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Originales

ASSOCIATIONS BETWEEN PHYSICAL ACTIVITY, SPORTS PARTICIPATION AND WELL-BEING IN ADOLESCENTS FROM LOW-DENSITY COMMUNITIES

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ABSTRACT

INTRODUCTION: Regular physical activity (PA) and sports participation in youth are usually associated with improved physical and psychological health. However, this evidence is scarce among adolescents living in low-density communities. Therefore, this study aimed to investigate the associations between PA, organized sports participation and well-being in adolescents living in low-density areas of the Portuguese midlands.

METHODS: The sample comprised 245 adolescents (114 girls), aged between 12 and 17 years (*M*= 14.20, *SD*= 1.09), recruited from public schools located in low-density communities. Participants completed self-report measures of sociodemographic data, moderate-to-vigorous physical activity (MVPA) levels (PACE+), sports participation, and well-being (MHC-SF and the physical well-being subscale of the KIDSCREEN-27). A tri-axial accelerometer was used to assess intensity levels of PA during week and weekend days separately. ANCOVAs and partial correlations were used controlling for potential confounders.

RESULTS: After controlling for sex, chronological age and school's context, findings indicated that adolescents meeting the MVPA guidelines reported higher levels of social and psychological well-being. In addition, physical well-being was positively associated with team sport participation, volume of sports training, self-reported MVPA levels (on weekdays and at the weekend) and MVPA assessed by accelerometry on weekdays. Sports participation revealed no significant effect on emotional, social and psychological well-being dimensions.

CONCLUSIONS: The findings revealed small to moderate effects of MVPA and sports participation on physical well-being. Conversely, the adolescents' social and psychological well-being was positively associated only with higher levels of self-reported MVPA.

Keywords: Physical activity; youth sports; well-being; adolescence.

ASOCIACIONES ENTRE ACTIVIDAD FÍSICA, PARTICIPACIÓN DEPORTIVA Y BIENESTAR EN ADOLESCENTES DE COMUNIDADES DE BAJA DENSIDAD POBLACIONAL

RESUMEN

INTRODUCCIÓN: La actividad física (AF) regular y la participación deportiva en la juventud suelen asociarse a una mejora de la salud física y psicológica. Sin embargo, esta evidencia es escasa entre los adolescentes que viven en comunidades de baja densidad. Por lo tanto, este estudio tuvo como objetivo investigar las asociaciones entre AF, participación en deportes organizados y bienestar en adolescentes que viven en áreas de baja densidad de la región central de Portugal.

MÉTODO: La muestra comprendió 245 adolescentes (114 chicas), con edades comprendidas entre los 12 y los 17 años (M= 14,20, SD= 1,09), reclutados en escuelas públicas situadas en comunidades de baja densidad. Los participantes completaron medidas de autoinforme sobre datos sociodemográficos, niveles de actividad física moderada a vigorosa (AFMV) (PACE+), participación en deportes y bienestar (MHC-SF y

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la subescala de bienestar físico del KIDSCREEN-27). Se utilizó un acelerómetro triaxial para evaluar los niveles de intensidad de AF durante los días laborables y los fines de semana por separado. Se utilizaron ANCOVA y correlaciones parciales para controlar los posibles factores de confusión.

RESULTADOS: Después de controlar el sexo, la edad cronológica y el contexto de la escuela, los resultados indicaron que los adolescentes que cumplían las directrices de AFMV informaron niveles más altos de bienestar social y psicológico. Además, el bienestar físico se asoció positivamente con la participación en deportes de equipo, el volumen de entrenamiento deportivo, los niveles de AFMV auto informados (en días laborables y durante el fin de semana) y la AFMV evaluada objetivamente en días laborables. La participación deportiva no reveló ningún efecto significativo sobre las dimensiones de bienestar emocional, social y psicológico.

CONCLUSIONES: Los resultados revelaron efectos entre pequeños y moderados de la AFMV y la participación en deportes sobre el bienestar físico. Por el contrario, el bienestar social y psicológico de los adolescentes se asoció positivamente sólo con niveles más altos de AFMV autodeclarada.

Palabras clave: Actividad física; deportes juveniles; bienestar; adolescencia.

ASSOCIAÇÕES ENTRE ATIVIDADE FÍSICA, PARTICIPAÇÃO DESPORTIVA E BEM-ESTAR EM ADOLESCENTES DE COMUNIDADES DE BAIXA DENSIDADE POPULACIONAL

RESUMO

INTRODUÇÃO: A atividade física (AF) regular e a participação desportiva na juventude estão geralmente associadas a uma melhor saúde física e psicológica. No entanto, esta evidência é escassa entre os adolescentes que vivem em comunidades de baixa densidade populacional. Assim, este estudo teve como objetivo investigar as associações entre AF, participação em desportos organizados e bem-estar em adolescentes que vivem em zonas de baixa densidade populacional do centro de Portugal.

MÉTODO: A amostra foi constituída por 245 adolescentes (114 raparigas), com idades compreendidas entre os 12 e os 17 anos (M= 14,20, DP= 1,09), recrutados em escolas públicas localizadas em comunidades de baixa densidade populacional. Os participantes completaram medidas de autorrelato de dados sociodemográficos, níveis de atividade física moderada a vigorosa (AFMV) (PACE+), participação desportiva e bem-estar (MHC-SF e a subescala de bem-estar físico do KIDSCREEN-27). Foi utilizado um acelerómetro triaxial para avaliar os níveis de intensidade da AF durante os dias de semana e de fim de semana, separadamente. Foram utilizadas ANCOVAs e correlações parciais para controlar o efeito de variáveis sociodemográficas.

RESULTADOS: Após controlar o efeito das variável sexo, idade cronológica e contexto escolar, os resultados indicaram que os adolescentes que cumpriam as recomendações relativas à AFMV reportaram níveis mais elevados de bem-estar social e psicológico. Além disso, verificaram-se associações positivos entre bem-estar físico, a participação em desportos coletivos, o volume de treino desportivo, os níveis autorreportados de AFMV (durante a semana e ao fim de semana) e a AFMV avaliada por acelerometria durante a semana. A participação desportiva não revelou efeitos significativos nas dimensões de bem-estar emocional, social e psicológico.

CONCLUSÕES: Os resultados revelaram efeitos pequenos a moderados da AFMV e da participação desportiva no bem-estar físico. Por outro lado, os níveis de bem-estar social e psicológico dos adolescentes associaram-se positivamente com os níveis de AFMV autorreportada.

Palavras-chave: Atividade física; desporto juvenil; bem-estar; adolescência.

1. INTRODUCTION

Physical activity (PA) is commonly defined as a multidimensional concept which includes a wide range of movements within its different dimensions, such as recreational activities, active commuting, school activities, and organized sports. This last dimension has long been acknowledged as an essential element of both physical health and social development. In fact, participation in organized sports promotes increasing physical fitness levels, particularly its cardiorespiratory component,[1] and concomitantly develops crucial life skills such as teamwork, respect for others, and social interaction/integration, among others.[2,3] Among the several advantages associated with organized sports, one of the most remarkable, yet under-studied, is its effect on different dimensions of mental well-being (emotional, social and psychological), particularly in adolescents residing in suburban and/or low-density communities.

Recent research indicates that the well-being and mental health of adolescents are considerably influenced by their engagement in organized sports, with benefits extending beyond physical health. Indeed, youth who participate in organized sports often exhibit higher levels of self-esteem, reduced levels of anxiety, and fewer depressive symptoms.[4–7] On the other hand, the sports activities available in the geographic settings where youth are living, as well as the specific nature of these activities, tend to have a crucial impact on their school activities, and familial and community satisfaction in their daily life.[8,9] For example, the social interactions inherent in individual and team sports training and competition foster a sense of belonging and community, which are essential components of positive mental health. Developing pleasant activities with teammates can provide emotional support and positively contribute to an individual's mental state.[4,10] Previous research has also shown that adolescents who regularly engage in organized sports tend to perceive their satisfaction with life more favorably than those who do not participate in such activities.[6]

The literature commonly reports that participation in team sports compared to non-sport participation is associated with 10% lower anxious/depressed scores, 19% lower withdrawn/depressed scores, 17% lower social problems scores, 17% lower thought problems scores, and 12% lower attention problems scores.[10] In addition, this same study conducted with a broadly representative sample of 11,235 US children and adolescents aged 9 to 13 years, revealed that team sport participation was associated with fewer mental health difficulties, whereas individual sport participation was associated with greater mental health difficulties compared

with team sport. Other research had already indicated that child and adolescent participation in team sports appeared to be associated with improved psychosocial health compared to individual activities.[4,7,9] In general, engagement in sports can enhance the mental well-being of adolescents by providing valuable opportunities to develop social connections and friendships, contributing to a sense of belonging within the sporting environment. The aforementioned relationships have been influenced not only by the analytical approaches used in previous studies, but also by the geographic communities and the socioeconomic features where data are collected.

Encouraging greater involvement in sports among children and adolescents is also a goal outlined in the Healthy People 2030 physical activity objectives.[11] However, in some countries, the existing pay-to-play structure of the youth sports system has created significant barriers to participation, disproportionately affecting adolescents from minority backgrounds or from different neighborhood environments. Indeed, youth from families with higher income levels have significantly higher levels of participation in organized activities.[12] In addition, youth from rural or suburban settings may have less access to structured forms of PA and sports participation due to higher unavailability or distance to sports facilities and infrastructures, less pedestrian infrastructures for walking and cycling, and more transportation barriers.[13–15] Research evidence suggests that children and adolescents of less densely populated communities are less likely to participate in organized sports, especially in more diverse activities, than their urban counterparts,[16] whereas other studies have found no significant association between youth's PA and neighborhood characteristics.[17] Therefore, there is a need for more comprehensive studies to investigate these influences in suburban and low-density communities, as these settings may present unique challenges and opportunities for well-being and mental health promotion in young people.[15]

Furthermore, a lack of comprehension also exists regarding the impact of certain moderating factors on youth participation in sports and how these elements interact to affect the well-being of adolescents.[18] As society continues to recognize the importance of active lifestyles for maintaining health across all age groups, particularly at earlier stages of life, understanding these associations becomes increasingly important for public health initiatives aimed at encouraging greater involvement of youth in organized sports activities. Therefore, the present study aimed to investigate the associations between PA, organized sports participation, and the perception of well-being in a sample of adolescents living in suburban and low-density communities, controlling for potential confounders (i.e., sex, age and schools' geographic context). It was hypothesised that: i) adolescents involved in organized sports would be more physically active; and ii) more physically active adolescents and sports participants would report higher levels of well-being.

2. METHODS

2.1. Participants and study design

Participants were recruited under the scope of the project PMBH-2024 "Portuguese Midlands Behavioral Health", which aims to assess the behavioral lifestyle and health markers of Portuguese youth, and their association with pediatric obesity. The sampling design for this cross-sectional study, conducted in 2024, is similar to previous scientific projects.[19] The current study sample included 245 adolescents (114 girls and 131 boys), aged between 12 and 17 years (M= 14.20; SD= 1.09), recruited from two public schools located in Coimbra (n= 101) and Viseu (n= 144) districts. These schools were located in non-urban, low-density communities, classified as areas of residence with fewer than 500 inhabitants/km^2 or less than 50,000 inhabitants.[20] For the accelerometer analysis, data were collected from a subsample of 78 adolescents. However, nine of these youths (11.5%) failed to provide adequate accelerometry data (≥ 10 hours of registered time on the measured days). Therefore, the final accelerometer subsample included 69 adolescents (34 girls and 35 boys) with a mean age of 13.86 years (SD= 0.96).

This study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the Institutional Ethics Committee (CE/FCDEF-UC/00092024) and the Portuguese Directorate-General for Education (Study Registration No 1472300001/MIME) before data collection. Additionally, approval was provided by the head of each school, and informed written consent was obtained from parents or guardians.

2.2. Instruments

2.2.1. Physical activity

The PA assessment included a multi-method approach, utilizing a self-report questionnaire and accelerometry, which objectively measured the adolescents' activity for 7 consecutive days using a w*GT3X-BT Actigraph* accelerometer (ActiGraph LLC, Pensacola, FL, USA).

Self-report instruments

The PA levels were assessed through the PACE+ two-item questionnaire.[21] Adolescents reported the number of days they were physically active at a moderate to vigorous intensity level, in the last week and a typical week. An average value of the two items represented the number of days per week that adolescents accumulated 60 or more minutes of moderate to vigorous physical activity. Compliance with MVPA recommendations was determined by creating a binary variable for those adolescents who met (≥ 5 days) or not (< 5 days) the physical activity guidelines for health.[22] In this study, a moderate correlation was observed between the PACE+ score and the MVPA levels measured through accelerometery (r= 0.36, p< 0.01). Adolescents were also asked to indicate their average time (in minutes) spent in moderate to vigorous physical activity, during a typical weekday and a weekend day.

wGT3X-BT Actigraph accelerometer

Adolescents were instructed to use the tri-axial accelerometer over the hip with an elastic belt above the right anterior superior iliac spine. The filtered acceleration signal was digitized, and the magnitude was summed over a user-specified period (an epoch interval), set at 5 seconds, as in other studies of children, which has been shown to be more accurate for the assessment of the spontaneous and intermittent activities of young people. Accelerometer data were electronically downloaded using ActiLife 6 software. Non-wear time was defined as periods of at least 20 consecutive minutes of zero counts. After removing sequences of 20 or more consecutive zero counts, interruptions up to 2 minutes were allowed. Days in which participants did not complete a minimum of 600 minutes of accelerometer data were excluded from subsequent analyses. Data processing and inclusion criteria were the same as in a previous study.[1] For pediatric individuals, accelerometer output was interpreted using intensity-based cut-points, which categorizes activity counts as sedentary, light, moderate, or vigorous PA. In this study, only light and MVPA levels were considered and analyzed.

Table 1. Descriptive statistics for the self-reported and accelerometer-measured physical activity levels, for the total sample and separately for boys and girls

Variables	Total sample *M* ± *SD*	Boys *M* ± *SD*	Girls *M* ± *SD*
Self-report			
MVPA levels (days/week)	3.48 ± 1.69	4.08 ± 1.68	2.79 ± 1.42
MVPA on weekdays (min/day)	94.72 ± 100.22	110.57 ± 106.09	76.33 ± 89.94
MVPA on weekend days (min/day)	67.81 ± 77.68	85.49 ± 91.29	47.09 ± 50.90
Accelerometry			
Light PA on weekdays (min/day)	166.96 ± 44.80	174.46 ± 45.71	159.25 ± 43.15
Light PA on weekend days (min/day)	144.56 ± 48.37	154.77 ± 46.32	134.05 ± 48.38
MVPA on weekdays (min/day)	54.09 ± 23.14	59.67 ± 26.20	48.36 ± 18.15
MVPA on weekend days (min/day)	42.24 ± 26.98	45.37 ± 28.14	39.02 ± 25.75

Table 2. Descriptive statistics for the well-being dimensions, according to the MVPA compliance.

Variables	Meeting the MVPA guidelines *M* ± *SD*	Not meeting the MVPA guidelines *M* ± *SD*
Emotional well-being (MHC-SF)	12.03 ± 2.33	11.03 ± 3.02
Social well-being (MHC-SF)	16.33 ± 5.43	13.25 ± 5.69
Psychological well-being (MHC-SF)	21.50 ± 5.03	18.24 ± 6.27
Total well-being (MHC-SF)	49.61 ± 11.49	42.70 ± 13.31
Physical well-being (KIDSCREEN)	20.42 ± 3.12	16.72 ± 3.84

2.2.2.

Sports participation

Adolescents responded to three questions that measured organized sports participation (yes or no), type of sport (individual or team) and volume of practice (number of training hours per week).

2.2.3.

Mental well-being

A validated Portuguese version of the Mental Health Continuum-Short Form (MHC-SF) was used to assess adolescents' well-being.[23] The MHC-SF includes 14 items that measure emotional (3 items), social (5 items), and psychological well-being (6 items). A total score of well-being was computed by summing all 14 items. These items were rated on a six-point Likert scale, ranging from 0 (never) to 5 (every day), depending on the frequency of well-being symptoms in the last month. The scores for each dimension were calculated by summing all items in each dimension. Omega reliability values indicated good internal consistency for all dimensions, namely, emotional well-being (ω= 0.83), social well-being (ω= 0.84), psychological well-being (ω= 0.81) and total well-being (ω= 0.92).

Physical well-being was measured using the Portuguese version of the KIDSCREEN-27 questionnaire.[24] This dimension includes five items rated on a five-point Likert scale, summed to provide a total score. Higher scores indicate better physical well-being. Internal consistency analysis revealed good reliability (ω= 0.87).

2.3.

Statistical Analyses

The data set was initially inspected for input errors or outliers. Descriptive statistics included means, standard deviations (SD), frequencies and percentages (%). The subscales' internal consistency (reliability) was estimated using McDonald's omega coefficients.

The chi-square test was employed to compare proportions between variables. The analysis of covariance (ANCOVA) was used to examine the differences between groups (sex, MVPA compliance and sports participation) on physical activity and well-being levels, while controlling for certain factors (sex, chronological age and school of origin). Estimates of effect size (partial eta squared: η^2) were used to interpret the magnitude of the differences between groups, according to the following cutoffs: small (η^2 > 0.01), medium (η^2 > 0.06) or large (η^2 > 0.14). Pearson's correlations were used to examine the relationships between sports, MVPA and well-being variables.

McDonald's omega coefficients were calculated using JASP software (JASP Team 2024, version 0.19). The remaining analyses were conducted using IBM SPSS Statistics for Windows, version 27 (IBM Corp., Armonk, NY, USA). The level of statistical significance was set at 5%.

3.

RESULTS

Table 1 presents the mean and *SD* for self-reported and accelerometer-measured physical activity levels for the total sample, as well as separately for boys and girls. The accelerometer subsample included 69 adolescents (34 girls and 35 boys).

ANCOVA analysis, controlling for chronological age and schools' context, indicated that boys reported significantly higher MVPA levels (p< 0.001, η^2= 0.15) than girls, as well as MVPA on weekdays (p= 0.009, η^2= 0.03) and MVPA at the weekend (p< 0.001, η^2= 0.06). Additionally, results showed that boys were more active than girls (p< 0.023, η^2= 0.08), in terms of MVPA during weekdays. No other significant differences were observed between boys and girls for the remaining physical activity categories.

About 32% of the adolescents of the present study (62 boys and 16 girls) achieved the minimum recommended MVPA guidelines ≥ 5 days per week. The descriptive statistics (means and *SD*) for the well-being dimensions according to compliance (or not) with the MVPA recommendations are presented in Table 2.

ANCOVA analysis, controlling for sex, chronological age and schools, indicated that MVPA compliance had significant small to

Table 3. Descriptive statistics for sports participation variables, for the total sample and separately for boys and girls.

Variables	Total sample	Boys	Girls
Sports participation			
Yes (%)	89 (36.3%)	55 (42.0%)	34 (29.8%)
No (%)	156 (63.7%)	76 (58.0%)	80 (70.2%)
Type of sports			
Team (%)	62 (69.7%)	40 (72.7%)	22 (64.7%)
Individual (%)	27 (30.3%)	15 (27.3%)	12 (35.3%)
Weekly volume of practice (min)	286.85 ± 152.46	272.00 ± 135.05	310.88 ± 176.56

Note Continuous values presented as mean ± SD and frequency data in percentage values

Table 4. Descriptive statistics for the self-reported and accelerometer-measured physical activity levels, according to the types of sports participation.

Variables	Participation in team sports *M* ± *SD*	Participation in individual sports *M* ± *SD*	Non-sport participation *M* ± *SD*
Self-report			
MVPA levels (days/week)	4.37 ± 1.36	4.06 ± 1.46	3.02 ± 1.68
MVPA on weekdays (min/day)	136.08 ± 108.22	112.59 ± 112.16	74.81 ± 88.98
MVPA on weekend days (min/day)	91.13 ± 75.02	65.44 ± 50.55	58.71 ± 81.06
Accelerometry			
Light PA on weekdays (min/day)	162.61 ± 46.39	175.69 ± 48.55	166.76 ± 44.29
Light PA on weekend days (min/day)	160.06 ± 54.15	128.62 ± 44.01	142.19 ± 46.56
MVPA on weekdays (min/day)	46.79 ± 24.05	67.73 ± 29.74	53.96 ± 20.54
MVPA on weekend days (min/day)	49.85 ± 38.03	33.63 ± 25.17	41.23 ± 22.15

moderate effects on social (p= 0.006, η^2= 0.03), psychological (p= 0.005, η^2= 0.03), total (p= 0.012, η^2= 0.03) and physical well-being (p< 0.001, η^2= 0.11), with more physically active adolescents reporting higher levels in these well-being dimensions.

Regarding sports participation, about 36% of the sample (89 adolescents) reported being engaged in organized sports (62 in team sports and 27 in individual sports). The descriptive statistics (frequencies, means and *SD*) of the sports participation variables for the total sample and separately for boys and girls are presented in Table 3.

Chi-square analysis indicated that significantly more boys than girls reported involvement in organized sports participation ($\chi^2_{(1)}$= 3.90, p= 0.048). However, no significant differences were observed for the different types of sports (p= 0.424) and the weekly volume of practice (p= 0.259), when compared by sex.

The mean scores (and *SD*) of the self-reported and accelerometer-measured PA levels are presented in Table 4, according to the types of organized sports participation. Of note, the accelerometer subsample included 69 adolescents (44 non-sport, 16 team, and 9 individual participants).

ANCOVA analysis, controlling for sex, chronological age and schools, indicated that the sports participation variable had large to moderate effects on MVPA levels (p< 0.001, η^2= 0.12) and MVPA during weekdays (p< 0.001, η^2= 0.06). Bonferroni pairwise comparisons showed that team sport participants reported significantly higher MVPA levels (p< 0.001) and MVPA during weekdays (p< 0.001) than their non-sport participant counterparts, who reported lower levels of MVPA during weekdays than their individual sport participation peers (p= 0.006). No other significant differences were observed between sports and non-sports participants for the remaining physical activity categories.

Table 5 presents the descriptive statistics (means and *SD*) for the well-being dimensions according to the different types of sports.

After controlling for sex, chronological age and schools, results indicated that the sports participation variable had a significant moderate effect on physical well-being (p< 0.001, η^2= 0.06). Specifically, Bonferroni pairwise comparisons showed that team sport participants reported significantly higher levels of physical well-being (p< 0.001) than non-sport participants. No other significant effects were observed on well-being dimensions.

Table 6 presents the partial correlation coefficients between sports/physical activity levels and the well-being dimensions, controlling for sex, chronological age and schools.

Findings revealed that the physical well-being dimension was positively associated with all self-reported sports/physical activity levels and with MVPA during the weekdays, as measured by accelerometry. Moreover, self-reported MVPA levels were also positively associated with the social, psychological and total well-being dimensions, although the correlation coefficients were somewhat smaller.

4.

DISCUSSION

Despite the health benefits of PA and sports participation during adolescence, there is limited evidence about these associations and effects in adolescents living in suburban and low-density communities, which may restrict access and opportunities for some types of spontaneous PA and organized sports. The main findings of

Table 5. Descriptive statistics for the well-being dimensions, according to the types of sports participation.

Variables	Participation in team sports *M* ± *SD*	Participation in individual sports *M* ± *SD*	Non-sport participation *M* ± *SD*
Emotional well-being (MHC-SF)	11.66 ± 2.50	11.30 ± 2.55	11.23 ± 3.03
Social well-being (MHC-SF)	15.40 ± 5.60	14.82 ± 4.81	13.68 ± 5.95
Psychological well-being (MHC-SF)	19.60 ± 6.00	19.48 ± 5.34	19.14 ± 6.27
Total well-being (MHC-SF)	46.81 ± 12.74	45.59 ± 11.10	44.05 ± 13.61
Physical well-being (KIDSCREEN)	19.74 ± 3.41	18.59 ± 3.63	17.05 ± 4.05

Table 6. Correlation coefficients between sports/physical activity levels and well-being dimensions.

Variables	EWB	SWB	PWB	TWB	PhWB
Self-report					
Weekly volume of SP (min)	0.01	0.10	0.01	0.05	0.31**
MVPA levels (days/week)	0.11	0.19**	0.20**	0.20**	0.41**
MVPA on weekdays (min)	0.10	0.17*	0.11	0.15*	0.23**
MVPA on weekend days (min)	0.09	0.16*	0.17*	0.17*	0.19**
Accelerometry					
Light PA on weekdays (min)	0.03	0.16	−0.01	0.09	0.19
Light PA on weekend days (min)	0.08	0.04	−0.13	−0.02	0.06
MVPA on weekdays (min)	0.00	0.15	0.18	0.13	0.29*
MVPA on weekend days (min)	0.14	0.05	0.02	0.08	0.22

Note SP = Sports participation; EWB = emotional well-being, SWB = social well-being, PWB = psychological well-being, TWB = total well-being and PhWB = physical well-being.

* $p < 0.05$

** $p < 0.01$

this study showed that self-reported MVPA and sports participation were positively associated with some well-being dimensions, particularly with physical well-being. Moreover, physical well-being was also positively associated with MVPA levels during weekdays, as measured by accelerometry. These results add to the growing evidence on the effects of MVPA and sports participation on well-being,[4,7,9,15] by providing context-specific findings for adolescents residing in suburban and low-density communities.

Regarding the influence of PA on well-being, the results of the present study suggest that compliance with MVPA recommendations during adolescence contributes to better physical and psychosocial well-being, which is in line with previous studies.[4–6] Notably, both self-reported and accelerometer-measured MVPA showed the most substantial effects on physical well-being, which translates into a better general state of physical health and fitness. This evidence supports previous research findings based on self-report,[25] accelerometer data,[26] or both,[27] suggesting that the direct positive outcomes from PA are primarily achieved through better physical fitness and health perceptions, rather than on emotional or psychosocial outcomes. This finding is particularly significant in this sample of adolescents, as youth populations living in suburban and low-density communities are known to face more emotional and mental health difficulties[28] and they have less availability of sports facilities and accessibility to parks, sidewalks, recreational facilities, and organized sport,[13–16] although this evidence is somewhat not consensual.[29] Previous studies have also suggested the need for a more in-depth understanding and identification of potential mediators and moderators of the relationship between PA and mental health,[30,31] which may vary according to different social and neighborhood contexts.[32] Therefore, future studies are needed to examine the complex interplay between urbanization, urbanicity and socioeconomic status on physical activity and sports participation in youth, and consequently, its effects on distinct dimensions of well-being.

A finding of particular interest of this study was that team sports participation only had a moderate effect on adolescents' levels of physical well-being, compared to non-sport participants. On one hand, previous research has suggested that the effects of youth sports and PA on well-being and mental health dimensions are better explained by physical or body-related mediating factors, such as body image satisfaction, physical health, or physical self-worth,[6,31] which lead to more positive feedback and evaluation by peers and significant others, as well as lower social-appearance anxiety.[30] On the other hand, and contrary to previous research,[3,4,10] youth's participation in team (and individual) sports showed no positive association with social well-being. This suggests that the social opportunities, experiences and interactions perceived by these adolescents during sports activities are not fostering a sense of belonging, connection and community, as hypothesized. Therefore, more studies are also needed to further examine the associations between youth sports participation and psychosocial well-being, considering potential mediators (social support, social connections and sense of belonging) and moderators (urbanization, urbanicity and socioeconomic status) of this relationship.

The present study has several strengths and limitations that should be acknowledged. The major strengths of this study are

the multi-method approach used for PA assessment of adolescents and particularly the sociodemographic features of those participants who are from less studied geographic communities such as the low-density people areas of the Portuguese midlands. Second, the integrated examination of the potential factors of diverse nature (i.e. biological, behavioral, and emotional) and their different etiology related to youth sport participation should be clearly highlighted. Third, the analysis of the associations between the study variables, while controlling for sociodemographic variables (sex, chronological age and schools' context) related to PA, sports participation and well-being. One of the study's limitations is its cross-sectional design which restricts the ability to draw conclusions about causal relationships. Second, the moderate and unrepresentative sample size of this study, that may compromise the generalizability of the results to adolescents who practice sports; in fact, the external validity of a study is often affected by the size and diversity of the sample. Moreover, since adolescents come from suburban communities it is natural the concept of sport participants is somewhat reduced to the usual low diversity of activities available in those geographic settings.
5.

CONCLUSIONS

Findings of the present study revealed that adolescents who meet the MVPA recommendations reported higher levels of social and psychological well-being, after adjusting for sociodemographic variables. In addition, physical well-being was positively associated with team sport participation, volume of sports training, self-reported MVPA levels (on weekdays and at the weekend) and objectively measured MVPA on weekdays.

Specific strategies are needed to implement and promote diversity of available PA and sports opportunities for youth living in suburban and low-density communities, to avoid unhealthy lifestyles that may last into adulthood. Future scientific investigations ought to broaden the scope of their design to encompass larger samples of adolescents living in different neighborhood social and built environments, while continuing to use objective measures of PA to validate the findings of the current study.

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A.M. Machado-Rodrigues and H.M. Fernandes have given substantial contributions to the conception or the design of the manuscript; A.M. Machado-Rodrigues, F. Sobral, N. Borges and H.M. Fernandes have given substantial contributions to acquisition, analysis and interpretation of the data. All authors have participated in drafting the manuscript and revised it critically. All authors read and approved the final version of the manuscript.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

ETHICAL RESPONSABILITIES

Protection of individuals and animals: The authors declare that the conducted procedures met the ethical standards of the responsible committee on human experimentation of the World Medical Association and the Declaration of Helsinki.

Confidentiality: The authors are responsible for following the protocol established by their respective healthcare centres for accessing data from medical records for performing this type of publication in order to conduct research/dissemination for the community.

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