A healthy bond: relationship between dog ownership, physical activity levels, motivation, physical self-concept and well-being in adolescents

Un vínculo saludable: relación entre la tenencia de perros, niveles de actividad física, motivación, autoconcepto físico y bienestar en adolescentes

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Abstract

Introduction: physical inactivity, especially among adolescents, is linked to serious health problems, with girls being particularly affected. Given the increasing prevalence of dog ownership, dog-assisted physical activity programs could offer new strategies to counteract this issue.
Objective: this study examines the relationship between dog ownership and various aspects of adolescent health, including physical activity levels, motivation, physical self-concept, and well-being, while also considering the moderating effect of gender.
Methodology: a descriptive, comparative, and correlational study was conducted with 610 adolescents (301 males and 309 females) with a mean age of 15 years (SD = 1.3 years) of whom 34.9% lived with a dog.
Results: girls engaged in more physical activity during school and leisure time, while boys were more active in sports. Dog owners had higher physical activity levels, especially during school. Boys showed greater intrinsic motivation, integrated motivation, and physical self-concept, while girls had higher academic efficacy. Significant interactions were found between gender and dog ownership, with a greater impact on boys' sports participation.
Discussion: gender differences were observed in physical activity, motivation, and well-being, with boys benefiting more from sports participation and physical self-concept, while girls were more academically confident. Dog ownership was positively associated with increased physical activity, particularly in boys. Future studies should consider individual and social factors and employ longitudinal designs to further examine these relationships
Conclusions: dog-assisted interventions could promote adolescent physical activity and well-being, offering new opportunities for professionals in Physical Activity and Sports Sciences.

Keywords

Adolescents; dog ownership; health; physical activity; well-being.

Resumen

Introducción: la inactividad física en adolescentes está vinculada a graves problemas de salud, afectando especialmente a las chicas. Ante el aumento en la tenencia de perros, los programas de actividad física asistida por perros podrían ser una estrategia para revertir esta situación.
Objetivo: este estudio analiza la relación entre la tenencia de perros y diversos aspectos de la salud en adolescentes, incluyendo la actividad física, la motivación, el autoconcepto físico y el bienestar, considerando el efecto moderador del género.
Metodología: se realizó un estudio descriptivo, comparativo y correlacional con 610 adolescentes (301 chicos y 309 chicas) con una edad media de 15 años (SD = 1.3), de los cuales el 34.9% convivía con un perro.
Resultados: las chicas fueron más activas en el ámbito escolar y el tiempo de ocio, mientras que los chicos destacaron en actividades deportivas. Los adolescentes con perros mostraron mayores niveles de actividad física, especialmente en el ámbito escolar. Además, los chicos presentaron mayor motivación intrínseca e integrada y mejor autoconcepto físico, mientras que las chicas destacaron en eficacia académica. Se encontraron interacciones significativas entre el género y la tenencia de perros, con un mayor impacto en la participación deportiva de los chicos.
Discusión: se observaron diferencias de género en la actividad física, motivación y bienestar, asociándose positivamente con un aumento en la actividad física, especialmente en los chicos. Se recomienda que futuros estudios consideren factores individuales y sociales, así como el uso de diseños longitudinales para profundizar en estas relaciones.
Conclusiones: las intervenciones asistidas por perros podrían fomentar la actividad física y el bienestar en adolescentes, abriendo nuevas oportunidades para los profesionales de las Ciencias de la Actividad Física y del Deporte.

Palabras clave

Actividad física; adolescentes; bienestar; salud; tenencia de perros.

Introduction

Currently, there is a worrying trend towards insufficient physical activity (PA) among school-aged adolescents worldwide, with girls having the highest levels of physical inactivity (PI) (Guthold et al., 2020). Among the negative consequences of low levels of PA for this group are overweight and obesity, cardiovascular problems and an increased risk of cancer in the future (Gasol Foundation, 2023; Tapia-Serrano et al., 2020). In addition, the absence of PA, especially noticeable in the post-COVID-19 generation of adolescents, has contributed to an increase in mental health disorders such as depression and anxiety (van Sluijs et al., 2021). The risks of PI also include a 20% to 30% increased risk of death compared to people who are physically active (World Health Organization, 2019). In addition, PI is the fourth leading cause of death in the world (World Health Organization, 2020). Considering that more than 80% of the world's adolescents have insufficient levels of PA, the member states of the World Health Organization (WHO) adopted a Global Action Plan on Physical Activity in 2018, which aims to achieve a 15% reduction in insufficient PA among adolescents by 2030 (World Health Organization, 2019).

In addition to that plan, the WHO published in 2018 a document on Physical Activity Guidelines where it is determined that the practice of PA is essential for the health and well-being of all people, especially in the stages of physical, mental and social development, as is adolescence (World Health Organization, 2020). Recent research highlights a statistically significant positive association between physical activity and adolescent mental health, indicating that higher levels of physical activity are linked to improved psychological well-being (Hartanto et al., 2024). To achieve these benefits, WHO (2020) recommends that children and adolescents aged 5 to 17 years perform at least 60 minutes per day of moderate to vigorous PA (aerobic exercise) along with a minimum of three days per week of vigorous PA (intense exercise). In addition, evidence from the past two decades supports the idea that these health benefits extend into adulthood (Aira et al., 2021; Kujala, 2018; Mathisen et al., 2023; Nicklas & Brinkley, 2009; World Health Organization, 2010).

Based on the above, it should be considered that adolescence is a period of different PA needs due to the rapid and diverse physical, emotional, social and academic changes that occur during this period (Gmmash et al., 2023). In this regard, girls experience more rapid physical, sexual, emotional and social development than boys (van Sluijs et al., 2021). The last study conducted by the Gasol Foundation (2023), indicated that girls would experience a greater concern for their health, feeling a greater sense of sadness and unhappiness than boys their age. According to this study, lower levels of PA and increased use of screens seem to be responsible for this situation. Other studies carried out with the adolescent population show that girls do not feel sufficiently prepared at a physical or motor level to engage in certain sports practices, feeling laziness and fatigue (Delfa-De la Morena et al., 2022; Fernández et al., 2017; Luque & del Villar, 2019; Zaragoza et al., 2011). Not only that, but girls would have a worse physical perception than boys, which, due to the importance of physical appearance in this age group, would seem to have a negative influence on PA practice (Rosselli et al., 2020).

In addition to gender differences in adolescents, other aspects relevant to their health should also be considered, such as motivation and physical self-concept (PSC), which are interrelated and have a direct influence on PA practice, a fundamental aspect for improving the overall well-being of this group (Sáez et al., 2020). Therefore, the different needs and motivations for PA among boys and girls should be considered (Egli et al., 2011; Espada et al., 2023). Several studies have found that gender influences the predisposition and motivation to practice PA, with boys showing a greater predisposition and motivation than girls (Galindo-Perdomo et al., 2022; Hall-López & Ochoa-Martínez, 2023; Seabra et al., 2013). In addition, motivation is considered a determining psychological variable in establishing healthy habits and promoting adherence to PA practice (Vaquero-Solís et al., 2020). Considering that people participate in and/or drop out of various physical and/or sporting activities for different reasons (Peñaloza et al., 2024; Ruiz et al., 2007), in the case of adolescents, the main reasons for their practice would be fun and health (Pallarés et al., 2020; Planas et al., 2020). In the case of girls, premature maturation compared to boys is a factor to consider and is influential in the design of PA promotion programs (Rodríguez-Fernández et al., 2020). This would be due to differences in body composition, muscle strength, motor skills, as well as other psychological and emotional changes they would experience at this age (Soler & Arriagada, 2022). In relation to this, girls tend to show lower levels of autonomous motivation (intrinsic, integrated and identified), which is largely influenced by factors such as beauty standards and other

social influences, in addition to their greater maturity (Luque & del Villar, 2019; Romero-Parra et al., 2022).

On the other hand, physical self-concept (PSC) plays a key role in adolescent health and is closely related to the regular practice of physical activity and overall well-being (Goñi et al., 2004; Mamani-Ramos et al., 2023). Research consistently shows that boys tend to report higher levels of PSC compared to girls, which has been linked to increased engagement in physical and sports activities (Montalt et al., 2023; Revuelta et al., 2016). PSC has also been associated with psychological well-being and healthy lifestyle habits during adolescence, making it a crucial variable in physical activity promotion strategies (Babic et al., 2014; Benitez-Sillero et al., 2024; Jankauskiene et al., 2022). Today, promoting the well-being of adolescents is a public health priority in order to avoid the challenges faced by this population group, such as bullying and violence, among many other disorders that affect their mental health (World Health Organization, 2013, 2021). This is why, following this line, the well-being of adolescents in the school environment has also become one of the fundamental priorities of current educational policies, where the evidence reflects the importance of the educational well-being of students in relation to their academic performance (Du et al., 2023; Wang et al., 2024). In this sense, the school environment would be key to promoting student well-being (Clarke et al., 2023) and encourage them to adopt healthy habits that improve their physical and mental wellbeing (Herlitz et al., 2020; Kidger et al., 2012), as well as to motivate them and promote their participation in physical activities and sports (Jussila et al., 2023).

In this context, it would be crucial to identify the motivations that would lead adolescents to have healthy movement patterns. Recent studies indicate that dog ownership is associated with a higher probability of meeting the PA recommendations established for this group (Pajaujiene & Petrigna, 2024), in addition to helping to improve the quality of sleep (Moore et al., 2020). These data are relevant, especially considering that the number of households with pets has grown exponentially worldwide as of 2020 due to the effects of the COVID-19 pandemic (American Pet Products Association, 2023). In Spain, for example, more than 19% of the population lives with a dog in their homes (National Association of Pet Food Manufacturers, 2021; National Institute of Statistics, 2024). The mere fact of living with animals would have a positive impact on people's health (Barcelos et al., 2020; Koohsari et al., 2020). Currently, there are multiple studies that have shown that dog ownership has health benefits for people (Bao & Schreer, 2016). In this sense, several PA promotion programs have been developed with dogs that have proven to be effective in increasing people's PA levels, such as "dog-walking", which consists of walking with a dog (Christian et al., 2016; Curl et al., 2016; Morrison et al., 2013; Salmon et al., 2010). This is because interaction with animals would increase people's satisfaction and motivation to practice PA (Christian et al., 2016; Potter et al., 2019). In addition, it would increase motivation to participate in other more physically demanding physical-sports activities, such as walking at a faster pace and/or running (Christian et al., 2016; Potter et al., 2019). Running with a dog is the activity called canicross, a sport modality that comes from mushing, a sport regulated by the Spanish Federation of Winter Sports (2024) and has seen an increase in its practice due to its growing popularity and number of practitioners (Vicario, 2014). The practice of canicross requires regularity and daily routines (Essner et al., 2022), and is known to contribute to improving the health of the people who practice it, as well as that of their dogs (Degeling et al., 2012). Therefore, in recent years, there has been increasing research on the benefits that the practice of canicross would have on the physical and mental health of people, improving fitness, self-esteem and quality of life, and reducing stress, both in adults and in older individuals (Tena & Gamonales, 2022). Additionally, adaptations have been made to include canicross in physical-sport activity programs for people with Down Syndrome (Tena & Gamonales, 2022), people with Attention Deficit Hyperactivity Disorder (ADHD) (Calvo et al., 2019) and people with various intellectual disabilities (Gamonales et al., 2017).

Although dog ownership has been linked to improved health and physical activity, most studies have focused on adults, with limited evidence in adolescents. In particular, the potential moderating role of gender in this relationship remains largely unexplored. No prior research has specifically addressed how dog ownership relates to adolescent motivation, physical self-concept, and well-being from a gender-sensitive perspective. Clarifying this gap is essential for developing inclusive physical activity interventions involving animals, especially in school and community contexts. Considering the current evidence that associates dog ownership with better health and higher levels of PA in people, the main objective of the present study was to investigate the relationship of dog ownership with several relevant

aspects of adolescent health, such as PA levels, motivation, physical self-concept, and physical, psychological, and educational well-being. Based on this objective, our initial hypothesis is that there are differences based on gender and dog ownership in the type and amount of physical activity, as well as in motivation, physical self-concept, and well-being. Furthermore, gender may have a significant moderating effect on the relationship between dog ownership and some of these variables.

Method

Participants

A descriptive, comparative and correlational study was carried out. The sample consisted of 687 students aged 13 to 18 years (M= 15; SD = 1.3 years). The students were from two schools located in two municipalities in Biscay, which are close to each other and part of the Autonomous Community of the Basque Country. Both schools provide education at the compulsory secondary education level and the upper secondary level (Baccalaureate), with similar characteristics in terms of socio-demographic level and urban environment. Although no individual socioeconomic data were collected from the students, both participating schools are public institutions located in urban municipalities with similar demographic and socioeconomic characteristics, according to regional statistics. This contextual information was considered to ensure a certain level of homogeneity between the educational centers involved. The sampling method was non-probabilistic and based on convenience, as participation depended on the voluntary collaboration of the selected schools and their availability to take part in the study. However, after applying the inclusion criteria and excluding incomplete or invalid responses, the final sample used for statistical analysis comprised 610 adolescents (301 boys and 309 girls). The inclusion criteria for this study were being enrolled in secondary education level and the upper secondary level (Baccalaureate) in the participating educational centers, being between 13 and 18 years old, and having the informed consent of the participant and/or their legal guardians, in accordance with current regulations. Exclusion criteria included students outside the established age range, those who did not provide consent or whose legal guardians did not authorize their participation, as well as questionnaires that were incomplete or contained invalid responses.

Procedure

After preparing the questionnaires, we contacted the educational centers to collect the data. For this purpose, a letter containing detailed information about the project was sent, along with an informed consent form for the students' families or legal guardians to fill in, who had to give their consent by signing the consent form. The students completed the questionnaires during class time. To ensure that the questionnaires were filled out correctly, the responsible researcher was present during data collection. The students were informed of the objectives and nature of the study. In addition, they were informed that their participation was voluntary and that the data collected will be treated confidentially. The students completed the questionnaires online using Qualtrics software, without receiving any type of incentive. Data were collected between March and October 2022. This research followed the guidelines established in the Declaration of Helsinki (World Medical Association, 2013), considered the regulations on personal data protection (EU 2016/679) approved by the European Commission and Council in April 2016, and received a favorable report from the Ethics Committee of the University of Deusto (Report No. ETK-17/21-22, dated May 31, 2022).

Data collection

An ad-hoc questionnaire was used to collect the sociodemographic data and information about sports habits of the subjects participating in the study. They were asked about their gender, age, weight and height, as well as whether they lived with a dog at home. Data collection took place over four days designated by the educational centers, with two days allocated to each center. The process was carried out between March and October 2022, with the principal investigator present to address any questions regarding the questionnaires and ensure their proper completion.

Inventory of Habitual Physical Activity for Adolescents (IAFHA)

The Inventory of Habitual Physical Activity for Adolescents (IAFHA) activity (Gálvez et al., 2006), adapted from Baecke et al. (1982) was used to measure physical activity in different contexts. This instrument includes 28 items that evaluate physical activity during school time, leisure time, and sports participation. Each of these dimensions is assessed through multiple items on a Likert-type scale ranging from 1 ("never") to 5 ("very often"), allowing for the calculation of a total activity index. An example item is: "How often do you participate in sports activities outside school?" The questionnaire has demonstrated good internal consistency in previous studies conducted with Spanish adolescents, with a Cronbach's alpha of α = 0.84.

Motivation. The Behavioural Regulation In Exercise Questionnaire (BREQ-3)

Motivation was measured with the Behavioral Regulation of Exercise Questionnaire (BREQ-3) (González-Cutre et al., 2010). This instrument has been validated for use with Spanish-speaking adolescent populations, showing robust psychometric properties. The questionnaire is composed of 23 items measuring five types of motivation: intrinsic regulation, identified regulation, introjected regulation, external regulation and demotivation. The response scale was a Likert scale with five response options, from 1 ("Strongly disagree") to 5 ("Strongly agree"). All subscales of the questionnaire demonstrated adequate internal consistency: intrinsic regulation obtained a Cronbach's alpha of α = 0.86, integrated regulation α = 0.88, identified regulation α = 0.70, introjected regulation α = 0.74, external regulation α = 0.80, and demotivation α = 0.74.

Physical Self-Concept (PSQ)

The Physical Self-concept Questionnaire (PSQ) was used to measure the physical self-concept (PSC) (Goñi et al., 2004), based on the Fox (1997) model of physical self-concept. The questionnaire consists of 36 items and six scales: physical ability, physical condition, physical attractiveness, strength, general physical self-concept and general self-concept. This instrument was developed and validated with Spanish adolescent populations, demonstrating adequate psychometric properties. For the present study, only the items referring to the scales of physical ability, physical condition, general physical self-concept and general self-concept (24 items) were used. The response scale was a Likert scale with five response options, from 1 ("Strongly disagree") to 5 ("Strongly agree"). The reliability of each subscale was physical ability α = 0.83; physical fitness α = 0.88; general physical self-concept α = 0.88 and general self-concept α = 0.81.

Physical and psychological well-being (KIDSCREEN-27)

The KIDSCREEN-27 questionnaire was used to measure physical and psychological well-being (Robitail et al., 2007). The Spanish version of the questionnaire adapted to Spanish was used for the present study (Quintero et al., 2011). The questionnaire is composed of 27 items and five dimensions: physical well-being, psychological well-being, autonomy and relationship with parents, friends and social support, and school environment. In the present study, only two subscales were used: physical well-being and psychological well-being. The final version of the questionnaire provided consisted of 12 items, on a Likert scale with five response options, from 1 ("Always") to 5 ("Never"). The reliability of the subfactors was: physical well-being α = 0.74 and psychological well-being α = 0.85.

Student Subjective Well-being Questionnaire (SSWQ)

The Student Subjective Well-being Questionnaire (SSWQ) (Renshaw, 2024; Renshaw et al., 2015) was used to assess educational well-being. Although there is no official validation of the SSWQ in Spanish populations, the original instrument has demonstrated solid psychometric properties in adolescent samples and was carefully reviewed for linguistic and cultural adequacy prior to its administration. It consists of 16 items grouped into four subscales: Joy of Learning, School Connectedness, Educational Purpose, and Academic Efficacy (4 items per subscale). Responses were recorded on a 5-point Likert scale from 1 ("Strongly disagree") to 5 ("Strongly agree"). Sample items include "I enjoy learning new things at school" or "I feel connected to others at my school." The reliability coefficients in this study were: joy of learning α = 0.80; school connectedness α = 0.73; educational purpose α = 0.77; academic efficacy α = 0.87.

Data analysis

Data analysis was performed with the statistical program Jamovi 2.4.11. Descriptive analyses, Pearson's correlation test and Student's t-tests were performed to analyze the difference in means between groups. Effect sizes, represented by the mean differences, were estimated using Cohen's d. It was considered "small", 0.5 "medium" and 0.8 "large" (Cohen, 1988). Given the lack of reference values for this specific context, the conventional classification of effect sizes was considered the most appropriate. The significance level used was 0.05. The moderating role of the gender variable on the potential effects of dog ownership was also analysed. The p-value of the interaction between the predictor variable (dog ownership) and the dependent variable (the four measures of physical activity level) was calculated. Differences between Cohen's d values in each gender identity subgroup provide insight into the strength of the moderating effect of gender identity.

Results

The participants in this study included 301 males and 309 females. Of the total, 31% currently owned a dog, 11% had owned a dog in the past but did not have one at the time of the survey, and 58% had never owned a dog. For this purpose, Student's t-tests were performed for independent samples. As a general trend, male participants obtained higher scores in sports practice, motivation, and physical self-concept, while female participants obtained higher scores in school and leisure-time physical activity, as well as academic efficacy. The mean differences in all the study variables with respect to gender and dog ownership are presented below (Table 1).

Table 1. Gender and dog property effects on physical activity levels, motivation, physical self-concept, physical and psychological well-being and educational well-being.

	Gender differences					Dog propriety differences				
Variable	M_M	M_F	d	t	p	M_{yes}	M_{no}	d	t	p
Sports practice time (ID)	2.29	1.97	0.46	6.03	< .001	2.23	2.07	0.23	2.65	0.008
School practice time (IE)	2.45	2.65	-0.40	-5.09	< .001	2.66	2.48	0.34	3.95	< .001
Free practice time (IO)	3.01	3.15	-0.37	-4.82	< .001	3.11	3.07	0.08	0.92	0.357
Total physical activity (IAF)	2.58	2.59	-0.02	-0.29	0.769	2.66	2.54	0.41	4.70	< .001
Variable	M_M	M_F	d	t	p	M_{yes}	M_{no}	d	t	p
Intrinsec motivation	4.07	3.77	0.34	4.39	< .001	3.95	3.87	0.09	1.03	0.302
Integrated motivation	3.73	3.39	0.36	4.61	< .001	3.56	3.53	0.04	0.42	0.678
Identified motivation	4.01	3.92	0.12	1.59	0.112	3.94	3.95	-0.01	-0.10	0.922
Introjected motivation	2.18	2.19	-0.02	-0.22	0.825	2.17	2.17	-0.00	-0.00	0.998
External motivation	1.66	1.77	-0.14	-1.79	0.074	1.68	1.74	-0.07	-0.86	0.391
Demotivation	3.51	3.50	0.01	0.13	0.893	3.51	3.52	-0.02	-0.23	0.820
Variable	M_M	M_F	d	t	p	M_{yes}	M_{no}	d	t	P
Physical ability	3.80	3.41	0.48	6.19	< .001	3.66	3.58	0.09	1.10	0.272
Physical condition	3.75	3.26	0.58	7.47	< .001	3.58	3.47	0.13	1.51	0.131
General physical self-concept	4.01	3.57	0.50	6.44	< .001	3.81	3.80	0.01	0.11	0.909
General self-concept	4.12	3.80	0.41	5.25	< .001	3.98	3.98	-0.00	-0.05	0.962
Variable	M_M	M_F	d	t	p	M_{yes}	M_{no}	d	t	p
Physical well-being	4.13	3.71	0.59	7.69	< .001	3.94	3.92	0.04	0.41	0.681
Psychological well-being	4.24	3.79	0.67	8.66	< .001	4.05	4.01	0.05	0.60	0.549
Variable	M_M	M_F	d	t	p	M_{yes}	M_{no}	d	t	p
Joy of Learning	3.31	3.32	-0.03	-0.36	0.720	3.30	3.32	-0.03	-0.30	0.767
School Connectedness	3.47	3.52	-0.06	-0.72	0.469	3.50	3.51	-0.02	-0.28	0.783
Educational Purpose	3.80	3.80	0.00	0.02	0.984	3.77	3.82	-0.07	-0.82	0.411
Academic Efficacy	3.52	3.75	-0.29	-3.75	< .001	3.66	3.65	0.02	0.19	0.853

Physical activity levels

With respect to gender differences in the levels of physical activity, both in terms of school time and in terms of the level of physical activity (t(610)= -5.09, p< .001, d=-.40), as well as in leisure time (t(610)= -4.82, p< .001, d=-.37) were significant. In both cases, girls scored higher than boys. Conversely boys obtained higher scores in the time dedicated to sports activities, which was also significant(t(610)= 6.03, p< .001, d=.46).

Regarding dog ownership, students who own dogs compared to those who do not, showed higher scores in physical activity during school time (t(610)= 3.95, p< .001, d=-.34) and in total physical activity levels (t(610)= 4.70, p< .001, d=-.41).

Motivation

Regarding gender differences in the types of motivation analyzed, the results showed significant differences in two types: intrinsic motivation (t(610)= 4.39, p< .001, d= .34) and integrated motivation (t(610)= 4.61, p< .001, d= .36). Boys had higher scores than girls in both intrinsic motivation and integrated motivation. No significant differences were observed with respect to dog ownership.

Physical self-concept

Regarding gender differences in physical self-concept, all subfactors were significant: physical ability (t(610)= 6.19, p< .001, d=.48), physical condition (t(610)= 7.47, p< .001, d=.58), general physical self-concept (t(610)= 6.44, p< .001, d=.50) and general self-confidence (t(610)= 5.25, p< .001, d= .41). Moreover, in all of them, boys obtained higher scores than girls. Dog ownership did not show significant differences in this aspect.

Physical and psychological well-being

In addition, the gender differences in well-being were significant, both in physical well-being (t(610)= 7.69, p< .001, d= .59) and in psychological well-being (t(610)= 8.66, p< .001, d=.67). Boys showed higher scores than girls on both factors. Likewise, dog ownership was not significant in this variable.

Education well-being

Finally, with respect to educational well-being, only the academic efficacy factor was found to be significant (t(610)= -3.75, p< .001, d=-.29). In this case, girls showed higher scores than boys. With respect to dog ownership, none of the educational binomial subfactors showed significant differences.

Moderation Analyses

In line with the study's aim to explore gender-based differences, we also examined whether gender moderated the relationship between dog ownership and physical activity levels. In addition, the moderating role of gender on the effect of dog ownership on physical activity levels has been analyzed. In this case, significant interactions were found where gender had a greater direct effect on boys (d= 0,44, p= <.001 male) compared to girls (d= 0,08, p= .512), specifically in the time dedicated to sports activities. These differences are detailed in Table 2, which shows physical activity levels for dog owners and non-owners within each gender group. No significant interactions were found for the other dimensions of physical activity, suggesting that the moderating role of gender is most relevant in the domain of sports participation.

Table 2. Moderating role of gender on the effect of dog ownership on physical activity levels.

	Male participants					Female participants					Interaction
Variable	M_{yes}	M_{no}	d	t	p	M_{yes}	M_{no}	d	t	p	p
Sports practice time (ID)	2.53	2.18	0.44	3.55	< .001	1.99	1.95	0.08	0.66	0.512	0.011
School practice time (IE)	2.50	2.40	0.20	1.55	0.122	2.77	2.57	0.41	3.45	< .001	0.227
Free practice time (IO)	3.01	3.02	-0.02	-0.19	0.852	3.18	3.13	0.12	1.04	0.298	0.393
Total physical activity (IAF)	2.68	2.54	0.46	3.59	< .001	2.65	2.55	0.36	3.05	0.003	0.475

Discussion

The aim of this study was to examine the differences between genders, as well as the differences between dog ownership and non-ownership, in several aspects relevant to adolescent health, such as PA levels, motivation, PSC, and physical, psychological and educational well-being. In addition, the moderating role of gender on the effect of dog ownership on physical activity levels was investigated.

With respect to gender, the results obtained showed that the PA levels of boys in sports activities were higher than those of girls. These results are in line with the results of other current studies that have analyzed this aspect at the adolescent stage (Fernández et al., 2017; Gasol Foundation, 2023; Luque & del Villar, 2019; Zaragoza et al., 2011). On the other hand, girls showed higher levels of PA than boys in

physical activities performed during leisure time and school time, as supported by several international studies (Montalt et al., 2023; Moral-García et al., 2023). These differences in physical activity levels between girls and boys in certain situations can be attributed to various reasons that influence their habits and behaviors. These differences appear to be the result of a complex interaction between individual, social, cultural, educational and access to physical activity factors. These elements could, in part, explain the discrepancies observed in physical activity participation between the two genders.

Regarding motivation, the results of the present study showed that boys scored higher than girls. These results are consistent with other previously published studies that explored the difference between genders (Jones et al., 2017; Liu et al., 2023; Portela-Pino et al., 2019). Specifically, the data showed higher scores among boys in relation to intrinsic motivation and integrated motivation. Gender roles could play an important role in the motivations that boys and girls present to practice PA. The sports environment has historically been a space for boys, and this can generate among them a motivation linked to the development of their own personality and character. Moreover, this type of motivation, related to a greater practice of PA in the future, would explain how the practice, especially among girls, decreases with increasing age, as reflected in some reports (Bizkaia Provincial Council, 2022).

With respect to physical self-concept, this study shows significantly higher scores in boys on all dimensions measured. Previous studies generally show similar results, with boys tending to show higher scores than girls (Castro-Sánchez et al., 2019, Marsh et al., 2006; Montalt et al., 2023; Revuelta et al., 2016). These differences between boys and girls may contribute to disparities in their participation in physical activity and/or sports, as noted in other studies (Benitez-Sillero et al., 2024; Jankauskiene et al., 2022). Generally, boys would tend to perceive themselves as being more physically fit, more athletically adept, and stronger than girls (Fraile & Catalina, 2013). In addition, the greater participation of boys in sporting activities and the influence of Western society in attributing a high value to the body could explain these results (Murcia & Cervelló, 2005). Based on this, it is crucial to consider the different perceptions that appear between boys and girls during adolescence, due to their influence on the adoption of healthy lifestyle habits that promote the improvement of their mental health, social relations and overall well-being (Sáez et al., 2020).

Regarding physical and psychological well-being, the results of the present study showed significant differences in relation to gender, with boys scoring higher. These results corroborate the findings of previous research conducted with adolescents (Bisegger et al., 2005; Boraita et al., 2020; Haraldstad et al., 2017; Sarkova et al., 2014; Torsheim et al., 2006). Additionally, longitudinal research such as that conducted by Meade and Dowswell (2016), reported similar data, where there is a consistent pattern of girls scoring lower than boys throughout their adolescent years in relation to their physical and psychological well-being.

Students' educational well-being was another aspect investigated in the present study, in which the results showed significant differences in academic efficacy, with girls obtaining higher scores compared to boys. Despite the complexity of identifying the factors that may lead girls to show greater confidence in their academic development, the main causes seem to be related to socialization processes and learning strategies that are different from those of boys, as similar research has also indicated (Barca et al., 2016; Huang, 2013; Weis et al., 2013). These patterns are consistent with social cognitive theory, which suggests that girls tend to develop greater academic efficacy through early reinforcement of verbal, organizational, and self-regulatory skills. In this regard, recent systematic reviews emphasize that academic self-concept and by extension, self-efficacy, shows gender moderated effects on motivation, performance, and self-esteem, often favoring girls in verbal and self-regulation domains, thus contributing to their greater academic confidence (Wang & Yu, 2023).

On the other hand, the results obtained showed significant differences in those students who have dogs, who showed higher PA scores, both during school time and in general. These results are in line with previous studies that support a positive association between dog ownership and increased likelihood of meeting PA recommendations for this group (Bushman, 2017; Engelberg et al., 2016; Machová et al., 2019; Pajaujiene & Petrigna, 2024; Powell et al., 2020; Sirard et al., 2011). The interaction with these animals can generate a positive effect on the motivation to practice PA and improve people's physical condition, as has been concluded in several studies on the promotion of dog-assisted PA through dog-walking (Christian et al., 2016; Morrison et al., 2013; Potter et al., 2019; Salmon et al., 2010) or canicross (Tena & Gamonales, 2022). Dog ownership appears to be associated with increased physical activity in

adolescents, where the moderating effect of gender on the relationship between dog ownership and physical activity levels is greater among boys. Living with a dog could help students achieve the recommended levels of daily physical activity and promote healthy habits that improve the well-being and health of this group. Although much of the literature has focused on adult populations, particularly women, recent qualitative studies have shown that living with dogs can reduce stress and anxiety, enhance motivation, and foster emotional well-being benefits that, as seen in our study, may also extend to adolescents (Astuti et al., 2024). Considering that improving the well-being of the adolescent population is a public health priority (World Health Organization, 2013, 2020), actions and programs are needed to help reverse the physical inactivity patterns of students, where the involvement of dogs could be effective. In this sense, it would be necessary to carry out awareness campaigns and/or specific training, which would be duly justified, given that health education and the promotion of healthy lifestyles occupy a relevant place in current health and educational legislation (Organic Law 3/2020, 2020). Educational centers are considered key environments for promoting PA and carrying out actions for health education and promotion (Herlitz et al., 2020; Kidger et al., 2012), dog-assisted interventions could prove to be effective strategies for the promotion of PA in the educational setting. These educational initiatives can also be implemented in natural outdoor environments, where recent research supports the implementation of programs in these settings to improve adolescent fitness and well-being (Nugraha et al., 2024). In this regard, educational programs such as "KorriCan" have already been implemented, using canicross as a tool to promote health and physical activity through animal-assisted interventions in natural settings (González-Santamaría et al., 2024). This is undoubtedly in line with the objectives established in various health promotion plans and strategies agreed upon by the (Agreement 24-28, 2024), and would open up new scenarios for professionals with a university degree in Physical Activity and Sports Sciences. Moreover, this study offers a novel contribution by identifying the effect of gender as a moderating factor in the relationship between dog ownership and adolescent physical activity an area scarcely addressed in previous research. This finding underscores the importance of considering the effect of gender in future dog-assisted physical activity interventions targeting youth.

Finally, regarding the results on the moderating effect of gender on the relationship between dog ownership and physical activity levels in adolescents, significant interactions were observed gender had a more pronounced direct effect among boys than girls, particularly in terms of time spent engaging in sports activities. In this sense, and despite the fact that dog ownership is related to higher levels of physical activity in adolescents and the existence of previous studies analyzing gender differences in this relationship, no studies have been found that provide specific evidence on this effect. Therefore, further research are needed to confirm this interaction with certainty.

This study has some limitations that should be considered. The main limitation is its cross-sectional descriptive design, which does not allow for establishing a cause-and-effect relationship between the variables analyzed and the nature of the interaction between the adolescents and their dogs, as well as the impact of this interaction on the adolescents' health and well-being. Longitudinal studies would allow a more complete understanding of how the presence of dogs can influence and help develop effective strategies to promote physical activity in this population group. These longitudinal studies would allow exploration of the possible long-term implications of the interaction between adolescents and their dogs. Although both participating schools shared similar urban and sociodemographic profiles, no individual socioeconomic data were collected. This may represent a potential confounding variable, as socioeconomic status could influence physical activity, motivation, and well-being. Future studies should include such data to better account for its possible effects.

Second, the results are based on measures taken through questionnaires completed by young people. Future studies should be carried out by means of objective evaluations that could complement this information by incorporating quantitative data collection systems (walking, running, etc.) through heart rate monitors and accelerometers. This approach would record schoolchildren's data with greater accuracy compared to questionnaires, reducing the potential for results to be influenced by subjective factors.

Finally, despite the large sample size, the results should be viewed with caution. This, future studies should consider replicating this study with other types of methodologies, such as pre-post studies and/or in other population samples or cultural contexts.

Conclusions

The present study examined the relationship between dog ownership and various aspects of adolescent health, such as physical activity, motivation, physical self-concept, and physical, psychological, and educational well-being, also considering the moderating effect of gender on this relationship. These findings contribute to a deeper understanding of how everyday contexts such as living with a dog, can influence health related behaviors during adolescence. The identification of gender as a moderating factor is particularly relevant, as it suggests that interventions leveraging dog-assisted physical activity may be especially impactful for boys in promoting sports participation. This highlights the importance of designing health promotion strategies that are sensitive to both environmental and individual variables, including gender, motivation, and self-concept. The integration of such approaches in school settings could offer innovative pathways to reduce physical inactivity among adolescents and support broader well-being objectives.

In conclusion, dog ownership seems to be positively associated with physical activity levels in adolescents, particularly among boys. Given the relevance of schools as settings for promoting health and physical activity (Herlitz et al., 2020; Kidger et al., 2012), dog-assisted programs could be integrated as innovative and evidence-based strategies to enhance adolescent well-being. These approaches are consistent with national education and health priorities (Agreement 24-28, 2024; Organic Law 3/2020, 2020) and could open up new scenarios for professionals with a university degree in Physical Activity and Sports Sciences.

Based on these findings, we recommend that educational and health institutions consider incorporating dog-assisted physical activity programs such as canicross into their school-based health promotion strategies. These programs could be particularly effective for engaging adolescent boys, who appear to benefit more from the motivational impact of dog ownership in terms of sports participation. Additionally, interventions should consider the effect of gender when designing strategies to promote physical activity, particularly by reinforcing girls' physical self-concept and promoting inclusive participation. Furthermore, teacher education programs should incorporate training on animal-assisted interventions, positioning them as innovative and evidence-based strategies to enhance physical activity engagement among adolescents. Such approaches are consistent with the priorities outlined in current Spanish legislation (Agreement 24-28; 2024; Organic Law 3/2020, 2020), which emphasizes health education and the promotion of healthy lifestyle habits within the school environment.

However, longitudinal studies and objective measurements are required to better understand this relationship and its long-term implications.

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