classes. The study provides evidence of the effectiveness of autonomy support programs in physical education classes, emphasizing the importance of pedagogical strategies and educational programs that promote the development of basic psychological needs, self-determined motivation and their positive consequences in relation to physical education classes.

Keywords: self-determination theory; basic psychological needs; motivation; interpersonal interaction style; competence.

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Resumen

El objetivo del estudio fue comprobar el efecto de un estilo interpersonal de apoyo a la autonomía del docente en el interés por la materia, la competencia académica, las necesidades psicológicas básicas y la motivación autónoma en estudiantes adolescentes en clases de educación física. La muestra estuvo compuesta por 142 estudiantes de entre 12 y 14 años, de ellos 84 estudiantes estaban en el grupo de intervención y 58 en el grupo control. Tras una intervención con apoyo a la autonomía durante 22 clases, se encontraron diferencias a favor del grupo de intervención en la satisfacción de las necesidades psicológicas básicas, la motivación autónoma, el interés y la competencia académica en clases de educación física. El estudio proporciona evidencias de la eficacia de los programas que apoyan a la autonomía en las clases de educación física, haciendo hincapié en la importancia de las estrategias pedagógicas y los programas educativos que promueven el desarrollo de las necesidades psicológicas básicas, la motivación autodeterminada y sus consecuencias positivas en relación con las clases de educación física.

Palabras clave: teoría de autodeterminación; necesidades psicológicas básicas; motivación; estilo de interacción interpersonal; competencia.

Introduction and objectives

Physical education classes throughout adolescence are an ideal framework for promoting healthy lifestyles and encouraging students to take part in sporting activities (Basset et al., 2013). Currently, only 19% of young people meet the minimum recommended daily physical activity requirements (WHO, 2020). Therefore, there is a need for teachers to find useful tools to bring about positive changes in students' attitudes towards physical education. Previous studies (Barkoukis et al., 2021; Fin et al., 2019) have already indicated the importance of a certain way of teaching students in generating greater motivation and interest in physical education. Furthermore, research (Abula et al., 2020; Hosseini et al., 2022; Van Aart et al., 2015) largely supports the relationship between the interpersonal style of autonomy support and different relevant variables in the educational context, but it is important to further explore this relationship through interventions applied to physical education in the school context.

For this purpose, a study is presented whose main objective is to evaluate the effect produced by the application of autonomy support strategies in physical education on the student's interest in the subject, academic competence, basic psychological needs (BPN) and autonomous motivation. Consequently, as a hypothesis, it is expected that the application of autonomy support strategies will satisfy the BPNs and generate autonomous motivation, leading to an improvement in the student's interest in the subject that will have a positive impact on their academic competence.

The importance of interpersonal teaching style in physical education

Self-Determination Theory (SDT), proposed by Deci and Ryan (2000, 2002), seeks to explain human behaviour through different motivational styles, contextual influences and interpersonal perceptions. To do so, it employs an organismic metatheory that emphasises the importance of internal resources for personality development and self-regulation of behaviour (Deci and Ryan, 2000). Among the micro-theories that make up TAD, the Need Theory, together with the Cognitive Appraisal Theory and the Organismic Integration Theory, study the effect that environmental factors have on the satisfaction of basic needs. Need Theory establishes the existence of three basic psychological needs directly related to motivation. These include autonomy, which according to Ryan and Deci (2017, 2019) is related to the level of independence and control that humans have over their decisions; competence is linked to a person's ability to perform a task successfully; and relatedness refers to the perception of connectedness to others.

If motivation is affected by whether or not needs are satisfied in a given context, when talking about teaching and learning processes, the context generated by a teacher in the classroom becomes a major factor in promoting student motivation (Taylor et al., 2010). In this sense, TAD and related literature show that using an autonomy-supportive interpersonal style can be a very effective trigger for the development of intrinsic motivation (Conesa et al., 2022; Moreno-Murcia et al., 2019) or general motivation towards physical education (De Meyer et al., 2016), in addition to other goals such as regular physical activity practice in adolescents (Abula et al., 2020; Barkoukis et al., 2021). Whereas the opposite, a controlling style is linked to increased demotivation (Haerens et al., 2015).

Thus, if teachers create scenarios where students decide on certain issues, becoming more actively involved, focusing on the process rather than the outcome and guiding them along the way, young people will have a more self-determined motivation towards physical activity (Escriva-Boulley et al., 2018; Ulstad et al., 2018). From this reflection, success or failure in students' behaviour can be conditioned by methodological approaches that support needs or by choosing controlling styles that lead to possible frustration.

Interpersonal styles can be characterised by extreme control or by support for teacher autonomy. A controlling style based on putting pressure on students without their active participation may lead them to act out of fear of punishment or negative consequences (Reeve, 2010). On the other hand, an autonomy-supportive style will seek to satisfy NPB through strategies such as posing different variants for the same task, using empathetic language, asking the student about their preferences in relation to a task, etc. (Huéscar et al., 2022; Moreno-Murcia et al., 2021). This relationship with NPB is shown by different studies (Cheon and Reeve, 2015; Conesa et al., 2022) and also the opposite (Fin et al., 2019; Haerens et al., 2015; Pérez-González et al., 2019; Vasconcellos et al., 2020), where the controlling style has a negative relationship with these needs.

Competence-based education in physical education

In accordance with European recommendations (Eurydice, 2012; Recommendation 2006/962/EC of the European Parliament and of the Council of 18 December 2006), we find ourselves in an educational context in which key competences are established as a curricular element of reference. Although there is no motor competence as such within the key competences, within the current curriculum it is referred to as one of the main aims within the specific context of physical education: "The aim is to provide people with the necessary resources to enable them to reach a level of motor competence and to be autonomous in their practice of physical activities and regular practice" (R.D. 217/2022). Few studies have been found (Barrachina, 2017) that show an improvement in these skills through interventions based on support for autonomy. Some correlational studies (Barrachina, 2017; Moreno-Murcia et al., 2015, 2020) have shown the predictive power of variables such as teacher autonomy support on basic competences. These studies suggest the need to develop interventions that make it possible to specify tools for the development of competences in physical education classes.

The present study

The autonomy-supportive teacher interpersonal style has been presented as an effective way to elicit a series of positive consequences in students (Escriva-Boulley et al., 2018; Hosseini et al, 2022; Moreno-Murcia et al., 2019; Reeve and Cheon, 2021). For this reason, the purpose of this study was to examine the influence of an intervention based on the teacher's interpersonal style of autonomy support on subject interest, academic competence, autonomous motivation, and NPB satisfaction in adolescent students in physical education classes. Since physical education classes have a direct impact on the competence of accepting codes of conduct and respect for civic coexistence with peers, opponents and rules or arbitration (Monzonís and Capllonch, 2014; Pennington et al., 2014), it is expected that students in the intervention group with autonomy support will obtain better results in the satisfaction of the NPB, motivation, interest and academic competence in physical education. Finally, this study presents as a novelty the inclusion of academic performance variables in the school context such as academic competence and the implementation of a validated intervention programme such as the Autonomy Supported Intervention Programme (PIAA).

Method

Population and sample

The sample consisted of 142 Spanish students in the first year of Compulsory Secondary Education aged between 12 and 14 years (M = 12.5; SD = 1.9). Forty-four percent were girls (n = 62) and 56% boys (n = 80). They were divided into an intervention group (n

= 84), of which 45 were boys and 39 girls, and a control group (n = 58), consisting of 35 boys and 23 girls.

Instrument

Autonomy support. The *Autonomy Support Scale* (EAA) by Moreno-Murcia et al. (2020) was used. This scale is composed of 12 items that measure, through a single factor, the need for autonomy support that students perceive from their teachers in physical education classes. The items (e.g. "He/she explains to us why it is important to do the tasks") were developed after the previous statement "In my physical education classes, my teacher...". It was measured on a Likert-type scale defined from 1 (*Surely not*) to 5 (*Surely yes*). Internal consistency at pretest was .84 and at posttest .83.

Controlling style. The *Controlling Style Scale* (EEC) (Moreno-Murcia et al., 2020) was used, which is composed of 9 items that measure in a single factor the controlling style perceived by students of their teachers in physical education classes. The items (e.g. "He/she talks continuously and does not allow us to make contributions in class") were preceded by the pre-sentence "In my physical education classes, my teacher...". It was measured using a Likert-type scale with the options 1 (*Surely not*) to 5 (*Surely yes*). Cronbach's Alpha for the pretest and posttest was .71 and .76, respectively.

Teacher social support. The *Interpersonal Behavior Scale* (IBS) by Pelletier et al. (2007), validated in the Spanish context by Moreno-Murcia and Corbí (2020) and consisting of 10 items, was used to assess the social support of the teaching staff by measuring the three constructs: support for autonomy (e. g. "It provides me with many opportunities to make personal decisions about what I do"), support for competence (e. g. "It conveys to me that I am capable of learning"), and support for the relationship with the teaching staff.g. "Provides me with many opportunities to make personal decisions in what I do"), support for competence (e.g. "Conveys to me that I am capable of learning"), and support for relationships with others (e.g. "Enjoys spending time with me"). The pre-sentence was "My physical education teacher...". A likert scale ranging from 1 (*Never*) to 5 (*Always*) was used. Internal consistency at pretest and posttest was .75 and .76 for social support for autonomy, .70 and .80 for social support for competence, and .77 and .71 for social support for relating to others.

*Basic psychological needs***.** The Spanish version (Moreno-Murcia et al., 2011) of the *Psychological Need Satisfaction in Exercise Scale* (Wilson et al., 2006) was used to measure the NPB. The questionnaire is composed of 18 items grouped into three factors of six items each: competence (e.g. "I believe I can complete exercises that are a personal challenge"), autonomy (e.g. "I feel I can exercise in my own way") and relationship with others (e.g. "I think I get along well with those I relate to when we exercise together") being preceded by the pre-sentence "In my physical education classes...". Responses are collected on a Likert-type scale with a range of scores from 0 (*False*) to 6 (*True*).

Crombach's Alpha at pretest and posttest was .74 and .77 for autonomy, .84 and .87 for competence and .72 and .70 for relatedness to others.

Motivation. The Spanish version (Moreno-Murcia et al., 2011) adapted to physical education of the *Behaviour Regulation in Sport* Questionnaire (BRSQ) by Lonsdale et al. (2008) was used to measure motivation towards physical education classes. The questionnaire consists of 36 items preceded by the statement "I participate in PE lessons..." and is grouped into nine factors: general intrinsic motivation (e.g. "Because I enjoy it"), intrinsic knowledge motivation (e.g. "Because of the pleasure I get from learning more about PE"), intrinsic stimulation motivation (e.g. "Because I love the intense stimulation I can feel while doing PE"), intrinsic attainment motivation (e.g. "Because I enjoy it when I try to do PE"), intrinsic achievement motivation (e.g. "Because I enjoy it when I try to do PE") and intrinsic knowledge motivation (e.g. "Because of the pleasure I get from learning more about PE").g. "Because I enjoy trying to achieve long-term goals"), integrated regulation (e.g. "Because it is part of who I am"), identified regulation (e.g. "Because the benefits of PE are important to me"), introjected regulation (e.g. "Because I would feel ashamed if I gave it up"), external regulation (e.g. "Because if I don't do it others would not be happy with me") and demotivation (e.g. "However, I don't know why I do it"). The Likert-type scale used was from 1 (*Not true at all*) to 7 (*Very true*). Pre-test internal consistency was .83, .89, .87, .87, .79, .76, .65, .78, .71 and at post-test .81, .81, .74, .82, .80, .73, .72, .79 and .82, respectively.

Importance of physical education. The variable importance and usefulness attached by students to physical education was measured (Moreno et al., 2009). It consisted of three items grouped into a single factor: "I consider it important to receive physical education classes", "Compared to the rest of the subjects, I think physical education is one of the most important" and "I think that the things I learn in physical education will be useful in my life". Students were asked to respond on a Likert-type scale with a range of scores from 1 (*Strongly disagree*) to 4 (*Strongly agree*). The questions were preceded by the sentence: "Regarding physical education classes...". The internal consistency at pretest was .70 and at posttest .73.

Academic competition. Four modified invasion game situations were designed (Table 1). A rubric composed of nine items was created for their evaluation, six to measure the evaluation criterion "Successfully resolve different real situations of competition and cooperation through the application of specific motor skills and strategies, through the promotion of self-management of the practice of physical activity and sport"; and three for the criterion "Actively participate and collaborate in games and physical sports activities, practising respect, tolerance and teamwork". The Likert-type scale used was from 1 (*Lowest fit to the standard*) to 4 (*Highest fit to the standard*). The internal consistency in the pretest was .92 and in the posttest .90.

Table 1

Game situations and competence assessment instrument in invasion sports games.

S1. LAUNCHES Objective: to knock down 5 cones placed on a wall. According to their level, the students will decide: throwing distance, scoring target and distribution of the score, type of ball (handball or basketball) and grouping (individual, small groups, etc.).
S2. BASKETBALL SHOT In a half basketball court, with handball and/or basketball, the objective is to make a shot at the basket. Depending on their level, the students will decide: type of ball (handball or basketball), whether to shoot (at the backboard, with or without a previous bounce, etc.) or make an entry to the basket (lay-up, passing hoop, etc.), groupings (individual, pairs or small teams) and whether to establish a scoring objective.
S3. PASSES AND RECEPTIONS IN MODIFIED PLAY SITUATIONS (tactical knowledge I: supports, unmarking) In a space of 10mx10m, a 2x2 or 3x3 is played. Objective: to make 5 passes of the type they consider according to the game situation. The students can modify the use of supports, under what conditions and what value they give to the support (e.g. whether it is worth repeating the pass, etc.); type of ball and whether or not to include the final objective after completing the 5 passes (shooting at goal or making a basket).
S4. DESIGNING AN ACTION PLAN (tactical knowledge II: elaborating/implementing action plan in attack and defence) They play 2x2 or 3x3 basketball zones where the defending team leaves the 6.25m zone to initiate an attack and/or carry out handball attacks at the edge of the area, they choose either of the two games. They can think of a rule based on these main instructions, for example, based on a consequence of the game that they find, they propose rules and/or variants.
Criterion. Collaborates in different types of groupings in exploratory situations. 1 = Acts passively, does not cooperate. 2 = Occasionally collaborates. 3 = Active collaboration on many occasions. 4 = Cooperates on most occasions by showing empathy, tolerance and respect.

Subordinates their personal interests to the interests of the group by taking on roles and efforts prioritising the common goal.	1	2	3	4
Does not mind working, helping and/or grouping with all colleagues.	1	2	3	4
Ask for help when necessary in an uninhibited way.	1	2	3	4
Criterion. Improves autonomy through free choice in decision making in a context with a variety of exploratory activities. 1 = No initiative and inhibited / little participation despite *feedback* 2 = Some initiative or constant feedback 3 = Fairly proactive or supported with little feedback 4 = Initiative with timely feedback				
Acts to decide on the design of game strategies, selection of rules and level of difficulty, making his or her judgement known in exploratory situations.	1	2	3	4
Selects the most suitable tasks according to their characteristics and benefit	1	2	3	4
Is able to choose the appropriate equipment according to the environment and his/her level of practice.	1	2	3	4
Criterion. Shows confidence and security in motor competence in exploratory play situations. 1 = No implementation; very poor implementation 2 = Somewhat effective implementation 3 = Fairly effective implementation 4 = Highly effective implementation				
Executes technical aspects such as throwing, passing and catching with efficiency and confidence.	1	2	3	4
Interprets the game situation (attack) and executes in a support (approach) or unmarking in order to solve it.	1	2	3	4
Interprets the game situation (defence) and executes a marking, a help (permutation, change of pair) and/or a tilting.	1	2	3	4

Data collection and analysis procedure

The project was approved by the Project Evaluation Body of the Miguel Hernández University (2017.06.259.E.OEP; 2017.07.305.E.OEP; 2018.333.E.OEP). First of all, the school management team was contacted and the aim of the research was explained to them and permission was requested from the school council for the participation of the corresponding classes. In addition, due to the fact that the children were minors, a signed authorisation was requested from the adults in charge of them for their participation in the study. All participating students were treated in accordance with institutional ethical guidelines regarding consent, confidentiality and anonymity of responses.

A quasi-experimental design was used for the selection of the sample, since the participants could not be randomly selected because they were previously divided into groups. The whole sample was distributed in six groups, three of them had a teacher who followed an autonomy-supportive intervention model and the other three had a teacher who used a free interpersonal style. Both at the beginning and at the end, the students answered the questionnaires described above, the time ranged from 25 to 35 minutes, depending on the agility of the class.

Prior to the implementation of the project, the teacher of the intervention group was trained through a PIAA (Huéscar et al., 2022). The intervention of the teacher who followed the PIAA model consisted, in general, of gaining interest in teaching and in the students' learning, being positive, being patient and listening to the students, giving more importance to the process than to the final result in the tasks, respecting the differences among the students, their learning rhythms, behaviours and interests, showing empathy and managing emotions appropriately during conflicts.

The intervention took place during the months of March, April, May and June, with two 50-minute classes per week (22 classes in total). Both the control group and the intervention group developed the same contents (collective sports such as tchoukball and basketball). Figure 1 shows the timeline of the study.

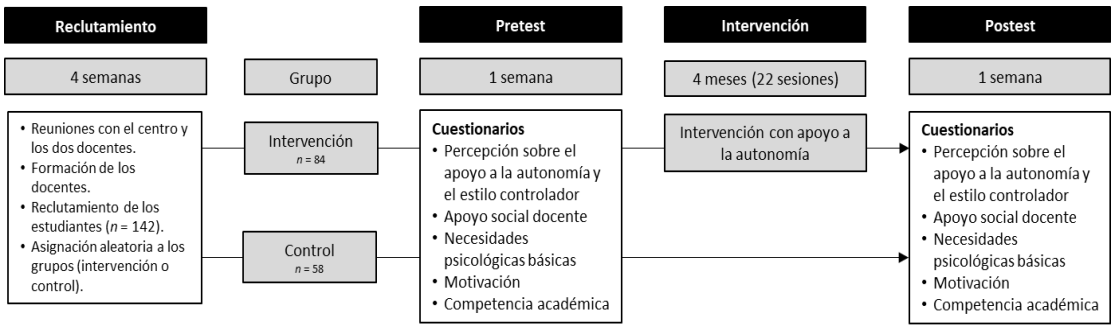

Figure 1. Timeline for autonomy support intervention and data collection.

Although the teacher of the intervention group received the PIAA training, it was proposed to implement the autonomy support strategies progressively. Taking into account the strategies proposed by Moreno-Murcia et al. (2021), they were structured so that they were all being developed progressively by the sixth week. This can be seen (Table 2) in the analysis of the classes that were recorded. For this purpose, a measuring instrument (Barrachina-Peris et al., 2022) was used to check the types of verbal interactions of the teacher (10 classes were recorded, one per week for each group) and the percentages devoted to each style (autonomy support and controlling style) were coded.

For the purpose of this study, in the treatment group it was necessary to (a) verify a significant change in the perception of autonomy support and (b) provide a minimum of 80% of the autonomy supportive information (Perlman, 2015). The mean data obtained were as follows: intervention group (84.5% in autonomy support, 15.8% in controlling style) and control group (22.5% in autonomy support and 77.5% in controlling style). Table 2 shows that in week six, the teacher in the intervention group already had percentages of autonomy-supportive behaviours recorded above 80% (Perlman, 2015). The teacher in the control group showed values between 25% and 30% in autonomy-supportive behaviours in all of his classes.

Table 2

Percentage of autonomy support and controlling style in each group per session.

Sessions	**Intervention group**		**Control group**	
Styles	**Autonomy support (%)**	**Controlling style (%)**	**Autonomy support (%)**	**Controlling style (%)**
1	22.1	77.8	28.8	72.2
2	30.7	69.5	20.2	79.8
3	37.8	62.5	32.3	68.7
4	45.2	55.0	25.4	74.6
5	68.8	31.2	27.5	72.5
6	85.3	15.3	21.4	78.6
7	81.4	18.5	25.7	74.3
8	82.5	17.4	28.9	71.1
9	82.3	18.0	26.4	73.6
10	84.5	15.8	22.5	77.5

Results and discussion

Preliminary analysis

First, to test the homogeneity of the two groups before the intervention, a one-factor analysis of variance was performed (Table 3), considering as dependent variables (autonomy support, controlling style, teacher social support, NPB, motivation, interest and competence in invasion sports) and as a fixed factor (the group), finding differences (Wilks' Lambda = .011, $F(13,128) = 863.075$, $p < .001$, $\eta^2 = .98$) in the variables social support for autonomy ($F(8,49)$, $p < .01$, $\eta^2 = .05$), social support for competence ($F(10,81)$, $p < .01$, $\eta^2 = .07$) and academic competence ($F(6,72)$, $p < .05$, $\eta^2 = .04$) in favour of the control group and on the basic psychological need for autonomy ($F(5,39)$, $p < .05$, $\eta^2 = .03$) in favour of the intervention group.

Table 3

Preliminary análisis

	Intervention group (*n* = 84)		**Group control (*n* = 58)**				
	M	***DT***	***M***	***DT***	***F***	***p***	η^2
Support for autonomy	3.23	.87	3.4	.48	2.42	.12	.01
Controlling style	2.76	.53	2.6	.48	3.05	.08	.02
Social support autonomy	3.01	1.06	3.49	.77	8.49	.004	.05
Social support competence	3.02	.60	3.36	.62	10.81	.001	.07
Social support relationship	2.72	1.13	3.02	.79	2.90	.091	.02
Autonomy	3.83	1.10	3.43	.83	5.39	.022	.03
Competition	4.63	1.19	4.66	1.16	.26	.871	.00
Relation	4.25	1.03	4.54	.83	3.22	.075	.02
Autonomous motivation	4.80	1.57	5.29	1.22	3.74	.051	.02
Controlling motivation	3.09	1.24	2.93	1.35	.43	.513	.00
Interest in physical education	2.94	.83	3.13	.64	2.10	.149	0.1
Academic competence	2.45	.89	2.84	.81	6.72	.010	.04

Effect of the intervention

To avoid discrepancies between what we thought we were doing and what was actually happening, the autonomy support perceived by the students was measured. This inclusion was intended to elicit perceptions of autonomy support during the lessons, and thus to gain more information about the effects of the intervention programme on the students. After performing a repeated measures ANOVA, the effect

of the intervention on the experimental group was measured (Figures 1, 2, 3, 4 and 5) and improvements were observed after the intervention in all variables except for the controlling style: perception of autonomy support (M_{pre} = 3.23 and M_{post} = 3.76, p < .01), perception of controlling style (M_{pre} = 2.76 and M_{post} = 2.73, p > .05), social support for autonomy (M_{pre} = 3.01 and M_{post} = 3.66, p < .01), social support for competence (M_{pre} = 3.02 and M_{post} = 3.26, p < .01) and social support for relationship (M_{pre} = 2.72 and M_{post} = 3.38 p < .01). While in the control group no differences were obtained in any variable, except for the controlling style: perception of autonomy support (M_{pre} = 3.42 and M_{post} = 3.32, p > .05) and perception of control*l*ing style (M_{pre} = 2.61 and M = 2.61, p < .01).61 and M_{post} = 2.70, p < .05), social support for autonomy (M_{pre} = 3.49 and M_{post} = 3.40, p > .05), social support for competence (M_{pre} = 3.36 and M_{post} = 3.18, p > .05) and social support for relatedness (M_{pre} = 3.02 and M_{post} = 3.05, p > .05).

Cronbach's alpha coefficient was used to verify the internal consistency of each factor. To ensure the homogeneity of all dependent variables, a Levene's test was carried out at pre-test and post-test. The effect of the intervention was assessed through a 2x2 (group x Time) repeated measures analysis (ANOVA). To answer the research questions, a repeated measures ANOVA was conducted with all dependent variables (autonomy support, controlling style, teacher social support, NPB, motivation, interest in physical education and academic competence). Data analysis was performed using SPSS 22.0 statistical software.

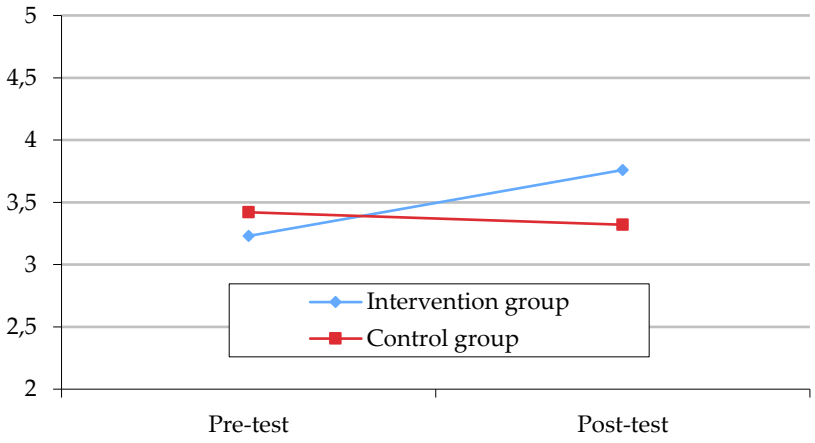

Figure 2. Student perception of teacher autonomy support (EAA).

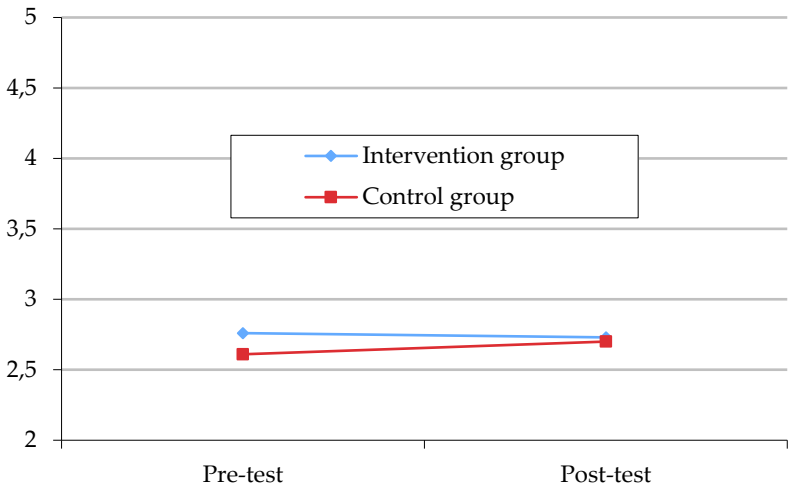

Figure 3. Participants' perception of the teacher's controlling style (EEC).

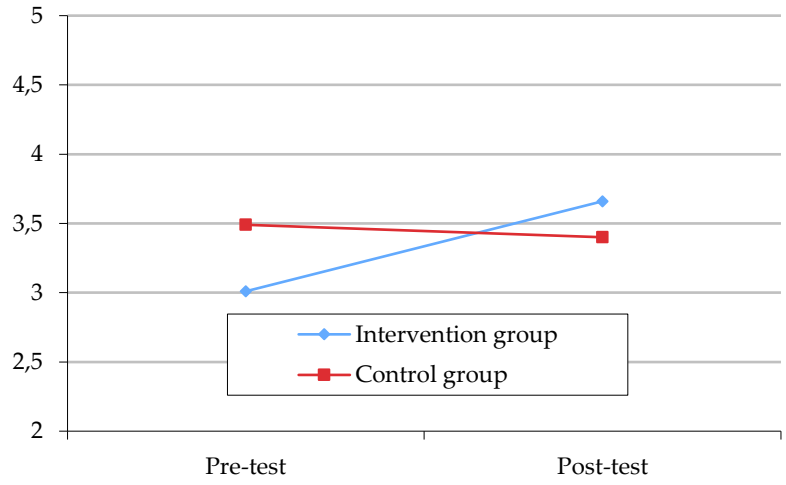

Figure 4. Students' perception of social support for autonomy (IBS).

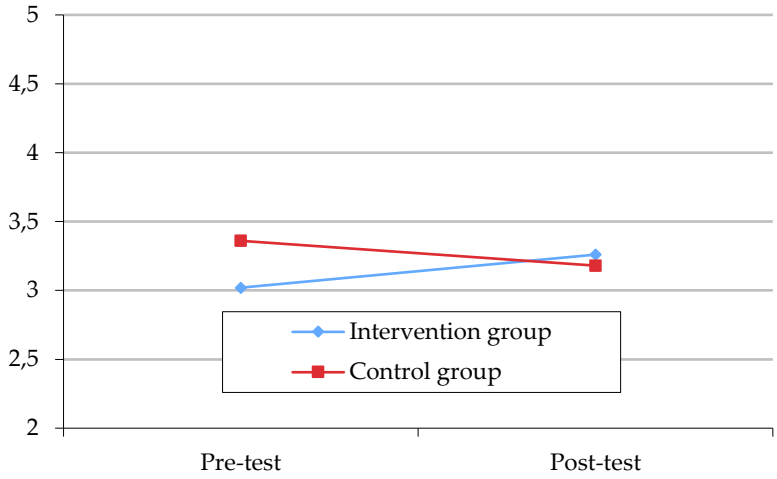

Figure 5. Student perception of social support for competence (IBS).

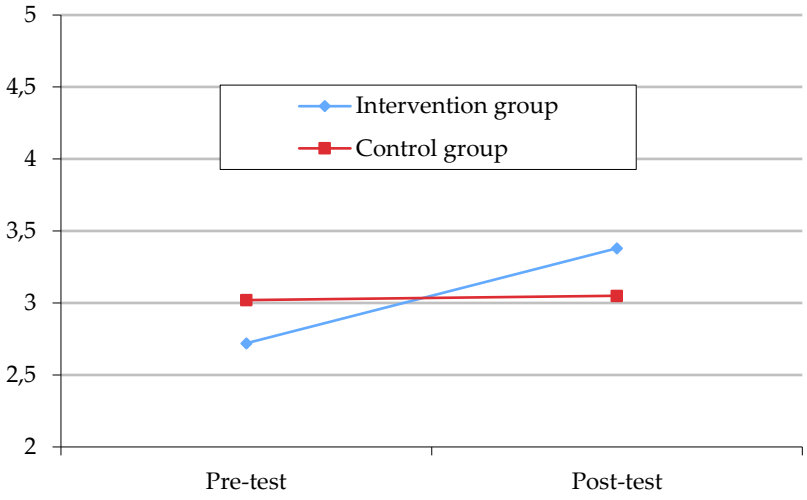

Figure 6. Students' perception of social support for relationships with others (IBS).

When checking the effect after the intervention, in the experimental group (Table 4), satisfaction with the NPBs of autonomy, competence and relationship with others improved ($p < .001$), as well as autonomous motivation ($p < .01$), interest in physical education ($p < .001$) and teaching competence ($p < .001$). While in the control group, satisfaction with the NPBs of autonomy, competence and relationship with others worsened ($p < .001$).

Table 4

Repeated measures analysis

		Intervention group (*n* = 84)			**Control group (*n* = 58)**		
		M	***DT***	***d***	***M***	***DT***	***d***
Autonomy	Pre	3.23	.54	-.24	3.43	.83	.64
	Post	3.83**	1.10		2.98**	.55	
Competition	Pre	3.44	.66	-1.24	4.66	1.16	1.60
	Post	4.63**	1.19		3.20**	.57	
Relationship with others	Pre	3.01	.54	-1.51	4.54	.83	2.48
	Post	4.25**	1.03		2.70**	.64	
Autonomous motivation	Pre	4.80	1.57	-.39	5.29	1.22	.13
	Post	5.35*	1.19		5.13	1.16	
Controlling motivation	Pre	3.09	1.24	-.14	2.93	1.35	-.05
	Post	3.28	1.41		2.99	1.31	
Interest in physical education	Pre	2.94	.83	-.27	3.13	.64	.20
	Post	3.15**	.74		3.00	.67	
Academic competence	Pre	2.47	.90	-.59	2.84	.81	-.06
	Post	2.96**	.74		2.89	.82	

Note: * $p < .05$; ** $p < .01$

Discussion

The aim of the study was to test the effect of the interpersonal style of teacher autonomy support on NPB, motivation, interest in physical education and academic competence in adolescent students in physical education classes. The hypothesis is confirmed, the interpersonal style of autonomy support satisfies the needs for autonomy, competence and relationship with others, leads to greater autonomous motivation, makes the student show more interest in physical education and improves academic competence.

The intervention has had a positive effect, students who received autonomy-supported education presented better values in NPB satisfaction and motivation in line with previous studies (Cheon and Reeve, 2015; Conesa et al., 2022; Fin et al., 2019; Hosseini et al, 2022; Moreno-Murcia and Sánchez-Latorre, 2016; Reeve and Cheon, 2021; Trigueros et al., 2019; Yew and Wang, 2016). According to these studies, these improvements will result in an increase in aspects such as interest in the subject, desire to participate in future physical activities, satisfaction with life, commitment to the proposed tasks, etc. In this sense, if the teaching team maximises the application of

strategies based on autonomy support and reduces the use of controlling strategies, students will tend to lead a more active life.

In terms of academic competence, there is also an improvement in the intervention group, in accordance with studies such as that of Moreno-Murcia et al. (2015) in which an autonomy-supportive interpersonal style positively predicted academic competence, or Barrachina (2017) and Barrachina-Peris et al. (2024), who followed a similar approach to this study, as well as Behzadnia et al. (2019) in badminton and Van Aart et al. (2015) on basic motor skills. This fact shows that the implementation of the autonomy-supportive teaching style not only has consequences at the behavioural level in variables such as the importance given to the subject or affective, in aspects such as autonomous motivation and NPB, from the perspective of adherence to physical activity. Improvements are also observed at a cognitive level in performance criteria in the subject of physical education; in this case, the technical-tactical improvement in invasion sports, which indicates that this style is also effective for learning the knowledge proposed in this subject.

The pedagogical contributions of the study highlight the importance that some strategies (giving students a choice of content among different possibilities, offering level options within the tasks themselves, encouraging participation and cooperative work together with a good atmosphere in class, guiding students towards the search for answers without facilitating the solution to the problems posed or the use of non-controlling language, etc.) can have to improve students' motivation and their competence in physical education.

Limitations of the study include the need to increase the number of participants in the future, and to increase the intervention time. Another limiting factor is given by the context of the procedure itself, in which strategies linked to interpersonal style are controlled but other strategies that may affect the outcome are not contemplated, which should be considered in future studies. Finally, a comparative analysis of the participant population (male and female) was not carried out, which could be an element of great interest in future studies.

This study is a pioneer in incorporating academic performance variables in the school context, in this case academic competence, as well as the use of a validated intervention programme such as the PIAA. In this sense, this work opens the door to future studies to determine the role of the interpersonal style of autonomy support in relation to other variables and how it influences the teaching-learning process in general or its link with learning in other subjects of a different profile within the context of secondary education.

Conclusions

In conclusion, the study shows the effectiveness of an autonomy-supportive interpersonal teaching style programme in physical education classes in promoting NPB satisfaction, autonomous motivation, increased interest in physical education and improved academic competence.

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