

# Sport practice with friends and perceived physical competence as predictors of physical activity in adolescents

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## ABSTRACT

Understanding which factors influence participation in physical activity is essential for the development and improvement of public health intervention. The aim of this study was to provide an explanatory prediction model for physical activity level in adolescents, involving a number of influencing variables. 576 participants took part in the study: 275 boys and 301 girls aged between 12 and 18 years old ( $M = 14.80$ ;  $SD = 1.180$ ). They attended one of the 11 selected schools from Galicia (Spain), chosen by sampling in the seven main urban areas in that region. The International Questionnaire on Physical Education, Health and Lifestyle was administered. The findings revealed that age, sex, physical perceived competence and sport practice with friends had statistically significant influence on physical activity index. By contrast, the influence of perception of physical attractiveness could not be confirmed. Sport practice with friends and physical perceived competence were the main predicting variables for physical activity level. All this knowledge must be taken into account by physical activity and sport professionals, such as teachers or trainers. Likewise, to improve physical perceived competence, it is essential to offer a wide variety of activities, to propose different levels of problem resolution, to help students make adaptive causal attributions based on effort, and to break gender stereotypes. Strategies involving school mates or friends in different PA and sport projects are needed.

**Keywords:** Decision trees; Perceived motor competence; Friendships; Gender; Student's perceptions; Appearance.

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## INTRODUCTION

Children start practising physical activity (PA) during childhood, so this context becomes an important environment for the promotion of a healthy lifestyle. Nowadays, there is large evidence on the beneficial effects that PA has on health in scholar age (Janssen and LeBlanc, 2010; Poitras et al., 2016). Consequently, the analysis of the influence that personal and social factors have on physical activity and sport practice in adolescence has been granted considerable relevance within the physical activity (PA) and sport field in the past few years.

Common trends have been detected in variables like sex or age. Thus, it was verified that PA level decreased with age during school years (Aznar et al., 2011; Bringolf-Isler et al., 2018; Kirby et al., 2011; Seabra et al., 2008). Likewise, Marques and Carreiro (2013) observed that PA levels decreased with age in secondary education (SE) students, and the same occurred in AVENA study with Spanish adolescent students (Tercedor et al., 2007).

Similarly, differences between boys and girls regarding participation and PA levels have been broadly described in scientific literature, values being higher among boys (Calahorra et al., 2014; Erikson et al., 2008; Henriksen et al., 2016; Marques et al., 2015; Mota et al., 2008; Van Hecke et al., 2016).

In line with the above, a positive correlation was confirmed between some variables that are included in the physical self-concept and PA at these ages. This is the case of perceived physical competence (PPC) and perceived physical attractiveness (PPA).

The importance of PPC in the context of physical activity and sport has been widely verified. A large number of studies showed that more physically active individuals presented higher PPC levels than less physically active ones (Aşçi et al., 2001; Moreno et al., 2007). In fact, this is considered to be a paramount predictor of sport practice and participation (Burkhalter and Wendt, 2001; Eberline et al., 2018; Zhang et al., 2015). It was also confirmed that PPC tended to be worse among girls than boys (Esnaola and Revuelta, 2009; Murillo et al., 2014) and to decrease with age (Hernández et al., 2008; Navarro-Patón et al., 2020).

Besides, satisfaction with the own appearance or physical attractiveness (in this study, PPA) is a sub-domain of physical self-concept that decreases from primary to secondary education and is lower in girls than boys (Navarro-Patón et al., 2020). This construct has traditionally presented lower correlation with physical activity and sport practice compared to other sub-domains, such as PPC or perceived physical fitness (Esnaola and Revuelta, 2009; Van der Horst et al., 2007). Nevertheless, there is evidence that the adolescents who participated in competition were more satisfied with their physical appearance than those who did not (Piéron, 2002). Moreover, various studies positively related body satisfaction with PA or physical fitness (Borrego et al., 2014; Gómez and Ramírez, 2011).

With regard to the group of peers, numerous studies agreed that friends or sport mates are a powerful social motivational agent, either as support towards practice or as company during practice (Cheng et al., 2020; Maturo and Cunningham, 2013). Nonetheless, discrepancy existed when determining whether they could predict or not the continuation of more or less adaptive behaviours (Sánchez et al., 2012). Sport practice with friends (SPF) is one of the more commonly analysed variables in this regard and some results revealed positive relationships with PA (Finnerty et al., 2010; Kirby et al., 2011).

Given the well-known relevance of these variables, it seems appropriate to establish certain patterns to predict whether an individual will be active or inactive. Research confirmed the lack of a unique behaviour pattern, as well as the importance of geographical and cultural context (Bringolf-Isler et al., 2018; Sterd et al., 2014). The strategies promoted within Europe seem to be insufficient, and it is necessary to consider such cultural variability as a key factor in PA of adolescents (Aibar et al., 2013). It is important to describe every group under study in order to provide solutions that enhance adherence to exercise and promote an active lifestyle. In this study, the autonomous region of Galicia (Spain) was analysed. Pérez-Ríos et al. (2015) reported a high inactivity index among the general population of this region. In particular, this index was also noteworthy among adolescents (Barja-Fernández et al., 2020).

Therefore, the aims of the present study were: (a) to analyse the variables that affect physical activity index (PAI) in adolescents, and (b) to provide a predictive and explanatory model for PA level.

## METHOD

### *Participants*

576 participants took part in the study: 275 boys and 301 girls aged between 12 and 18 years old ( $M = 14.80$ ;  $SD = 1.180$ ). They studied in 11 selected schools from Galicia (Spain), chosen by sampling in the seven main urban areas in that region.

Considering that the number of schoolchildren enrolled in Galician towns and cities is more than 50,000 (data provided by the Regional Ministry of Education), we use the formula of Milton and Tsokos (2001) to know the number of students needed to ensure the representation of the sample (confidence level of 99%;  $z = 2.57$ ; variance constant = 0.25; sampling error of 5%).

Once the necessary sample was known, an invitation to participate was sent to each school in the Autonomous Community and those that agreed to participate were included in the study. A random sampling was then carried out, once it had been verified that the centres had at least 25 students per course.

The data shown in this work are only those relating to primary school pupils.

### *Instrument*

The International Questionnaire on Physical Education, Health and Lifestyle was administered. The version for students contains four blocks: (1) personal details, (2) life habits, (3) attitudes and perceptions, and (4) perception of school, physical education and PA practice. Cronbach's alpha was higher than 0.87. It had been validated by Marques (2010) for Portuguese population and by Mourelle (2014) for Spanish population.

The Finnish PA index was applied in order to calculate the PA performed by the students. This is representative of the probability of doing PA in the future. This has been confirmed by several longitudinal studies on the same participants over 20 years (Telama et al., 2006). It results from adding up five items on a four-point scale.

The variables used in this study were:

- (a) PAI, with value ranges between 5 and 20. It was recoded twice. Firstly, the sample was divided into three groups. This recoding divided the participants into low (PAI below 9), medium (PAI between 9 and 13) and high PA level, PAL, (PAI above 13). Besides, the sample was divided into two groups

following Marques et al. (2015). In this case, the cut-off point was set at PAI = 12: less active or sedentary (scores equal to or below 12) and active (scores equal to or above 13).

- (b) PAL Classification 1 was PAL1 (low, medium and high level; 1, 2 and 3 respectively) and PAL Classification 2 was PAL2 (sedentary or active; 1, and 2 respectively).
- (c) Sex: boy or girl.
- (d) Age: with value ranges between 12-18.
- (e) PPC: do not now, good, above average, average, below average, poor.
- (f) SPF: do not now, never, sometimes, often, usually, always.
- (g) PPA: do not now, good, above average, average, below average, poor.

Thus, a classification model for the variable PAI in its two versions (PAL1 and PAL2) was established with this set of variables. The rest of variables are explanatory variables whose statistical influence on the dependent variable will be analysed.

### **Procedure**

The questionnaire was collectively administered to the students in different schools Galicia (Spain) with prior authorization from both the school and families. After communicating the appropriate instructions and once the informed consent form was signed, all students voluntarily and individually completed the requested information in their group-class.

The study was carried out according to the standards established by the Declaration of Helsinki, and the recommendations of Good Practice of the EEC. Besides, the protocol was approved by the University of A Coruña. This investigation was part of a global initiative from the Euro American Network of PA, Education and Health.

### **Statistical analysis**

Various statistical analyses were conducted, divided into several phases. Firstly, a descriptive analysis was performed to gain general knowledge on the sample. During the influential analysis phase, a one-way analysis of variance (ANOVA) was conducted to study the influence of several nominal variables on PAI. In the last analysis phase, it is important to note that the dependent variable showed both quantitative and qualitative aspects once it was grouped. Therefore, the classification and regression trees (CART) were chosen as the best technique, due to their usefulness when drawing conclusions.

Lastly, the confidence interval for PAI was calculated, providing the mean PAL for the whole population with a specific probability. Statistical data analysis was performed using the SPSS v.23 software.

## **RESULTS**

### **Descriptive analysis**

The descriptive analysis of the variable sex shows that the sample is very balanced (47% men towards 53% women). Each age group by sex is also homogeneous: there are approximately half men than women for all ages, except for the age of 14, where 40% men towards 60% women can be found. However, in the variable age, within the 12-18 age group, more than 75% of the students are in the core values, this is, they are between 14 and 16 years old, close to the 20% are between 13 or 17 years old and the students with ages in said interval represent around 5% of the sample. As regards to PPC, the majority of students have a positive opinion about their physical competence: more than half admits having good skills (22%) or above average (30%) while the 27% admits being on average. Only the 6% admits not having sports skills and the

13% are below the average. If we observe the frequency the students practice physical and sports activities with their friends (SPF) the extreme categories “Never” and “Always I am with my friends” represent a 9 and a 6% respectively, while the core categories are much more frequent “Sometimes” (44%), “Often” (21%) and “Usually” (10%). In the PPA variable we can see that almost two thirds of students (65%) are satisfied with their appearance or think is above average, the average is around 20% and the remaining 15% think is below average or are not satisfied with their appearance. Finally, if we look at the frequencies according to the PAL1 categorization, it is observed that 38% of students are in the lowest level, 46% in the intermediate and only 16% in the highest level.

### **Influential analysis**

In this section, ANOVA tests are displayed for every independent variable, with the aim of determining whether the average in each of the established categories is the same between the groups or not. It will be considered that the difference between the averages is significant if the  $p$ -value ( $p$ ) is lower than .05.

Table 1. Mean PAI and ANOVA results for variables that influence PAI.

	<b>N</b>	<b>Average</b>	<b>F</b>	<b>p</b>
<b>Sex</b>				
Boys	275	10.76	41.704	.000
Girls	301	8.88		
<b>Age</b>	12	7.50	4.684	.000
	13	10.80		
	14	10.26		
	15	9.79		
	16	8.94		
	17	9.13		
	18	4.00		
<b>Perceived physical competence</b>				
Do not now	10	8.40	33.648	.000
Good	127	12.17		
Above average	173	10.49		
In average	155	9.00		
Below average	75	7.01		
Poor	36	7.39		
<b>Sport practice with friends</b>				
Do not now	10	11.50	26.350	.000
Never	51	7.31		
Sometimes	251	8.57		
Often	122	10.84		
Usually	110	11.66		
Always	32	9.78		
<b>Perception of physical attractiveness</b>				
Do not now	7	9.3	2.872	.14
Good	208	10.47		
Above average	166	9.63		
In average	114	9.18		
Below average	51	9.45		
Poor	30	8.73		

As it can be observed in Table 1, all independent variables in this study establish categories with significant differences.

We will see, for each variable, in which groups have been found the differences that appear in the ANOVA test. For this, the Bonferroni test has been applied to the age, PPC and SPF variables. The differences have only been considered for the analysis between variables with a valid answer, this is, different to “Do not now” because these differences, if there, could be due to mistakes and not give into relevant conclusions. The sex variable has not been applied because there are only two groups.

PPC. In this variable, the PAI average in all groups is taken into consideration with significant differences among them, except for “Poor” and “Below average” in which  $p$ -value is .097, consequently there is a trend to significance. Outstanding differences between these groups and “Do not now” cannot be found. Although in general this former group does not possess a high interest, this figure acquires importance in the analysis of the decision trees.

SPF. The differences are between the groups with a low level of sports activities with friends, “Never”, “Sometimes” and the three other groups.

Age. The test displays that, between similar ages, differences are not significant while if they often do is when the difference is over 2 years.

Consequently, a series of Chi square tests are shown to prove whether the categories set consistent independent variables or not. The sex, age, PPC and SPF variables have been applied, and have been crossed with the PAI, PAL1 categorization (Table 2).

Table 2. Cross table for variables sex age PPC and SPF versus PAL1.

	Chi-Square	$p$
Sex	27.033	.000
Age	28.936	.004
PPC	126.670	.000
SPF	89.106	.000

When examining Table 2, it can be seen that all variables are dependent with the PAI categorization, which is aligned with the results in the ANOVA tests. Therefore, it is possible to conclude that the proposed categorization is consistent because the dependence between explanatory variables and the dependent can be qualitatively and quantitatively seen.

### **Predictive analysis**

As previously mentioned, the dependent variable has been classified in categorical variables PAL1 (3 categories) and PAL2 (2 categories) which will allow us to calculate two classification trees, one taking as a dependent variable PAL1 and the other with PAL2. The results are displayed in Figures 1 and 2 respectively.

Figure 1 shows the classification tree for PAL1. As can be seen, the most influential variable is PPC that appears in the highest part of the tree, followed by the SPF variable. Another aspect where the consistency of the analysis can be seen is that the Bonferroni test did not mark as significant the differences between groups “Poor” and “Below average” which appear in the classification tree as fused. As a matter of fact, the percentage of students who are in some of these categories represents a low PAL1 is 73%. It can be

observed that the better the students' PPC the less likely to obtain a low PAL1. It can also be seen that generally students who practice sports with friends less frequently obtain a lower PAL1 score.

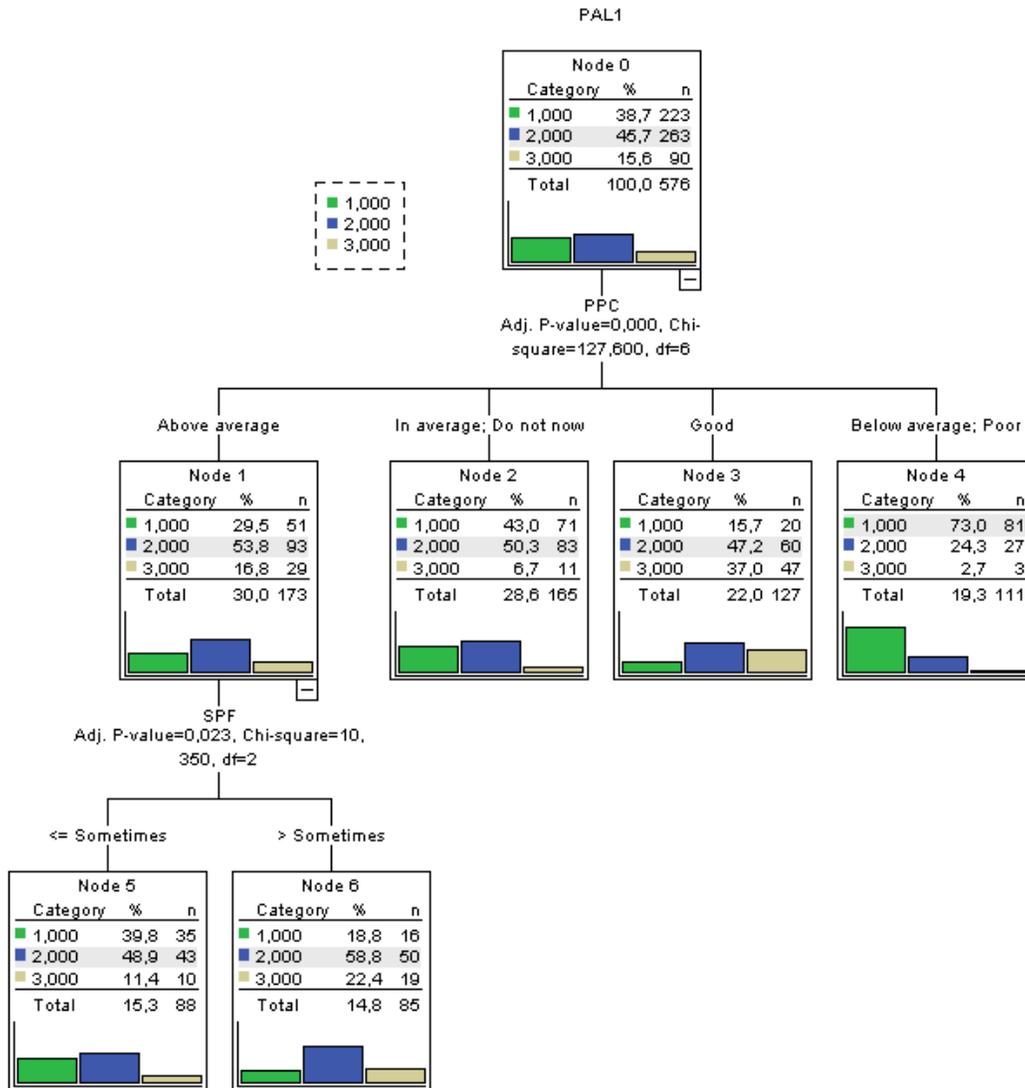


Figure 1. Classification tree for the variable PAL1.

In this second analysis the variables of PA practice with friends are still more relevant (SPF) and their self-perception of the physical competence (PPC) although, compared to the previous case, SPF is in the first level and PPC in the second. It is also displayed again the coherence with the ANOVA and the Chi square tests. The sex variable is also important, at the same level of PPC and in both cases coherence between Bonferroni and the grouping of the categories in a tree format can be observed. This way, 86.7% of students who practice little physical activities with their friends have a low PAL2, towards a 55.9% of low PAL2 who admit doing this activity with their friends more often.

On the other hand, among male students who often practice physical activities with their friends and think that they are above average in PPC, the 56.5 % have a good PA. By contrast, female students who did not report good PPC were associated with lower PAL2.

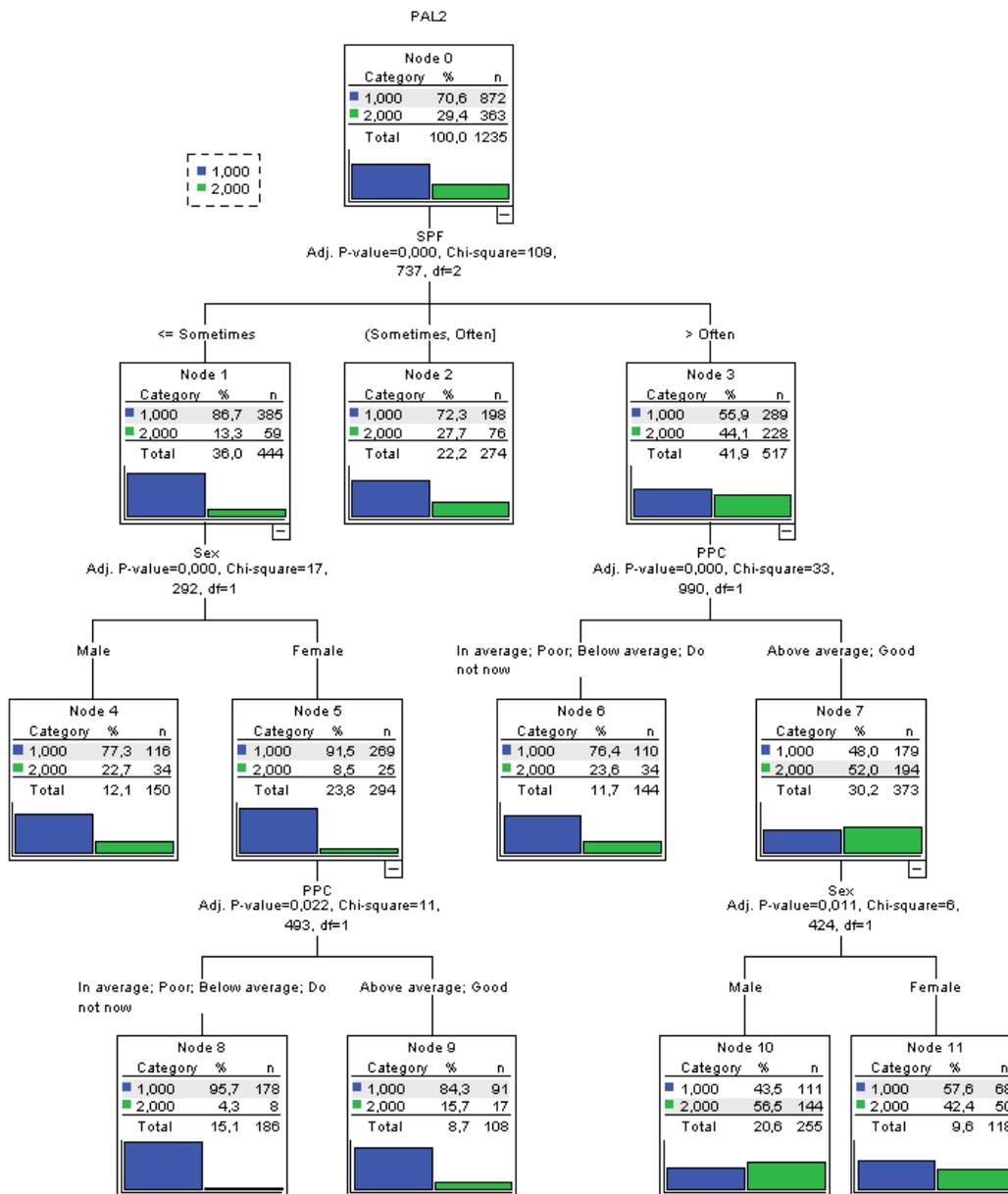


Figure 2. Classification tree for the variable PAL2.

## DISCUSSION AND CONCLUSIONS

Understanding which factors influence participation in PA is essential for the development and improvement of public health intervention. The aim of the present study was to analyse the variables that influence the PAL of secondary school students. Furthermore, the second aim was to provide an explanatory prediction model for the PAL, using a number of potentially influencing variables.

The descriptive analysis revealed a clear positive trend as regards students' perception of their own sport abilities and an average trend with regard to practice with friends. The majority of students showed satisfaction with their appearance (PPA). The variable PAL1 revealed medium levels of participation in physical activity and sport.

The influence analysis for PAI yielded significant differences in all explanatory variables, except in PPA (age, sex, PPC, SPF). The analysis conducted using PAL1 categorisation confirmed the same dependence relationships observed in the quantitative analysis. These data were in keeping with previous studies involving adolescents.

Reviews like the one performed by Seabra et al. (2008) concluded that age was negatively associated with physical activity, also confirmed by other studies like the one by Serra (2014), Marques and Carreiro (2013), Tercedor et al. (2007) or Aibar et al. (2013). Marques and Carreiro (2013) discussed this fact, which was observed in different countries, and suggested that it would be important to determine what kind of activity would offer most guarantee of practice stability. In this regard, organised activities seemed to have great potential. Aibar et al. (2013) emphasised the need for understanding of the adolescents' cultural context. By doing so, various practice options could be provided in order to deal with barriers to participation and withdrawal.

The differences in PA levels between boys and girls have been widely proved, boys presenting higher values (Barja-Fernández et al., 2020; Henriksen et al., 2016; Mota et al., 2008; Page et al., 2007; Van der Horst et al., 2007; Van Hecke et al., 2016). Consequently, large efforts have been made in the past few decades within the physical activity and sport sciences field to focus on women applying a gender perspective (Botelho-Gomes et al., 2000; Rebollo et al., 2012). Gender differences regarding the type of activities practised were also observed (Author; Gracia-Marco et al., 2010).

The PPC data were in agreement with multiple studies that clearly evidenced a positive association between the level of activity or participation in sport and perceived competence (Aşçi et al., 2001; Esnaola and Revuelta, 2009; Marques et al., 2015; Sterdt et al., 2014). The same trend was proved for adolescents who participated in sport competition compared to those who did not (Pastor and Balaguer, 2001). Furthermore, Moreno, Cervelló et al. (2007) concluded that practising boys presented higher values of perceived competence than practising girls.

The data analysis yielded no relationship between PPA and PA. As mentioned in this manuscript introduction, other authors did not find any dependence relationship between these variables either (Craggs et al., 2011; Esnaola and Revuelta, 2009; Van der Horst et al., 2007). Nevertheless, the studies by Gómez and Ramírez (2011) or Biddle et al. (2005) led to the opposite conclusion. Moreover, Borrego et al. (2014) found that physical fitness correlated with appearance.

There is also scientific evidence of the influence of SPF on adolescents' PA (Finnerty et al., 2010; Maturo and Cunningham, 2013; Page et al., 2005; Page et al., 2007). Furthermore, according to Coppinger et al. (2010), peers had significant influence on the evolution of PA along time. In this case, correlation was found between staying physically active along time and the fact of having adjusted their schedule to do physical activity or to exercise with friends.

Finally, a deeper analysis (predictive analysis) enabled us to establish a model regarding the influence of the different variables on young's PAL. To do so, classification trees were built by dividing the students' PA into 3 categories in the first instance (PAL1) and into 2 in the second instance (PAL2).

The first classification tree, built for PAL1, showed that the most determining variable was PPC, followed by SPF. It was concluded that the better the self-perception of physical capacities, the lower the probability of

presenting low PAL1. Moreover, the students who practised sport with friends less frequently showed lower PAL1.

The second tree proved SPF to be the most important variable, despite sex and PPC being relevant as well. In this case, it was also observed that the students who practised sport with friends less frequently presented lower PA levels. The tree also revealed that male students who frequently practised physical activity and sport with friends and reported above-average PPC showed good physical performance. By contrast, female students who did not report good PPC were associated with lower PAL2.

Therefore, PPC and SPF were not only proved to have influence on PA, but they also showed certain capacity to predict such behaviour. In this regard, previous studies obtained similar data to those shared in the present research. For example, PPC was considered to predict practice in various studies (Eberline et al., 2018; Zhang et al., 2015). Moreover, it has been highlighted for being the main predictor of the intention to be physically active (Moreno et al., 2007). With regard to the variable SPF, Maturo and Cunningham (2013) confirmed the influence (predicting capacity) of friend participation on PA.

In future studies, it would be interesting to carry out interventions in which teachers and coaches consider different strategies for promoting PPC and measure their effectiveness. These could include: offering a wide variety of activities and encouraging enjoyment in all of them, proposing different levels of problem solving to provide rewarding experiences, providing positive feedback, helping students to make adaptive causal attributions based on effort, breaking down gender stereotypes and stigmas, etc. It would also be interesting to test this influence of friends through concrete strategies and to observe whether PA levels improve. We refer to strategies that involve schoolmates or friends in different PA and sport projects.

## AUTHOR CONTRIBUTIONS

Myriam Alvariñas-Villaverde: Drafting of the report (introduction, method, discussion and conclusions). Elena Giménez-de Ory: Analysis of data and writing of results. Belén Toja-Reboredo and Miguel González-Valeiro: Data collection.

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## DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

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