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Sport practice and depression during adolescence: Special emphasis on performance level and sport discipline

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ABSTRACT

Objectives: Depression is one of the most prevalent diseases worldwide, with almost half of the adolescent population affected according to latest research. Given this serious burden of disease, research points toward interventions that could effectively fight this disease in this population subset. One of these pivotal interventions is physical activity, although the effects of different sport types and sport performance level on depression have not yet been studied in adolescent populations. Accordingly, the objective of the current study was to assess the relationship between depressive symptoms, sport type and performance level in a large adolescent population.
Design: Cross-sectional study assessing a large cohort of adolescents through self-reported data.
Methods: 10,248 participants aged 11–19 years old answered questionnaires regarding depressive symptoms and sporting habits and were classified according to their sport performance level: from physically inactive to internationally competitive.
Results: Girls reported higher incidence of depressive symptoms than boys, difference that further increased during late adolescence. Performance level was related to depressive symptoms: inactive participants reported the highest depressive scores while internationally competitive athletes reported the lowest. However, there were no differences between competitive athletes of different performance levels. Further, sport type had a small influence on depressive symptoms.
Conclusions: All these findings result in a potential guideline for future research and community health recommendations: as long as sufficient physical activity levels are met and the adolescent engages in sporting activities, the protection against depressive symptoms remains largely unrelated to the sport type and the level at which he or she performs.

Practical implications

- The relationship between physical activity levels and depressive symptoms in adolescent plateaus after a minimal dose is met.
- As long as sufficient physical activity levels are met and the adolescent engages in sporting activities, the protection against depressive symptoms remains largely unrelated to the sport type and the level at which he or she performs.
- Given that inactive adolescents report the highest depressive scores, special efforts should be directed toward this subpopulation as evidence shows that even low doses of physical activity are related to much better outcomes.

1. Introduction

Depression is one of the most prevalent diseases worldwide, with over 350 million affected according to latest research. It is responsible for a large proportion of the world's burden of disease and represents an important source of total adjusted disability life years.[1] This fact is even more worrying given the total prevalence reported for children and adolescents: the numbers increase from 2 % during childhood to 22–27 % in mid-adolescence and to almost half of the late adolescent

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population.[2] Differences in the incidence of depressive symptoms in boys and girls have also been assessed, with the latter reporting more frequent and severe symptomatology.[2] Given this high incidence in young populations and its potential social, economic and health impact, there is a clear interest in the assessment of factors that could ameliorate depressive symptoms in these populations.

Sport practice has been commonly discussed in the literature as one of the main factors that could impact depressive symptoms in young populations. Concretely, recent systematic reviews and meta-analysis identified the negative association of a higher frequency of sport participation with depressive symptoms among adolescents.[3,4] Sport offers a unique integration of two factors that are independently established as inversely associated with depressive symptoms: physical activity and social relationships. However, the positive effects of sport practice on depressive symptoms have been studied from a broad perspective and may not represent a lineal trend in specific populations participating in different sport disciplines and at varying levels of performance.

Intrinsic factors such as sport type, performance level or training volume and intensity are rarely distinguished in studies of depressive symptoms.[5] Highly performing athletes could, in theory, be at risk for mental health problems due to the particular stressors and challenges they are exposed to: demands of competition and training, injuries and management of recovery, especially when large training volumes and intensities are characterizing their practice.[6] However, the practice of a sport at the high level does not appear psychopathogenic, since the prevalence of psychopathology identified is no higher than in the general population.[7] In fact, a dose–response relationship between level of physical activity and depressive symptoms in adolescents has been reported suggesting increased benefits for those who are most active.[8] Paradoxically, high intensity exercise and overtraining have been identified as risk factors for depressive disorders.[7] These contrasting findings suggest that an optimal dose may exist and it might be different across sport disciplines as differing psychological outcomes have been reported among adolescents participating in disciplines such as outdoor, esthetic or team sports.[9]

In summary, various factors such as gender, age, performance level and sport discipline can impact the relationship between sport practice and depressive symptoms in the adolescence. Therefore, the objective of the present study was to assess the interrelation between depressive symptoms and sport practice, clarifying the interaction between performance level, training volume, intensity and discipline depending on gender and age during adolescence.

2. Methods

2.1. Ethical requirements

The study was designed as a cross-sectional investigation based on self-reported data and was conducted following the principles of the Declaration of Helsinki. The study protocol was reviewed and approved by the Clinical Research Ethics Committee of Aragón (CEICA-PI/0339).

2.2. Participants and design

A total of 10,248 participants aged 11–19 completed the baseline assessment with valid data for physical activity and depressive scores. Participants were classified in 7 different categories: inactive, somewhat active, noncompetitive athletes, locally, regionally, nationally and internationally competitive athletes. National and international athletes were recruited through the Spanish and Regional Sports Federations, High Performance Sports Centers, Sports Technique Centers, and the 20 clubs of each sport discipline with the highest level of performance according to sex. Each school, club and sport institution was contacted by e-mail, letter and telephone. The invitation included a brief introduction to the study and an explanation of its anonymous nature and a link to the online questionnaire. To be included in the study, athletes had to train at least 2 days/week and competitive athletes had to report at least 6 months of experience in training and competing in a sporting discipline included in the Summer Olympic Games program.

To recruit inactive and somewhat active participants together with noncompetitive and locally and regionally competitive athletes, all students from all secondary education centers in three representative provinces of Spain were invited to participate in the study. Inactive subjects had to express that they did not do sports and had to be categorized as having low levels of physical activity according to the Patient Centered Assessment and Counseling for Exercise (PACE) criteria: from 0 to 2 days a week with at least 60 min of moderate and vigorous physical activity.[10] Somewhat active subjects had to express that they did not do sports regularly and be categorized as having moderate levels of physical activity according to the PACE criteria: 2–3.5 days a week with at least 60 min of moderate and vigorous physical activity. Noncompetitive athletes had to express that they did sports at least twice a week, but that they did not compete in any sport.

For all study subjects the exclusion criteria were: 1) chronic illness, or any physical or psychological limitation that may limit physical activity levels; and 2) presence of an injury that may affect participation in their respective sports and/or in any variable considered in the present study. Data were recovered in the months of January to March to assess all study variables, including the standardized and validated questionnaires described below. Choosing this timeframe guaranteed that athletes were in an advanced phase of the training season and the time limitation also allowed the possible seasonal effect to be controlled. Tables 1 and 2 represent the main characteristics of the participants according to gender, age, sport type and performance level.

2.3. Physical activity and sport

To obtain contextual information about physical activity, participants completed the Spanish version of the Physical Activity Questionnaire for Children and Adolescents (PAQ-C and PAQ-A).[11] Participants were asked to evaluate the level of physical activity in their free time, in physical education classes and at different times (lunchtime, afternoon and evening) on school days and weekends during the last 7 days. Nine (PAQ-C) and eight (PAQ-A) items were rated on a 5-point Likert-type scale and averaged to obtain an overall physical activity score of 1–5, with lower scores indicative of lower levels of physical activity. Physical activity was also assessed using a modified version of the PACE questionnaire for adolescents.[12] This adaptation has been used in epidemiological studies with European adolescents and involves asking the days on which subjects accumulate at least 60 min of moderate and vigorous physical activity during the last 14 days.[10]

The methodology proposed by McMahon et al.[10] was adapted to ask participants if they had participated in at least twice weekly training in the last 6 months. Other questions included their priority sport, the years of practice at the competition level and the current number of sessions/week and hours/week. Finally, they were asked questions related to their performance level, season objective and competitive allocation. The national level was considered when a participant competed in the highest competitive category at the national level for their age, sex and sport.

A traditional classification was adapted to differentiate between technical, power, gymnastic, combat, racket, team and endurance sports.[13] Sports were coded as team or individual based on whether they involved three or more athletes on each team competing simultaneously.[14] Team sports were differentiated into those with opponents and those without opponents depending on whether the practitioners competed simultaneously on the same competition field. Additionally, the study identified a group of athletes who indicated that they primarily competed both individually and in a team sport without an opponent.

This study applied classification systems that classify sports according to their predominant metabolism into alactic, lactic, mixed and

Table 1
Participant characteristics according to performance level and sex.

	Inactive		Somewhat active		Noncompetitive		Locally competitive		Regionally competitive		Nationally competitive		Internationally competitive	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
n	321	830	176	445	1536	2082	1563	568	503	342	987	701	101	93
Age (y)	15,6 (1,6)	15,5 (1,6)	15,5 (1,8)	15,2 (1,6)	15,1 (1,7)	14,8 (1,7)	14,6 (1,7)	14,5 (1,6)	15,0 (1,7)	14,9 (1,8)	15,5 (1,9)	15,2 (2,0)	16,9 (1,7)	16,5 (1,9)
BMI (kg/m^2)	21,9 (4,6)	20,7 (3,6)	21,6 (5,4)	20,7 (3,5)	21,1 (3,9)	20,2 (3,2)	20,1 (3,0)	19,8 (2,9)	21,5 (3,1)	19,8 (2,7)	20,9 (3,0)	20,0 (2,8)	22,3 (2,5)	21,0 (2,9)
PA level (1–5)	1,7 (0,5)	1,6 (0,4)	2,0 (0,5)	1,8 (0,5)	2,6 (0,6)	2,4 (0,6)	2,8 (0,6)	2,5 (0,6)	2,8 (0,6)	2,7 (0,6)	2,9 (0,6)	2,8 (0,6)	2,8 (0,7)	2,7 (0,6)
Sport training														
Years (y)					4,1 (3,3)	3,7 (3,1)	6,9 (3,3)	4,6 (2,9)	6,5 (3,3)	6,4 (3,3)	7,1 (3,4)	6,6 (3,2)	9,3 (3,2)	8,5 (3,5)
Hours week (h/wk)					4,0 (2,8)	3,2 (2,4)	5,7 (3,3)	4,4 (2,4)	7,4 (4,0)	7,4 (4,1)	10,5 (5,6)	11,5 (6,4)	15,7 (7,5)	16,1 (8,1)
Days week (d/wk)					3,3 (1,6)	2,8 (1,5)	3,6 (1,2)	3,0 (1,1)	3,9 (1,1)	3,8 (1,2)	4,7 (1,3)	4,7 (1,3)	5,7 (1,2)	5,4 (1,2)

aerobic.[15] A differentiation was also made between sports that are normally trained and competed outdoors and those that are normally practiced indoors.

2.4. Depressive symptoms

Depressive symptoms were measured using the Spanish version of the Beck Depression Inventory (BDI-II), for which an internal consistency of 0.87 has been reported.[16] The 21 items of this instrument evaluate specific symptoms of depression experienced during the last two weeks, such as mood, pessimism, feelings of failure, and dissatisfaction. Each scored 0–3, indicating symptom severity, with total scores ranging from 0 to 63. Depression is then established as minimal (0–13), mild (14–19), moderate (20–28) and severe (29–63).[17] The reliability and validity of the BDI-II have been confirmed in clinical and community samples of adolescents.[18]

2.5. Socioeconomic status

Subjective socioeconomic status or perceived family wealth was assessed using the question "*How well-off do you think your family is?*". This question was originally used in the international study "The Health Behavior in School-aged Children (HBSC)" in 1994 as an indicator of the subjective socioeconomic status of adolescents.[19] The 5 response options were classified into 4 categories: 1 (poor), 2 (not very poor), 3 (normal) and 4 (rich or very rich).

2.6. Physical evaluation

The body mass index was calculated according to the reported values of weight and height. Pubertal status was evaluated using the Puberal Development Scale, which has shown acceptable levels of validity and reliability.[20] For girls, the questionnaire asks about five aspects: body hair, accelerated growth, skin changes, menarche and breast development. For boys, the first three questions are similar, and changes in facial hair and voice are also assessed. Additionally, girls were asked about the onset and age of menstruation. Finally, a 5-level categorical scale designed to be comparable to Tanner's stages of pubertal development was calculated.[21]

2.7. Other variables

Participants were categorized according to the geographical area of Spain (north–south) and the number of inhabitants of the place of residence (less than 1000 inhabitants, from 1001 to 10,000 inhabitants, from 10,001 to 100,000 inhabitants, from 100,001 to 500,000 inhabitants, more than 500,000 inhabitants).

2.8. Statistical analysis

All analyses were conducted using IBM SPSS Statistics v.26 software (IBM Corp. USA). The normality of the dependent variable was calculated using the Kolmogorov–Smirnov test while considering the asymmetry coefficient. Data did not show normality; therefore, it was log transformed for analysis. The effects of different factors on depressive symptomatology were taken into account: sex, age group (11–13, 14–16 and 17–19 years), maturative stage (stages 1–5), competition level (inactive, somewhat active, noncompetitive, locally, regionally, nationally and internationally competitive) and the type of sport (technical, power, gymnastic, combat, racket, team and endurance). In addition, the analyses were completed by assessing the effect of predominant metabolism of the sport (Alactic, Lactic, Aerobic, Mixed), type of competition (Individual, Team, Team without opponent, Individual and team without opponent), and training environment (Outdoors, Indoors) on depressive symptoms. The general linear model was used to control the influence of confounding variables. The selected covariates were

Table 2
Weekly training hours according to sport type, sex and performance level.

	Technical (n = 168)		Power (n = 128)		Gymnastic (n = 350)		Combat (n = 216)		Racket (n = 228)		Team (n = 2919)		Endurance (n = 789)	
	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)
Locally competitive														
Boys	6	6,2 (1,6)	2	4,5 (2,1)	5	4,6 (3,1)	22	5,3 (4,4)	46	4,1 (2,4)	1436	5,7 (3,2)	40	6,0 (3,9)
Girls	11	3,4 (1,8)	3	2,5 (0,9)	76	3,9 (2,4)	14	4,5 (2,6)	32	3,9 (3,4)	392	4,6 (2,3)	40	4,3 (2,7)
Regionally competitive														
Boys	8	8,8 (3,7)	8	5,6 (2,6)	2	10,5 (6,4)	21	6,7 (5,2)	51	6,3 (3,6)	312	6,9 (3,0)	94	9,7 (5,8)
Girls	10	6,1 (4,7)	10	6,3 (2,7)	97	8,3 (4,3)	12	5,5 (1,8)	31	5,4 (2,7)	93	6,4 (2,8)	83	8,9 (5,1)
Nationally competitive														
Boys	37	12,5 (6,9)	57	10,1 (4,7)	12	8,9 (2,6)	77	9,4 (5,5)	37	11,1 (6,4)	461	9,2 (4,8)	287	12,7 (5,9)
Girls	45	10,1 (6,6)	40	9,3 (3,8)	142	17,1 (6,2)	43	8,3 (4,3)	23	9,2 (4,8)	180	9,1 (4,5)	210	12,7 (6,4)
Internationally competitive														
Boys	28	18,8 (7,7)	2	14,0 (5,7)	4	14,3 (11,3)	19	13,5 (5,9)	4	21,3 (10,3)	23	12,6 (6,0)	15	17,8 (8,2)
Girls	20	17,6 (6,9)	6	10,7 (6,2)	12	24,1 (11,0)	7	14,4 (9,6)	3	13,7 (7,1)	21	13,8 (5,3)	19	16,2 (7,2)

maturational development, socioeconomic level, place of residence, size of municipality of residence and weekly training hours. In all cases, a p-value of <0.05 was considered statistically significant (Tables 3, 4).

3. Results

Depressive symptoms were significantly greater in girls than in boys in all performance level groups except for somewhat active participants. Depressive symptoms increased with age, with a larger increase in girls than in boys ($p = 0.00$). The differences in depressive levels among boys and girls were influenced by the maturative stage ($p = 0.00$). Significant differences were observed for Tanner stages 3, 4 and 5 but not 1 and 2.

In both sexes, depressive levels were influenced by the performance level (boys $F(6) = 28.745$, $p = 0.00$; girls $F(6) = 27.209$, $p = 0.00$), with higher levels reported for inactive and somewhat active participants of both sexes. Further, competitive athletes from all performance levels presented lower depressive scores than noncompetitive, somewhat active and inactive participants (all $p < 0.05$). In the frequency analysis, nationally and internationally competitive athletes reported the lowest % of moderate and severe depressive levels (2.8–1.5 % and 1.8–1.5 % respectively). Inactive participants also reported the highest depressive scores and largest percentages of moderate and severe symptoms (11.3 %–8.3 % respectively). No significant differences in depressive levels were observed among the different groups of competitive athletes.

The differences in depressive levels according to performance level were independent from the sport type, type of competition, type of metabolism and training place (all $p > 0.05$).

Regarding sport modalities, no significant differences were found for depressive scores across the different types of sport for both locally and regionally competitive athletes of both sexes. No significant differences were observed for both nationally and internationally competitive athletes, except for boys competing in technical sports, who reported the lowest depressive levels. Internationally and nationally competitive boys participating in combat and endurance sports reported significantly higher depressive values. As for girls, racket and gymnastic sport practitioners reported the lowest values, although no significant differences were reported. In these analyses no interaction with age or maturative stage was observed (all $p > 0.05$).

4. Discussion

This has been the first study that analyzed symptoms of depression in adolescents classified according to their sport performance level: from physically inactive to internationally competitive. The main findings of this study were: 1) girls reported higher depression scores than boys starting from Tanner's maturational stage 3; 2) depression levels increased with age and maturational stage, with a larger increase in girls; 3) inactive participants showed the highest levels of depressive symptoms; 4) competitive athletes had lower levels of depressive symptoms than non-competitive athletes; 5) among competitive athletes, the level of competition had a lesser influence on depression levels; 6) the differences in depression according to the type of sport seemed smaller, but there was a tendency toward worse values in combat and endurance sports; and 7) outdoor sports were related to lower depression levels in boys.

The results of the current study showed higher depression scores in girls than in boys, a difference that became particularly larger during late adolescence. These findings are not novel in the scientific literature as they have been reported widely in previous studies.[22,23] Some of the proposed mechanisms to explain these differences refer to gender variations in stress responses during this critical life period, with special emphasis on the differences in the hypothalamic–pituitary–adrenal axis response to stress and a larger exposure to bullying victimization in girls.[24] The altered stress regulation and its maladaptive coping strategies become more evident during late adolescence and in female populations in particular.[25]

The present study also showed that inactive participants reported the highest depression scores. Again, past scientific literature is consistent on the link between inactivity, sedentarism and depression in the adolescence.[26,27] Particularly, lack of physical activity during leisure time in the adolescence has been related to less social interactions, lower release of neurotransmitters such as dopamine and serotonin

Table 3
Depression according to performance level.

	Inactive (n = 1151)	Somewhat active (n = 621)	Noncompetitive (n = 3618)	Locally competitive (n = 2131)	Regionally competitive (n = 845)	Nationally competitive (n = 1688)	Internationally competitive (n = 194)	p
Boys	10,6 (11,2)	6,5 (7,7)*	7,0 (8,3)*	5,2 (7,4)*,+,^	5,2 (7,1)*,+,^	4,8 (6,4)*,+,^	3,9 (4,7)*,+,^	0.000
Girls	11,8 (10,4)	10,0 (9,4)*	9,0 (9,1)*,+	7,2 (8,8)*,+,^	6,9 (8,3)*,+,^	6,5 (7,4)*,+,^	7,3 (7,0)*,+	0.000
All	11,5 (10,4)	9,0 (9,1)*	8,2 (8,9)*,+	5,7 (7,8)*,+,^	5,9 (7,7)*,+,^	5,5 (6,9)*,+,^	5,5 (6,2)*,+,^	0.000

Values are the mean (standard deviation).
* $p < 0.05$ vs. inactive.
+ $p < 0.05$ vs. somewhat active.
^ $p < 0.05$ vs. noncompetitive.

Table 4
Depression according to sport type, performance level and sex.

	n	Technical (n = 168)	Power (n = 128)	Gymnastic (n = 350)	Combat (n = 216)	Racket (n = 228)	Team (n = 2919)	Endurance (n = 789)	p
Locally/regionally competitive	2961	8,1 (10,5)	6,5 (7,0)	6,6 (8,2)	7,3 (9,7)	5,1 (7,2)	5,6 (7,6)	6,5 (8,5)	0.195
Boys	2057	6,5 (9,4)	7,3 (9,1)	8,0 (6,9)	7,1 (9,4)	4,9 (7,1)	5,1 (7,3)	5,1 (6,9)	0.520
Girls	904	9,3 (11,4)	5,9 (5,2)	6,6 (8,2)	7,6 (10,4)	5,5 (7,4)	7,3 (8,4)	8,0 (9,7)	0.712
Nationally/internationally competitive	1837	4,2 (6,4)	4,9 (4,9)*	5,0 (6,1)*	6,1 (6,9)*	4,9 (6,2)	5,5 (6,9)*	6,0 (7,4)*	0.005
Boys	1065	2,9 (4,9)	4,0 (4,2)	4,8 (7,4)	5,0 (5,2)*	4,9 (6,6)	4,9 (7,0)*	4,5 (5,6)*	0.018
Girls	772	5,5 (7,4)	6,1 (5,5)	5,0 (6,0)	8,5 (9,0)	4,9 (5,7)	6,8 (6,5)	8,0 (8,8)	0.253
All	4798	5,1 (7,6)	5,2 (5,3)	5,8 (7,3)*	6,5 (7,9)*	5,0 (6,9)+	5,5 (7,4)+	6,2 (7,7)*,^,#	0.013

* $p < 0.05$ vs. technical.
\+ $p < 0.05$ vs. combat.
^ $p < 0.05$ vs. team.
\# $p < 0.05$ vs. racket.

and lowered self-esteem and self-beliefs regarding one's capabilities and physical appearance.[27] All these factors have been linked to decreased mental well-being and decreased protection against depressive symptoms in this crucial life period.[26]

One of the main findings of the current study was the difference in depression levels found between non-competitive and competitive athletes. More concretely, among competitive athletes, the competition level did not seem to have a significant impact on depressive symptoms. Previous evidence suggested that the relationship between physical activity and depressive symptoms could be represented as a U-shaped figure. Concretely, a previous study reported that adolescents with very high involvement in sport (e.g., >17 h of sport involvement per week) experienced more depressive symptoms.[28] Further, another study concluded that sport practice during adolescence apparently stopped being a protective factor and became an independent risk factor for poorer well-being when practicing more than double the 7 h recommended by week.[29] Curiously, the results of the current study (Fig. 1) suggest a plateau rather than a U given the diminishing but not disappearing returns in terms of increased training intensity and volume (summarized as total physical activity), which is in line with previous studies.[10,27] Regarding the second finding observed in this section, previous evidence has discussed that involvement in organized sport during adolescence, but not the amount and intensity of physical activity outside of a sport context, was associated with lower depressive symptom scores in early adulthood.[5] Concretely, competitive sport may be an environment conducive to social contagion effects, and may improve mental health outcomes through neurobiological influences such as monoamine availability and increased neurotrophic factors.[30] One explanation that could be offered for this finding is that once the benefit plateau is reached due to sufficient physical activity, the context of organized sport already fosters positive mental health by providing opportunities for social interaction and connectedness in these environments of competitive sports regardless of the athletic exigence.[5]

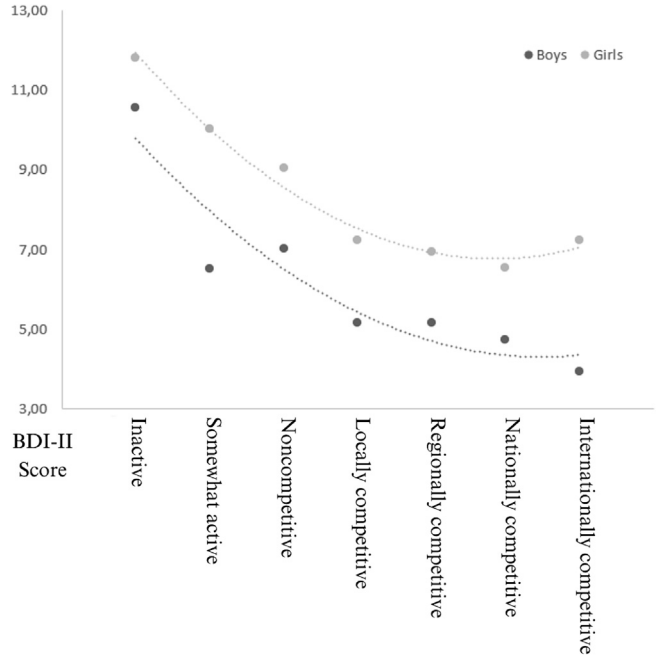

Fig. 1. Evolution of depressive symptoms with performance level.

One of the main interests of the current study was to assess the relationship between different sport types and depression levels. Curiously, the differences in depression levels across the different sports were minor. This results in a suggestion that could have a profound effect on future guidelines: as long as the adolescent participates in any kind of sport that allows him or her to reach the necessary physical activity levels, the protective benefits of these interventions will be similar regardless of the sporting activity chosen, which could be accordingly adjusted to benefit the preferences of each person. However, some specific results obtained during the present study could be highlighted: both combat and endurance sports were related to some of the worse depression scores: this could be explained, at least partially, by the low socioeconomic level of the participants given that this specific metric has been independently associated with worse psychosocial outcomes.[31] On the other hand, athletes participating in gymnastic sports reported good outcomes especially considering the broad debate regarding the presence of mental health problems in esthetic athletes.[32] One possible explanation for this finding could be a potential increase in the awareness and support provided by team members and coaches, with special emphasis on nutritional practices, psychological help and relativization of body image. Finally, boys but not girls reported better outcomes in outdoor sports. The benefits of outdoor physical activity have been broadly described in the literature and are normally related to decreased stress, reduced perceived effort and thus facility to engage in higher intensity exercise and, finally, mental and sensory stimulation.[33] However, the difference between sexes found in this study remains unclear.

The current study presented several limitations that should be listed: first, the recovery of self-reported data and the transversal design do not allow to establish a cause–effect relationship between performance level, type of sport and depressive symptoms. Further, performance levels were determined according to physical activity level and the participation in competitive and/or regulated sport disciplines. Other means of classification could have been possible, a factor that may have an influence on the outcome reported in the results.

5. Conclusion

This has been the first study that analyzed symptoms of depression in adolescents classified according to their sport performance level: from physically inactive to internationally competitive. Girls reported

higher incidence of depressive symptoms, which further increased during late adolescence. Performance level was related to depressive symptoms: inactive participants reported the highest depression scores while internationally competitive athletes reported the lowest. However, there were no differences between the different levels of competitive athletes. Further, sport type had a small influence on depressive symptoms. All these findings result in an interesting guideline for future research and community health recommendations: as long as sufficient physical activity levels are met and the adolescent engages in sporting activities, the protection against depressive symptoms remains largely unrelated to the sport type and the level at which he or she performs.

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Confirmation of ethical compliance

The study was conducted following the principles of the Declaration of Helsinki. The study protocol was reviewed and approved by the Clinical Research Ethics Committee of Aragón (CEICA-PI/0339).

CRediT authorship contribution statement

Sebastian Sitko: Writing – review & editing. **Marina Francín-Gallego:** Methodology. **Álvaro Pano-Rodríguez:** Visualization, Investigation. **Miguel Ángel Oviedo-Caro:** Visualization, Investigation. **Carmen Mayolas-Pi:** Software, Data curation. **Alejandro Legaz-Arrese:** Conceptualization, Methodology, Supervision.

Declaration of interest statement

The authors declare no competing interests.

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