

Do gender and the subject influence young students' psychological needs and positive and negative outcomes?

¿Influye el género y el tipo de asignatura sobre las necesidades psicológicas básicas y consecuencias positivas y negativas de jóvenes escolares?

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Gender and subject in young students

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Abstract

The present study aimed to analyze and compare gender differences in the basic psychological needs (BPN) in several subjects (Physical Education, Mathematics, English and Language, and Literature) in terms of satisfaction/frustration, the perceived subject importance, and perceived usefulness of the subject matters, and the degree of enjoyment/boredom perceived by secondary students. In addition, the differences between the subjects in the mean scores of all these motivational variables were analyzed. Participants were 1754 Spanish students (986 girls and 768 boys) in 3rd ($n = 991$) and 4th grade ($n = 763$) of secondary education with an average age of 15.70 years (± 0.75). An independent-sample t-test to assess possible gender differences and a paired t-test were carried out to compare the variables in the different subjects. The results revealed significant differences in the majority of variables analyzed according to gender, with higher values for girls than boys in need satisfaction, the perceived usefulness the enjoyment of most subjects, and lower values in need frustration and boredom. In addition, significant differences were found when comparing the four subjects. Specifically, Physical Education (PE) had significantly higher values in need satisfaction and enjoyment and significantly lower scores in need frustration, perceived usefulness, and boredom than the other subjects analyzed. These gender and between-subjects differences should be considered when teachers design and develop methodological strategies to carry out their roles with young students.

Keywords: adolescents, secondary school, enjoyment, psychological needs, perceived usefulness, differences analysis.

Resumen

El presente estudio pretendía analizar y comparar en varias asignaturas (Educación Física, Matemáticas, Inglés y Lengua y Literatura) las diferencias de género en la satisfacción/frustración de las necesidades psicológicas básicas (NPB), la utilidad percibida y el grado de diversión/aburrimiento percibido por el alumnado de secundaria. Además, se analizaron las diferencias entre las asignaturas en las puntuaciones medias de todas estas variables motivacionales. Participaron 1754 ($M_{\text{edad}} = 15,70 \pm 0,75$) estudiantes (986 chicas y 768 chicos) de tercer ($n = 991$) y cuarto curso ($n = 763$). Para determinar las diferencias de género, se realizó un análisis de diferencias para muestras independientes. Los resultados demostraron que las chicas reportaron significativamente valores más altos en la satisfacción de las NPB, la utilidad percibida y la diversión en la mayoría de las asignaturas, y menores en la frustración de las NPB y aburrimiento. En la comparación por pares entre asignaturas, la asignatura de Educación Física obtuvo significativamente las mayores puntuaciones de satisfacción y diversión, y menor frustración de las NPB y aburrimiento, pero también la que menor utilidad percibida presentaba respecto a las demás. Por tanto, se deben considerar las diferencias de género y entre asignaturas encontradas en las variables analizadas a la hora de desarrollar programas didácticos en esta etapa educativa.

Palabras clave: educación secundaria, adolescentes, disfrute, necesidades psicológicas, utilidad percibida, análisis de diferencias.

Introduction

In the educational field, various investigations have reported a systemic and progressive decrease in students' academic motivation throughout the courses (Gnambs & Hanfstingl, 2016; Gottfried et al., 2001), generalized in most subjects of the curriculum and especially in some like Mathematics, Science, and Language and Literature (Gottfried et al., 2001). In this sense, multiple studies have focused on analyzing the effect of basic psychological needs (BPN) on improving students' motivational processes towards learning (Haerens et al., 2015; Ng et al., 2016; Sánchez-Oliva et al., 2017). Also, how teachers develop the teaching-learning process in their subject can lead to greater satisfaction or frustration of students' needs (Aelterman et al., 2019; Haerens et al., 2015; Vasconcellos et al., 2020).

The Theory of Basic Psychological Needs

One of the theories that approach the study of motivation is the Self-Determination Theory (SSD; Deci & Ryan, 2000), which is one of the most used theoretical frameworks to explain motivation in different contexts. This macro theory explains why people start, consolidate, or cease the development of an activity, differentiating various types of motivation that range on a continuous gradient from higher to lower self-determination. Intrinsic motivation refers to the performance of an activity for the satisfaction and inherent pleasure of the action itself. Extrinsic motivation (integrated, identified, introjected, and external regulation) is characterized by motives outside the subject, such as parallel benefits related to health or social aspects, pride, or rewards. Finally, amotivation is where the activity performed seems meaningless to the person (Deci & Ryan, 2000) and, therefore, likely to be disorganized and accompanied by feelings of frustration or apathy. As part of this theoretical construct, the Theory of Basic Psychological Needs (BPN; Deci & Ryan, 2000) considers that three essential needs for well-being must be covered to develop self-determined motivation: the needs for autonomy, competence, and social relatedness (Ryan & Deci, 2017). The need for autonomy refers to students' desire to be the origin and guide of their behavior (Su & Reeve, 2010). In the school context, the need for competence refers to students' feeling of effectiveness when performing the tasks (Deci & Ryan, 2000), and the need for social relatedness concerns students' feeling integrated with significant others (students and teachers) from the social environment (Deci & Ryan, 2008).

Concerning the above and focusing on teachers as socializing agents, teachers are characterized by using a supportive interpersonal style or a controlling style (Su & Reeve, 2010). Teachers with a supportive style allow their students to make decisions about the activities (Reeve & Cheon, 2014), provide instructions according to individual learning progression (Jang et al., 2010), and offer positive and constructive feedback to help them develop skills and feelings of competence (Alevriadou & Pavlidou, 2016). The teachers structure the classes at the beginning according to the amount and clarity of information (Jang et al., 2010) and orient the students during the tasks about what to do and how to do it, facilitating skill development and the achievement of the desired results (Cheon & Reeve, 2015). Finally, teachers provide explanations using non-controlling and informative language, showing patience and affection, allowing the students sufficient time, and respecting their individual learning rhythm (Alevriadou & Pavlidou, 2016; Cheon & Reeve, 2015). On the other hand, a controlling interpersonal

style is characterized by authoritarian, chaotic, and hostile teaching behaviors, which curb or limit the satisfaction of students' BPN (Bartholomew et al., 2018; Moreno-Murcia et al., 2020; Reeve & Cheon, 2014; Salazar-Ayala et al., 2021). Teachers who use this style seek to increase motivation through direct instructions, incentives that are contingent on the results, or they pressure the students to behave in the desired way. However, their behavior does not facilitate students' perception of competence in tasks; they usually give little relevant information about performance, which can be counterproductive in their interactions with students (Alevriadou & Pavlidou, 2016). However, teachers' lack of supportive behaviors does not imply the automatic appearance and adoption of controlling behaviors (Cheon et al., 2018; Vansteenkiste & Ryan, 2013).

Although the literature supports and grants importance to teachers' use of interpersonal styles oriented to support BPN (Escriva-Boulley et al., 2018), such styles are not frequently used in practice (Cheon & Reeve, 2015; Haerens et al., 2013), whereas controlling interpersonal styles are more common (Cheon et al., 2018). Several works analyzing different subjects have shown that supportive teacher styles generate the appropriate conditions to increase students' satisfaction and reduce their frustration of BPN (Haerens et al., 2018; Vasconcellos et al., 2020), while increasing their interest and enjoyment (Tsai et al., 2008) compared to more controlling styles (Jang et al., 2016; Moreno-Murcia et al., 2020; Sánchez-Oliva et al., 2020). Likewise, students' perception of enjoyment in the classes has been positively related to their disposition towards the subject (Cairney et al., 2012; Jaakkola et al., 2017). In this sense, it has been shown that the satisfaction of students' needs is positively related to the attribution of greater importance to the subject, in this case, Physical Education (PE) (Bryan & Solmon, 2012; Bourne et al., 2015). Negative relationships have also been found between self-determined motivation and boredom, and between boredom and school performance (Barkoukis et al., 2012; Tze et al., 2016). Hence, it seems necessary to examine how these variables develop in different secondary subject matters from the students' point of view.

The present study

Several studies have analyzed the motivational processes that affect students during the teaching-learning process in various subjects (Gnambs & Hanfstingl, 2016; Gottfried et al., 2001). In addition, some investigations have focused on analyzing the differences in terms of students' gender in the motivational aspects of the educational process in the subjects included in this study, such as Mathematics (Gaspard et al., 2015; Rozek et al., 2015), English as a foreign language (Bugler et al., 2016; Hochweber & Vieluf, 2018), or PE (Ntoumanis, 2001; Sánchez-Oliva et al., 2020). However, we know no comparative studies of the subjects that analyzed the motivational mediators, establishing differences depending on the students' gender. Understanding these differences is essential, as it has been shown that students' type of motivation is determined by the mediation of the satisfaction and frustration of their BPN (Ryan & Deci, 2017; Vansteenkiste & Ryan, 2013). Thus, the main objective of this work was to analyze the possible differences in the levels of satisfaction and frustration of the BPN, enjoyment, boredom, and perceived usefulness of the subject, considering the students' gender in the subjects of Mathematics, English, Language and Literature, and PE. Based on this objective, we proposed the following hypothesis:

Hypothesis 1. There will be significant differences depending on the students' gender in the perception of their level of satisfaction and frustration of their BPN,

enjoyment/boredom, and perceived usefulness in each of the subjects analyzed.

In addition, we intended to compare the students' perceptions of the variables in the different subjects. Concerning this objective, we defined the following hypothesis:

Hypothesis 2. Significant differences will be found in the comparative analysis between the different subjects that make up the study.

Method

Investigation design

We conducted a cross-sectional study that met all the checklist elements that should be included in cross-sectional reports according to the STROBE criteria (Von Elm et al., 2007). Data collection took place in the middle of the second school term to ensure that the students answered the questions with an optimal knowledge of the variables.

Participants

The total study sample consisted of 1754 students (768 boys and 986 girls) of third ($n = 991$) and fourth grade ($n = 763$) of Compulsory Secondary Education ($M = 15.70$ years ± 0.75), belonging to public ($n = 29$) and subsidized schools ($n = 3$) of the Spanish autonomous communities of Andalusia ($n = 4$), Extremadura ($n = 25$), and Castilla-La Mancha ($n = 3$). We used a non-probabilistic sampling technique to select the sample, considering the proximity of the centers and the researchers' possibilities to access the sample.

Instruments

Satisfaction of the BPN. We used the Spanish-translated version of the Basic Psychological Needs in Exercise Scale (BPNE; Moreno-Murcia et al., 2008) to assess the degree of satisfaction of the BPN. The items of this instrument begin with the stem phrase "In the classes of this subject ...", followed by 12 items distributed in three factors of four items: Autonomy Satisfaction (e.g., "the activities and tasks I perform are in line with my interests"); Competence Satisfaction (e.g., "I perform the tasks effectively"); and Social Relatedness Satisfaction (e.g., "I feel very comfortable with my classmates").

Frustration of the BPN. We used the Spanish version of the Psychological Need Thwarting Scale (PNTS; Cuevas et al., 2015) to analyze the degree of frustration of the BPN. The items of this instrument begin with the stem phrase "In the classes of this subject...", followed by 12 items distributed in three factors of four items: Autonomy Frustration (e.g., "I feel pressured to behave in a certain way"); Competence Frustration (e.g., "there are situations where I feel incapable"); and Social Relatedness Frustration (e.g., "I feel rejected by those around me").

Perceived usefulness of the subject. We used the Importance of Physical Education Scale (IPE; Moreno-Murcia et al., 2009) to assess the students' perceived usefulness of each of the subjects. Following the introductory stem phrase "In my classes..." were three items grouped into a single factor (e.g., "Compared to the rest of the subjects, I think this subject is one of the most important").

Enjoyment and boredom. To assess the students' general enjoyment/boredom in each subject, we used the modified version of the Sports Satisfaction Instrument applied to PE (SSI-PE; Baena-Extremera et al., 2012). The instrument requests respondents to indicate their degree of agreement with each sentence and presents eight items, five for Enjoyment (e.g., "I usually find this subject interesting"), and three for Boredom (e.g., "in the classes of this subject, I am usually bored"). Participants rated their agreement with the statement on a 5-point Likert scale ranging from 1 (*totally disagree*) to 5 (*totally agree*).

Procedure

Before data collection, the principal investigator had previously contacted the participating school directors to explain the study's objectives and request their participation. Due to the participants' legal minority, the direction of the centers sent an informed consent to parents or legal guardians, who authorized the students' participation in this research. We informed the participants of the confidential treatment of all the responses and results within the scope of the investigation. We followed the necessary ethical standards when working with minors and the Declaration of Helsinki (1964) agreements at all times. The assessment took place during school hours, following the American Psychological Association (2010) guidelines regarding the responders' consent, confidentiality, and anonymity. The participants completed the questionnaires individually for approximately 30 minutes, in an appropriate climate without any distractions or the presence of any of the teachers of the subjects assessed in the study but in the presence of a researcher to solve any doubts or unforeseen events.

Data analysis

The statistical program SPSS 21.0 was used to analyze the results. First, we determined the homogeneity of variances and performed normality tests to validate the parametric tests. Specifically, the Levene test (homogeneity) presented a value of 99.3%. Next, we calculated the descriptive statistics, the bivariate correlations by subjects (see Supplementary Tables 1-4), and the internal consistency of the scales for each of the subjects. Subsequently, we performed a T-test for independent samples to determine possible gender differences in each variable. Finally, we used a related samples T-test for the pairwise comparison of the different subjects that made up the study.

Results

Descriptive statistics and internal consistency

Table 1 shows each dependent variable's descriptive statistics and internal consistency in the subjects assessed (Mathematics, English, Language and Literature, and PE). The results yielded higher scores in the satisfaction of social relatedness, perceived usefulness, and enjoyment. In contrast, the lowest values were obtained in the frustration of the BPN (especially autonomy frustration) and boredom. The reliability analysis was satisfactory for all the variables analyzed, obtaining results above .70 in the Cronbach alpha values. Likewise, the bivariate correlations between variables in each subject were significant. (They are included as supplementary tables at the end of the manuscript to avoid interference or confusion regarding the primary analyses of the research objectives).

Table 1. Descriptive statistics and reliability analysis of study variables

Variables	Mathematics				English				Language and Literature				Physical Education			
	M±SD	Skew	Kurt	α	M±SD	Skew	Kurt	α	M±SD	Skew	Kurt	α	M±SD	Skew	Kurt	α
1. Autonomy Satisfaction	3.27±.98	-0.21	-0.27	.80	3.33±.90	-0.22	-0.00	.76	3.27±.88	-0.14	-0.00	.76	3.45±.90	-0.15	-0.33	.77
2. Competence Satisfaction	3.43±.98	-0.27	-0.39	.80	3.52±.90	-0.25	-0.24	.78	3.46±.89	-0.22	-0.21	.78	3.63±.89	-0.30	-0.40	.79
3. Soc. Rel. Satisfaction	3.64±.97	-0.34	-0.50	.82	3.66±.95	-0.38	-0.27	.81	3.62±.95	-0.26	-0.46	.81	3.77±.90	-0.38	-0.59	.82
4. Autonomy Frustration	2.56±.95	0.12	-0.70	.72	2.57±.94	0.10	-0.70	.72	2.53±.93	0.16	-0.65	.72	2.55±.94	0.19	-0.62	.72
5. Competence Frustration	2.39±1.05	0.23	-0.86	.83	2.42±1.06	0.15	-0.95	.84	2.34±1.03	0.23	-0.89	.84	2.34±1.02	0.28	-0.80	.83
6. Soc. Rel. Frustration	2.35±1.09	0.26	-1.04	.85	2.37±1.08	0.23	-0.99	.85	2.31±1.06	0.27	-0.99	.84	2.29±1.06	0.31	-0.93	.84
7. Perceived usefulness	3.74±1.03	-0.20	-0.13	.80	3.78±1.00	-0.55	-0.27	.79	3.57±1.01	-0.44	-0.21	.78	3.44±1.01	-0.34	-0.33	.77
8. Enjoyment	3.25±.97	-0.02	-0.26	.82	3.26±.88	-0.11	-0.08	.79	3.22±.86	-0.21	0.10	.78	3.60±.87	-0.28	-0.26	.79
9. Boredom	2.91±1.09	-0.22	-0.64	.79	2.87±1.01	-0.37	-0.37	.74	2.96±1.01	-0.02	-0.38	.74	2.58±1.04	0.16	-0.67	.75

Note. Skew = Skewness; Kurt = Kurtosis; Soc. Rel. = Social Relatedness.

Analysis of gender differences

Table 2 shows the results of the analysis of differences for independent samples (T-test) considering gender as an independent variable. In Mathematics, we found significant differences between boys and girls ($n < .05$) in the satisfaction of social relatedness (higher values in girls), and autonomy frustration, competence, and social relatedness, perceived usefulness of the subject, and boredom (higher scores in boys). In the subjects of English and Language and

Literature, we observed significant gender differences in all the dependent variables (higher scores in satisfaction of autonomy, competence, and social relatedness, perceived usefulness of the subject, and enjoyment in girls; and higher scores in boys in frustration of autonomy, competence, and social relatedness, and boredom). Finally, considering the subject of PE, we found significant differences in the satisfaction of social relatedness (higher scores in girls) and frustration of autonomy, competence, and social relatedness, and boredom (higher scores in boys).

Table 2. T-test for independent samples of all the variables analyzed as a function of gender in all four subjects

	Mathematics			English			Language and Literature			Physical Education		
	Boys	Girls	p	Boys	Girls	p	Boys	Girls	p	Boys	Girls	p
	M±SD	M±SD		M±SD	M±SD		M±SD	M±SD		M±SD	M±SD	
Aut. Satisfaction	3.22 ±.99	3.31±.97	.08	3.26±.89	3.39±.90	<.001	3.18±.89	3.34±.87	<.001	3.46±.93	3.44±.89	.57
Comp. Satisfaction	3.38±.97	3.47±.99	.05	3.43±.88	3.60±.91	<.001	3.31±.89	3.58±.88	<.001	3.61±.89	3.65±.89	.29
Soc. Rel. Satisfaction	3.54±.94	3.72±1.00	<.001	3.56±.91	3.75±.97	<.001	3.45±.93	3.75±.95	<.001	3.71±.91	3.81±.96	<.05
Aut. Frustration	2.73±.91	2.42±.95	<.001	2.77±.91	2.42±.94	<.001	2.75±.92	2.36±.90	<.001	2.76±.91	2.38±.93	<.001
Comp. Frustration	2.56±1.03	2.27±1.05	<.001	2.58±1.03	2.29±1.06	<.001	2.51±1.01	2.20±1.02	<.001	2.50±1.01	2.22±1.02	<.001
Soc. Rel. Frustration	2.57±1.08	2.18±1.07	<.001	2.59±1.08	2.20±1.05	<.001	2.50±1.03	2.15±1.06	<.001	2.49±1.03	2.14±1.05	<.001
Perceived usefulness	3.64±1.03	3.81±1.02	<.001	3.62±.98	3.90±.99	<.001	3.42±1.01	3.69±1.00	<.001	3.48±.97	3.41±1.04	.15
Enjoyment	3.22±.92	3.28±1.00	.14	3.20±.85	3.31±.89	<.05	3.15±.86	3.27±.87	<.001	3.57±.82	3.62±.90	.27
Boredom	3.02±1.05	2.82±1.12	<.001	2.98±.99	2.79±1.01	<.001	3.09±.98	2.87±1.01	<.001	2.69±1.04	2.49±1.03	<.001

Note. Aut. = Autonomy; Comp. = Competence; Soc. Rel. = Social Relatedness.

Pairwise comparison of the subjects

Table 3 shows the results obtained after a related-sample T-test of the pairwise comparison of the four subjects: Mathematics, English, Language and Literature, and PE. In this comparison between PE and Mathematics and English, we found significant differences in the scores of satisfaction of autonomy, competence, social relatedness, and enjoyment, with higher scores in PE. Likewise, we observed significant differences in the frustration of competition and social relatedness, and perceived usefulness, and boredom, in this case, with higher scores in Mathematics and English. In comparing PE and Language and Literature, we obtained significant differences in the values of satisfaction of autonomy, competence, and social relatedness, and enjoyment, with higher scores for PE. Likewise, we found significant differences in

perceived usefulness and boredom, where the subject of Language and Literature obtained higher values. In the comparison between Mathematics and English, we observed significant differences in the satisfaction of autonomy, with higher scores for the subject of English. Comparing Mathematics and Language and Literature, we obtained significant differences in the satisfaction of competence and boredom, with higher values in Language and Literature. In addition, significant differences were found in the frustration of competition and social relatedness and perceived usefulness, in this case, with higher values in Mathematics. Finally, in the comparison between English and Language and Literature, we observed significant differences in the satisfaction of autonomy, competence, and social relatedness, and in the frustration of autonomy, competence, and social relatedness, and perceived usefulness, where the results in the subject of

English were higher. Significant differences were also found in boredom, with higher scores in Language and Literature.

Table 3. T-test for related samples comparing the subjects in pairs in each of the variables included in the study

	Autonomy Satisfaction		Competence Satisfaction		Relatedness Satisfaction		Autonomy Frustration		Competence Frustration		Relatedness Frustration		Perceived usefulness		Enjoyment		Boredom			
	M±SD	p	M±SD	p	M±SD	p	M±SD	p	M±SD	p	M±SD	p	M±SD	p	M±SD	p	M±SD	p		
Physical Education + Mathematics	3.45±.90	<.001	3.63±.89	<.001	3.77±.90	<.001	2.55±.94	.48	2.34±1.02	<.05	2.29±1.06	<.001	3.44±1.01	<.001	3.60±.87	<.05	2.58±1.04	<.001	2.91±1.09	<.001
Physical Education + English	3.45±.90	<.001	3.63±.89	<.001	3.77±.94	<.001	2.55±.94	.11	2.34±1.02	<.001	2.29±1.06	<.001	3.44±1.01	<.001	3.60±.87	<.05	2.58±1.04	<.001	2.91±1.09	<.001
Physical Education + Language and Lit.	3.45±.90	<.001	3.63±.89	<.001	3.77±.94	<.001	2.55±.94	.28	2.34±1.02	.80	2.29±1.06	<.001	3.44±1.01	<.001	3.60±.87	<.05	2.58±1.04	<.001	2.91±1.09	<.001
Mathematics + English	3.27±.98	<.001	3.43±.98	.11	3.64±.97	.27	2.56±.95	.37	2.39±1.05	.22	2.35±1.09	.26	3.74±1.03	.07	3.25±.97	.73	2.96±1.01	.13	2.91±1.09	.13
Mathematics + Language and Lit.	3.27±.98	.98	3.43±.98	<.05	3.64±.97	.20	2.56±.95	.07	2.39±1.05	<.001	2.35±1.09	<.001	3.74±1.03	<.001	3.25±.97	.17	2.96±1.01	<.05	2.91±1.09	<.05
English + Language and Lit.	3.33±.90	<.001	3.52±.90	<.001	3.66±.95	<.05	2.57±.94	<.001	2.42±1.06	<.001	2.37±1.08	<.001	3.78±1.00	<.001	3.26±.88	.06	2.87±1.01	<.001	2.96±1.01	<.001

Note. Language and Lit. = Language and Literature.

Discussion

The main objective of this study was to determine possible significant differences in the levels of satisfaction and frustration of the BPN, and perceived usefulness, enjoyment, and boredom between the subjects of Mathematics, English, Language and Literature, and PE, considering the students' gender. In addition, we compared the students' perceptions of the subjects for each of the variables analyzed. The results obtained revealed significant differences in most of the variables analyzed according to gender and in the pairwise comparison of the variables analyzed for the four subjects.

Considering the gender differences, the girls showed higher levels of BPN satisfaction (especially in English and Language and Literature), perceived usefulness of each of the subjects (except for PE), and enjoyment in Language and Literature and English. In contrast, they scored lower in BPN frustration and boredom than the boys in all subjects. These gender differences in the students' perceptions, regardless of the subject analyzed, must be considered by the teacher when developing a behavior appropriate to this reality. Specifically, several studies have shown that teaching behaviors based on interpersonal styles in which the students' individual differences are addressed and which support the students' autonomous work improve their levels of satisfaction and reduce the frustration scores of the BPN (Aelterman et al., 2019; Haerens et al., 2018; Vasconcellos et al., 2020). In this sense, it is essential to transmit messages and treat each subject in a differentiated emotional way, according to the students' gender and their expectations and interests. On the other hand, teacher controlling styles, in which the teacher does not value the differences between the students nor do they adapt and individualize the training process to their needs and interests, negatively affect their satisfaction of the BPN and positively impact the frustration of their BPN (Bartholomew et al., 2018; Jang et al., 2016; Moreno-Murcia et al., 2020). Specifically for PE, the results showed significant differences depending on the students' gender in favor of the girls, with higher scores in the satisfaction

of social relatedness and less frustration of all the BPN and boredom. These results differ from other studies that found lower scores in girls (Abós et al., 2021; Ferriz et al., 2013; Sánchez-Oliva, 2020). The use of interpersonal styles that address the students' differences according to gender may explain why our results differ from those found in previous studies. Also, contextual aspects, such as the contents developed, may have affected the results, as such elements have been shown to have different effects on the perception of competence depending on the students' gender (Murillo et al., 2014). Therefore, a change of trend is being achieved in the contents applied in the subject, where traditionally, those associated with the male gender have prevailed (Rodríguez et al., 2018). Likewise, we may be facing a fracture in the existing stereotypes, which have traditionally been more resistant to change (Zaravigka & Pantazis, 2012) and encouraged by the mass media (Del Castillo, 2012). Some work proposals have already positively affected this change in dynamics (Pelegrín et al., 2012; Rodríguez & Gómez, 2018).

On the other hand, considering the results obtained in the comparison of the four subjects, we observed that the subjects that generated greater satisfaction and less frustration of the BPN led to higher levels of enjoyment and less boredom. These results could be related to those obtained by Tsai et al. (2008), who found that teacher support of the need for autonomy in subjects as different as Mathematics, English, and Language and Literature increased the students' interest and enjoyment. In the educational context, there is much evidence showing that interpersonal teaching styles are essential to achieve positive effects on students' satisfaction of the BPN and their perceptions during their learning (Aelterman et al., 2019; Haerens et al., 2018; Teixeira et al., 2020; Vasconcellos et al., 2020), whereas controlling styles directly affect students' frustration of the BPN and negatively affect their attitude during the training process (Bartholomew et al., 2018; Jang et al., 2016; Salazar-Ayala et al., 2021). In addition, the results show that the subject of PE generates higher values in the satisfaction of autonomy, competence, and social relatedness, as well as

enjoyment, while obtaining lower scores in the frustration of autonomy, competence, and social relatedness, in addition to perceived usefulness and boredom. A possible explanation for this may be the students' difficulty in transferring the acquisition of learning PE and its usefulness for daily life and their future. This fact suggests that the efforts to establish habits of practicing physical activity in adolescents' daily lives have not yet had a clear impact on their perception of the usefulness of PE. Likewise, their social perception of PE, which has not overcome the secondary or complementary vision the rest of the subjects may explain this result. In addition, this decrease in the perceived usefulness increases with students' age in the secondary education stage (Moreno-Murcia et al., 2006). This student-perceived decrease, together with the emergence of other parallel motivations to perform other activities, could be considered a barrier for many adolescents to adopt a sufficiently active lifestyle and the prelude for many students to abandon sports (Escribano et al., 2017). Nonetheless, it is crucial to maintain high values in the satisfaction of BPN, as they are the antecedent to achieving positive effects in adolescents' behavior, both in the educational field and in extracurricular physical-sports practice (Moreno-Murcia et al., 2020; Ruiz-Juan & Baena-Extremera, 2015; Sánchez-Oliva et al., 2017). Likewise, although higher values were found in the enjoyment of PE than for the rest of the subjects, the differences are not exceptionally high for a learning dynamic based on motor skills and movement compared to others. Hence, there is room for methodological improvement to enhance the attractiveness of PE, based on the use of motor skills and movement, because the students think that teachers do not promote the increase in their interest in PE (Gil-Madrona et al., 2012).

In the comparison between the subjects considered instrumental, Mathematics and Language and Literature, the satisfaction of the BPN was practically the same in both of them, and competence satisfaction was only significant in Language and Literature, with higher scores. In addition, the results of the frustration of competence and social relatedness were higher in Mathematics. The perceived usefulness of Mathematics was also higher than that of Language and Literature, whereas boredom was higher in Language and Literature. In this sense, Tsai et al. (2008) found that students showed greater interest in Mathematics than in the subject of their mother tongue (in this case, German), thanks to the promotion of their autonomy during the teaching-learning process. It, therefore, seems clear that this type of teaching behavior favors the students' attitude towards this subject. These student perceptions could be due to the traditionalist tendency in the development of these subjects, using unidirectional teaching with a very controlling style of the BPN, due to the situation in the classroom (Reeve & Cheon, 2014). The need to apply certain unavoidable controlling behaviors to teach the subjects effectively may also have influenced the results (Behzadnia et al., 2018). However, several studies have shown that teaching behaviors that promote autonomy, mindfulness, and the flexibility of the task structure (Ng et al., 2016) or the use of spaces other than the conventional classroom to develop the contents and classes (Otte et al., 2019) positively affect students' motivational aspects in these subjects. Finally, students' pessimistic beliefs and expectations about the mastery of the content or the teacher's approach to the subjects, with unattractive content and learning experiences (Reeve & Cheon, 2014; Shen et al., 2010), may also generate maladaptive functioning in the classroom (Shen et al., 2010).

Finally, in the comparison between English and Language and Literature, English obtained higher levels

of satisfaction and frustration of the BPN and perceived usefulness. On the contrary, boredom was higher in Language and Literature. These comparative results were surprising because these subjects address competencies and learning tools of a similar nature. In this specific case, the higher levels of satisfaction of the BPN may be due to the creation, availability, and use of attractive didactic resources for the students when developing the contents of the subject. In contrast, the higher levels of frustration of the BPN may originate in the limitation of expression and comprehension in a foreign language, an obstacle that may have developed in previous courses, revealing difficulties and learning deficiencies that increase as the school year advances (Studenska, 2011).

Limitations and Future Prospects

Despite the strengths of this study, some limitations must be considered when interpreting the results obtained. The main limitation of our study is the large amount of data when splitting the subjects and assessing the variables in each subject. This required significant involvement and collaboration of the teachers and the students. Therefore, we decided to collect the data in a single measure for all four subjects instead of separately. This may have caused some response bias due to the difficulty of reflecting on all four subjects in a short time. Another limitation derived from this problem is our decision not to assess the students' type of motivational regulation towards the subjects or their perception of the teacher's interpersonal style or other specific aspects of teaching behavior. Likewise, no assessment of academic performance was made, either in previous courses or at the time of data collection. Finally, we did not evaluate not all the subjects that make up the educational system in these courses. The selection of the subjects was based on the consideration of their instrumentality (Mathematics and Language and Literature), the similarity of communication skills to be acquired (Language and Literature and English), and the differentiating nature of the use of motor skills for the development of learning (PE).

Concerning future prospects, we recommend performing studies that consider the different motivational regulations in comparing subjects and gender, along with the antecedents and consequences derived from the students' academic performance. Furthermore, future works should perform longitudinal studies comparing subjects to observe possible changes in variables depending on the course and the academic performance. Finally, given the evaluations of the students' perceptions, these results can help teachers reflect on their methodological orientations with the ultimate aim of optimizing the teaching-learning process.

Conclusions

The main conclusion of this study is that gender differences occur significantly in all the subjects and variables analyzed. This fact should encourage the teachers of the different subjects to reflect when designing and developing didactic programs at this educational stage. In addition, teachers should adapt their behavior to these differences during the teaching-learning process. For this purpose, it is crucial to adopt teaching behaviors based on interpersonal styles that transmit confidence and empathy to the students concerning the achievement of their goals in the different subjects. Furthermore, teachers should treat students' skills and needs individually according to gender, creating an environment that promotes the satisfaction of the BPN and opportunities for learning. On the other hand, the comparison of the subjects revealed significant differences in the variables analyzed, where PE obtained positive higher

results than the rest of the subjects in the motivational variables, but not in its perceived usefulness. This fact should make PE teachers reflect to keep up the line of work aimed at reversing this perception of the usefulness of PE. To this end, we underline the importance of PE to establish healthy lifestyle habits and of working to eliminate possible social stereotypes that may still exist despite the efforts made in recent years. Furthermore, at a general level, one could work on each subject in relation to the other subjects to reduce the shortcomings and problems in each of them, based on the potentialities and successful strategies found. For this purpose, the interdisciplinarity of the contents and the use of appropriate behaviors that affect the mediating motivations analyzed are essential throughout the educational process with the students.

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Appendix

Supplementary Table 1. Bivariate correlations of the study variables in the subject of Mathematics

Variables	1	2	3	4	5	6	7	8	9
1. Autonomy Satisfaction	-								
2. Competence Satisfaction	.75**	-							
3. Soc. Rel. Satisfaction	.57**	.63**	-						
4. Autonomy Frustration	-.15**	-.20**	-.31**	-					
5. Competence Frustration	-.23**	-.31**	-.35**	.79**	-				
6. Soc. Rel. Frustration	-.09**	-.19**	-.37**	.77**	.78**	-			
7. Perceived usefulness	.52**	.58**	.52**	-.23**	-.28**	-.25**	-		
8. Enjoyment	.59**	.58**	.43**	-.12**	-.20**	-.07**	.49**	-	
9. Boredom	-.36**	-.36**	-.27**	.39**	.44**	.35**	-.28**	-.43**	-

Note. Soc. Rel. = Social Relatedness. ** $p < .001$

Supplementary Table 2. Bivariate correlations of the study variables in the subject of English

Variables	1	2	3	4	5	6	7	8	9
1. Autonomy Satisfaction	-								
2. Competence Satisfaction	.67**	-							
3. Soc. Rel. Satisfaction	.59**	.67**	-						
4. Autonomy Frustration	-.15**	-.22**	-.32**	-					
5. Competence Frustration	-.23**	-.34**	-.39**	.79**	-				
6. Soc. Rel. Frustration	-.18**	-.27**	-.42**	.78**	.82**	-			
7. Perceived usefulness	.44**	.55**	.53**	-.28**	-.32**	-.32**	-		
8. Enjoyment	.54**	.54**	.46**	-.15**	-.23**	-.15**	.42**	-	
9. Boredom	-.29**	-.28**	-.22**	.35**	.37**	.32**	-.22**	-.40**	-

Note. Soc. Rel. = Social Relatedness. ** $p < .001$

Supplementary Table 3. Bivariate correlations of the study variables in the subject of Language and Literature

Variables	1	2	3	4	5	6	7	8	9
1. Autonomy Satisfaction	-								
2. Competence Satisfaction	.71**	-							
3. Soc. Rel. Satisfaction	.59**	.68**	-						
4. Autonomy Frustration	-.14**	-.22**	-.31**	-					
5. Competence Frustration	-.19**	-.29**	-.37**	.79**	-				
6. Soc. Rel. Frustration	-.15**	-.24**	-.39**	.77**	.81**	-			
7. Perceived usefulness	.48**	.53**	.49**	-.19**	-.23**	-.23**	-		
8. Enjoyment	.54**	.48**	.38**	-.06**	-.10**	-.04**	.46**	-	
9. Boredom	-.26**	-.25**	-.18**	.32**	.34**	.28**	-.27**	-.33**	-

Note. Soc. Rel. = Social Relatedness. ** $p < .001$

Supplementary Table 4. Bivariate correlations of the study variables in the subject of Physical Education

Variables	1	2	3	4	5	6	7	8	9
1. Autonomy Satisfaction	-								
2. Competence Satisfaction	.72**	-							
3. Soc. Rel. Satisfaction	.64**	.73**	-						
4. Autonomy Frustration	-.13**	-.21**	-.27**	-					
5. Competence Frustration	-.21**	-.30**	-.33**	.79**	-				
6. Soc. Rel. Frustration	-.16**	-.25**	-.37**	.77**	.82**	-			
7. Perceived usefulness	.50**	.48**	.42**	-.08**	-.15**	-.09**	-		
8. Enjoyment	.53**	.56**	.51**	-.20**	-.22**	-.19**	.50**	-	
9. Boredom	-.23**	-.31**	-.30**	.48**	.49**	.48**	-.20**	-.36**	-

Note. Soc. Rel. = Social Relatedness. ** $p < .001$