Profiles of physical fitness and fitness enjoyment among children: Associations with sports participation

An De Meester[1,2,3], Mohd Rozilee Wazir Norjali Wazir[4], Matthieu Lenoir[2], Farid Bardid[2,5]

[1] *Department of Physical Education, University of South Carolina, Columbia, USA*

[2] *Department of Movement and Sports Sciences, Ghent University, Ghent, Belgium*

[3] *The Policy Research Centre on Sports, Flemish Government, Brussels, Belgium*

[4] *Department of Sport Studies, University Putra Malaysia, Serdang, Malaysia*

[5] *School of Education, University of Strathclyde, Glasgow, UK*

Corresponding author: An De Meester

E-mail: demeeste@mailbox.sc.edu

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Abstract

Purpose: The present study examined whether groups of children with different physical fitness and fitness enjoyment profiles could be identified and, if so, whether the different groups varied from one another in terms of organized sports participation.

Method: Five hundred and fifty-eight 8-11-year-olds (56.99% boys) participated in this cross-sectional study. Physical fitness and fitness enjoyment were assessed with seven items from a standardized test battery and a pictorial scale containing pictures referring to the enjoyment in those seven physical fitness tests, respectively. To examine whether groups with different fitness and enjoyment profiles could be identified, we conducted cluster analyses based on children's standardized physical fitness and fitness enjoyment scores. A two-way ANOVA (sex*cluster) was conducted to investigate differences in weekly-organized sports participation among each of the identified groups while controlling for sex.

Results: Cluster analyses revealed two groups with aligned levels of physical fitness and fitness enjoyment (i.e., relatively low-low and relatively high-high) and two groups with unaligned levels (i.e., relatively low-moderate and relatively high-moderate), respectively. Both groups with relatively high fitness scores were found to spend significantly more time in organized sports (M=2.01hrs and 2.29hrs, respectively) than the two groups with relatively low fitness scores (M=1.08hrs and 0.98hrs, respectively), irrespective of their enjoyment levels.

Conclusion: Increasing physical fitness levels (especially among those children with suboptimal enjoyment levels) may lead to increased organized sports participation, while increased organized sports participation in its turn may lead to higher fitness levels. As such, participation in sports programs should be promoted in children of all age groups.

Key words: motivation, perceived joy, person-centered approach, cluster analysis, youth sport

Purpose

In many Western countries, the decreasing levels of physical activity in children, adolescents, and adults are one of the major public health challenges for the future (Guthold, Stevens, Riley, & Bull, 2018). Regular physical activity has short- and long-term physical, mental and social health benefits, including a reduced risk of overweight and obesity (World Health Organization, 2016). With these benefits in mind, numerous attempts have been made to promote physical activity, many of them in preschool or primary school children (World Health Organization, 2016). Sport is a structured form of physical activity, which is popular among children and linked to different positive psychological and social health outcomes such as higher self-esteem, better social skills, fewer depressive symptoms, higher confidence and higher competence (Eime et al., 2013). As such, understanding the factors that influence sports participation is crucial in order to encourage children to engage in physical activity and develop an active lifestyle.

In their conceptual framework, Stodden et al. (2008) describe the dynamic relationship between physical activity and other health-related factors, and how these factors interact. One of these factors is physical fitness, which refers to the capacity to carry out physical activity (Ortega et al., 2008). Physical fitness is a multi-faceted concept and involves health-related components such as cardiorespiratory endurance, muscular strength and endurance, speed and agility, and flexibility (Caspersen & Christenson, 1985). Literature has shown positive associations between physical fitness and various health-related outcomes including physical activity and motor competence (e.g., Smith et al., 2019; Utesch, Bardid, Büsch, & Strauss, 2019). Stodden and colleagues' (2008) model describes how children with higher levels of physical fitness will be more likely to participate in and maintain physical activity and develop motor skills, which will reduce the risk of unhealthy weight gain. This will in turn positively influence their levels of physical fitness, motor competence and physical activity, leading to a positive spiral of engagement in physical activity. Since the conceptual model was published (2008), numerous studies have examined and provided evidence for each of the hypothesized relationships (see Robinson et al., 2015, for a review).

As such, physical fitness can be seen as an important determinant of children's and adolescents' sports participation (Perkins et al., 2004). Yet, some children and adolescents may be physically fit, but still not continue their sports participation in the long run, particularly when their sports experiences are not inherently satisfying. In their systematic review, Crane and Temple (2015) identified a lack of enjoyment as one of the five most common constraints associated with dropout from organized sports among children and youth. These findings were confirmed in a recent longitudinal study among 327 Australian 11-15-year-old organized sports participants in which greater enjoyment in participants' main sport was inversely associated with dropout from organized sports (Gardner, Magee, & Vella, 2017).

It is therefore important to consider children's and adolescents experiences of enjoyment in relation to their participation in sports and fitness-related exercise. Enjoyment can be defined as a positive state of affect reflecting feelings of pleasure, fun and excitement (Wankel, 1993). Previous literature has shown that enjoyment is positively associated with sports participation (e.g., Bailey, Cope, & Pearce, 2013) in children and adolescents. Moreover, enjoyment is considered among the strongest predictors of physical activity in general (e.g., Lewis, Williams, Frayeh, & Marcus, 2016; Salmon, Owen, Crawford, Bauman, & Sallis, 2003) and sports participation in particular (e.g., Gardner et al., 2017). According to Deci and Ryan's Self-Determination Theory (Ryan & Deci, 2000), when individuals engage in physical activity because they experience enjoyment and satisfaction directly from participation, or when they find engagement in physical activity to be interesting or challenging, they are intrinsically motivated, with the latter reflecting the most self-determined regulation of behavior. Intrinsic motivation has been shown to be positively associated with physical activity (e.g., De Meester et al., 2016). Enjoyment can thus be seen as one of the key factors in motivation for and participation in physical activity. As noted by Barnett, Ridker, Okechukwu, and Gortmaker (2019), enjoyment should be considered in health interventions as it is positively related to physical activity. However, despite its positive relationship with physical activity (Barnett et al., 2019), little is known on how enjoyment is related to other factors influencing physical activity such as physical fitness (but see Eberline, Judge, Walsh, & Hensley [2018] and Gao [2008] for two exceptions). Eberline and colleagues (2018) found moderate to strong associations (ranging from 0.36 to 0.56) between various components of enjoyment (i.e., children's liking of exercise, liking of games and sports, and fun of physical exertion) and the PACER fitness test in a sample of 42 fifth graders from a school in a rural community in the Midwestern United States. Gao's (2008) study among 307 middle school students from a school in a southeastern state of the Unites States revealed a weak correlation between enjoyment for physical education and cardiorespiratory fitness. However, enjoyment for physical education was not found to be a significant predictor of cardiorespiratory fitness. Furthermore, most previous studies exploring the role of enjoyment in a physical activity context (e.g., Eberline et al., 2018) used a variable-centered approach which only provides information on the strength of the associations between variables (Magnusson, 1988). To our knowledge, no previous studies focusing on enjoyment applied a person-centered approach, which enables the identification of groups of children who share certain attributes or relations among attributes (in this case physical fitness and enjoyment; Magnusson, 1988). Such an approach is considered to be a prominent way to analyze data that relate to the notion of physical literacy (Cairney et al., 2019) as it can provide insight into the association between physical fitness and enjoyment at the individual level, as well as their collective association with sports participation. For example, a recent study by Estevan and colleagues (2019) among Spanish elementary school children used a person-centered approach to identify groups of children with similar levels of physical fitness, actual motor competence, and perceived motor competence and found that the group scoring relatively high on all three variables had the highest self-reported physical activity of the four identified groups. This study did apply a person-centered approach, however, it did not take the children's enjoyment levels into account. Furthermore, while other previous studies have examined associations between either enjoyment and fitness (e.g., Eberline et al., 2018; Gao, 2008), enjoyment and organized sports participation (e.g., Gardner, Magee, & Vella, 2017), or fitness and organized sports participation (e.g., Silva et al., 2013), no studies to date have simultaneously explored associations between all three constructs. As such, the present study will add to the currently existing literature by relying on a person-centered approach to (1) explore whether different fitness-fitness enjoyment based profiles exist among primary school children; and (2) investigate whether there are differences in organized sports participation between children with different profiles. We hypothesized that different profiles could be identified with the majority of children having corresponding levels of fitness and fitness enjoyment (i.e., relatively high-high or low-low; Eberline et al., 2018) and a minority of children having contrasting levels (i.e., relatively high-low or low-high; Gao, 2008). Furthermore, it was hypothesized that children with a profile with relatively high levels of physical fitness and/or fitness enjoyment would demonstrate higher levels of sports participation than children with a profile with relatively low levels of physical fitness and/or fitness enjoyment (Silva et al., 2013, and Gardner et al., 2017, respectively).

Methods

Participants and procedure

Twenty-one elementary schools in the Ghent area in Flanders, the northern part of Belgium, were contacted through the schools' principals. Eight principals agreed to participate with their school in the current study. Subsequently, all 8- to 12-year-old students in the school and their parents received an information letter. Consent to participate was obtained from all but seven students (response rate = 98.8%), resulting in a final sample of 558 students (318 boys; 56.99%) with a mean age of 10.15 years (SD = 1.06, range 78.17-12.00 years) and their parents. All measurements were conducted in 2017 by a team of researchers during school hours. Children's physical fitness levels, fitness enjoyment, and sports participation was measured with a physical fitness test battery, a pictorial scale and a questionnaire, respectively. Children were given the opportunity to ask questions for clarification when necessary. The current study was approved by the Ethical Committee of the Ghent University Hospital.

Measures

Physical fitness

Participants' physical fitness was assessed with seven tests (see below for a description of each test) from a standardized test battery (Vandorpe et al., 2012) in the physical education hall of the participating schools. Validity and reliability of each of the tests is very high (Vandorpe et al., 2012). At any given time, instruction and demonstration were standardized according to the test guidelines. The children performed four tests barefooted (i.e., the sit-and-reach test, sit-ups, knee push-ups, and the standing broad jump) to ensure uniformity of test conditions. The hand grip test, shuttle run and the endurance shuttle run test were all performed with running shoes for safety reasons.

Flexibility of the trunk and upper legs was assessed by the sit-and-reach (best of two attempts) test of the Eurofit test battery (Council of Europe, 1988) with an accuracy of 0.5 cm. The most distant point reached with the fingertips was used in our analyses as a measurement of flexibility. Abdominal strength was determined through the performance of sit-ups (one attempt) according to the Bruininks-Oseretsky Test of Motor Proficiency, Second Edition manual (BOT-2; Bruininks & Bruininks, 2005), requiring the participants to execute as many sit-ups as possible in 30 seconds. The number of correctly performed executed sit-ups (i.e., lifting back and arms off the floor and reaching for the knees with hands) was used in our analyses as a measurement of abdominal strength. Functional arm strength was measured by knee push-ups (one attempt) according to the BOT-2 procedures and requiring them to do as many push-ups as possible in 30 seconds. The number of correctly performed knee push-ups (i.e., bending arms with straight back and legs crossed and lowering body until nearly touching the floor) was used for further analysis. Static strength was measured in kg by means of a maximal handgrip test (best of two attempts; Council of Europe, 1988). The maximally produced strength was used in our analyses as a measurement of static strength. To estimate explosive strength, the standing broad jump as described in the Eurofit test battery was performed (Council of Europe, 1988) and the best score (i.e., distance) of two jumps was used for further analysis (0.1 cm). Agility and speed was determined with the 10x5m shuttle run (one attempt) according to Eurofit test (Council of Europe, 1988). The fastest time to complete the 10x5m shuttle run was used for further analysis. Cardiovascular endurance was obtained using the 20-m endurance shuttle run test (0.5 min; Council of Europe, 1988). Children had to run back and forth between two lines 20 meters apart, at a speed that was imposed by means of beep signals. As the test progressed, the time provided to reach the other side gradually decreased, requiring the children to run faster and faster. Failure to cross the other line before or on the beep was only allowed once. The time upon the second failure to cross the other line before or on the beep was used in our analyses as a measurement of cardiovascular endurance.

Fitness enjoyment

The participants' fitness enjoyment was measured by means of an online pictorial scale containing seven drawings of a child performing each of the seven physical fitness tests described above. For each of the seven drawings, participants were asked "how much do you like the activity presented in this picture?" after which they indicated their answers on a scale for 0 (not at all) to 10 (very much). Researchers were present during the test to answer any questions participants might have to ensure that drawings were interpreted correctly. The pictorial scale was face and content validated by a team of four motor development experts. The reliability was measured with a test-retest of 34 participants. The obtained intraclass correlations (ICC) were moderate to high according to the criteria of Streiner, Norman and Cairney (2014): flexibility (ICC = 0.436); abdominal strength (ICC = 0.588); functional strength (ICC = 0.456); static strength (ICC = 0.679); explosive strength (ICC = 0.692); speed and agility (ICC = 0.656); cardiovascular endurance (ICC = 0.789). The scale also has good internal consistency ($\alpha = 0.714$).

Sports participation

Children's weekly participation in organized sports was assessed with an adapted form of the Flemish Physical Activity Questionnaire, a reliable and valid instrument to measure different dimensions of physical activity in children (Philippaerts et al., 2006). The specific measurement of weekly organized sports participation within the Flemish Physical Activity Questionnaire shows good test- retest reliability ($r = 0.74$) and acceptable concurrent validity ($r = 0.52$ with objectively measured physical activity as measured by accelerometers in a sample of 33 Flemish 12-18-year-olds). Children were first asked whether or not they participated in organized sports. Children who did participate in organized sports were then asked how much time (per week) they usually engaged in organized sports.

Analyses

First, we calculated the descriptives for all the variables and examined the correlations among each of the variables. To examine whether groups with different profiles in relation to physical fitness and fitness enjoyment could be identified, we conducted cluster analyses based on standardized z-scores of children's performance on and fitness enjoyment of seven fitness skills. In a preliminary step, percentile scores were computed for each of the seven physical fitness tests (and inverted for the 10x5m shuttle run as a lower time indicates a better performance on this test) and each of the seven fitness enjoyment measurements. The obtained percentile scores were then used to compute a composite score for general physical fitness and for general fitness enjoyment, respectively. After standardizing both composite scores, we checked for univariate (values of more than three standard deviations above or below the mean) and multivariate outliers as identified using the Mahalanobis distance measure (Mahalanobis, 1936) as they can significantly perturb cluster solutions (Gore, 2000). Univariate outliers were not found. However, we identified and subsequently removed seven multivariate outliers, resulting in a final sample of 549 children.

A cluster analysis was then conducted by means of a two-step procedure (Gore, 2000). In the first step, Ward's hierarchical clustering method (Everitt et al., 2001) was used to conduct a hierarchical cluster analysis based on squared Euclidian distances to identify initial cluster centers. We considered three-, four-, and five-cluster solutions and inspected the percentage of explained variance in physical fitness and fitness enjoyment in each cluster solution. In the four- and five-cluster solutions, the explained variance in both physical fitness and fitness enjoyment was at least 50%. However, in the three-cluster solution the explained variance in fitness enjoyment was only 47.3%. As such, only the four- and five-cluster solutions were retained for further analyses. In the second step, the cluster centers were used as non-random initial cluster centers in an iterative, non-hierarchical k-means clustering procedure (Asendorpf et al., 2001) and the resulting cluster solutions were evaluated based on interpretability and parsimony. We conducted a double-split cross-validation procedure to check the stability of both cluster solutions (Breckenridge, 2000). After randomly splitting the total sample into two equal subsamples and repeating the entire two-step procedure (Ward and k-means) in both subsamples, the participants in each subsample were assigned to new clusters based on their Euclidean distances to the cluster centers of the other subsample. These newly formed clusters were then compared for agreement with the original clusters by computing Cohen's kappa (K). The two resulting kappa's for each of the cluster solutions were averaged, resulting in a kappa of .93 for the four-cluster solution (i.e., very good stability and replicability; Mahalanobis, 1936) and .71 for the five-cluster solution (i.e., good stability and replicability; Mahalanobis, 1936) respectively. Since the four-cluster solution scored better on stability and replicability than the five-cluster solution and explained 66.0% and 71.2% of the variance in physical fitness and fitness enjoyment, respectively, the four-cluster solution (Figure 1) was considered the best fit for further interpretation. To define each of the four clusters, standardized mean scores of both physical fitness and fitness enjoyment were inspected. Furthermore, we conducted a one-way MANOVA to examine whether the clusters, as intended, differed from each other in terms of relative values of the input variables, being physical fitness and fitness enjoyment.

To investigate differences in weekly-organized sports participation among each of the clusters while taking sex and age into account, a two-way ANOVA (sex*cluster) controlled for age was conducted. Scheffe post hoc analyses were then applied to identify significant differences between clusters. All statistical analyses were conducted in IBM SPSS Statistics 22.0. Statistical significance was set at $p < .05$.

[insert Figure 1 here]

Results

Descriptives

Table 1 provides an overview of the means and standard deviations of the participants' physical fitness, fitness enjoyment, weekly-organized sports participation, and age along with the correlation coefficients among each of the study variables**.**

[insert Table 1 here]

Table 2 shows the means and standard deviations of the actual physical fitness scores and the fitness enjoyment scores, as well as the Pearson correlations among each of the seven physical fitness test scores and the corresponding enyoyment scores.

[insert Table 2 here]

Identifying clusters

As shown in Figure 1, four approximately equal clusters were identified. The clusters were labelled based on their relative scores (i.e., in comparison to the study sample) for physical fitness (low, moderate, high) and fitness enjoyment (low, moderate, high), respectively. The first cluster (n=133; 24.2%) was characterized by children who, in comparison to children belonging to the other clusters, scored low on physical fitness and low on fitness enjoyment. This cluster was labelled the ‘low-low’ cluster. The second cluster (n=151; 27.5%) comprised children who had relatively low scores on physical fitness but relatively moderate scores on fitness enjoyment and was consequently labelled the ‘low-moderate’ cluster. Children in the third cluster (n=142; 25.9%) had relatively high scores on physical fitness but relatively moderate scores on fitness enjoyment. This cluster was labelled the ‘high-moderate’ cluster. The fourth and final cluster (n=123; 22.4%) was characterized by children who had relatively high levels of both physical fitness and fitness enjoyment and was labelled the ‘high-high’ cluster. Chi-square analyses, $\chi 2(3)=51.80$, $p<.001$, revealed an overrepresentation of girls (38.3% boys vs. 61.7% girls) in the ‘low-low’ cluster, while boys were overrepresented (82.1% boys vs. 17.9% girls) in the ‘high-high’ cluster. A more proportionate sex representation was found within the ‘low-moderate’ (53.6% boys vs. 56.4% girls) and the ‘high-moderate’ cluster (59.9% boys vs. 40.1% girls).

As intended by performing cluster analyses, there was a statistically significant difference in physical fitness and fitness enjoyment based on a cluster classification, $F(6, 1088)=412.68$, $p<.001$; Wilk's $\Lambda=0.09$, partial $\eta 2 = .70$. Sheffe post hoc analyses revealed that the ‘low-low’ ($M=35.65$; $SD=12.26$) and the ‘low-moderate’ ($M=36.67$; $SD=9.58$) clusters had significantly lower average percentile scores for physical fitness than both the ‘high-moderate’ ($M=65.71$; $SD=10.02$) and the ‘high-high’ cluster ($M=63.88$; $SD=10.76$; $F[3, 545]=331.43$, $p<0.001$, $\eta 2=0.65$). All four clusters differed from each other in terms of fitness enjoyment ($F[3, 545]=599.09$, $p<0.001$, $\eta 2=0.77$). More specifically, the ‘high-high’ cluster had the highest mean percentile score ($M=72.03$; $SD=7.23$), followed by the ‘low-moderate’ cluster ($M=54.81$; $SD=46.65$), the ‘high-moderate’ cluster ($M=46.65$; $SD=9.45$) and the ‘low-low’ cluster ($M=29.14$; $SD=7.57$), respectively (see Table 3).

[insert Table 3 here]

Differences among clusters in terms of weekly-organized sports participation

The two-way ANOVA (sex*cluster) controlled for age yielded significant main effects for sex (F[1, 345]=9.23, p=0.002, partial η^2=0.02), cluster (F[3, 545]=8.41, p<0.001, partial η^2=0.05) and age (F[1, 545]=6.25, p=0.013, partial η^2=0.01). The interaction effect (sex*cluster) was not significant (F[3, 545]=1.57, p=0.195, partial η^2=0.01). Weekly time spent in organized sports participation was significantly higher for boys (M=1.86 hours per week; SD=2.05) than for girls (M=1.16; SD=1.60) and children in the 'low-low' cluster (M=1.08; SD=1.34) and the 'low-moderate' cluster (M=0.98; SD=1.36) participated significantly less in organized sports than children in the 'high-moderate' (M=2.01; SD=2.07) and the 'high-high' cluster (M=2.29; SD=2.37; see Table 3). Children in the 'low-low' cluster (M=9.94; SD=1.07) and the 'low-moderate' cluster (M=9.83; SD=0.98) were also significantly younger than children in the 'high-moderate' (M=10.52; SD=1.02) and the 'high-high' cluster (M=10.32; SD=1.02).

Discussion

The main objectives of this study were to explore how children with different fitness-fitness enjoyment based profiles differed in weekly organized sports participation using a person-centered approach. Our study identified four, approximately equal-sized, profiles with different patterns between physical fitness and fitness enjoyment. In line with our hypothesis (Eberline et al, 2018), we identified two groups of children with corresponding levels of fitness and fitness enjoyment (i.e., one group with relatively high scores on both and one group with relatively low scores on both). Interestingly, the vast majority of children scoring high on both fitness and fitness enjoyment were boys (i.e., 82%) while the group of children scoring low on both constructs were mainly girls (i.e., 61%). Furthermore, we also identified a group of children with relatively low scores in physical fitness but relatively moderate scores in fitness enjoyment, and a group of children with relatively high physical fitness scores but relatively moderate fitness enjoyment scores. These results indicate that fitness enjoyment levels in fitness-related exercises and actual physical fitness levels, although overall positively related, are not directly proportional in all children. These findings shine a new light on the results of previous studies that revealed positive correlations between children's and young adolescents' enjoyment for physical activity or physical education (measured by the degree to which participants liked exercising and enjoyed physical exertion in Eberline et al., 2018; and measured with a subscale of the Intrinsic Motivational Inventory in Gao, 2008, respectively) and their cardiorespiratory fitness (measured with the PACER in both studies). Indeed, although most of the correlations in our study were positive and significant, the absolute values of the correlation coefficients indicate that the explained variance was between 2% and 18%, which is small to moderate (Cohen, 1988). It appears that variable-centered studies mask a significant amount of within-subject variability in these profiles, which might hamper the development of successful interventions that lead to a healthier lifestyle. It remains unclear how children with corresponding levels of fitness and fitness enjoyment may differ from those with divergent levels. We did not find any evidence for age-, school-, or sports type-related differences in the current sample. It is recommend for future studies to further explore the potential impact of individual factors (e.g., weight status and self-perception) and environmental factors (e.g., psychological need support and socio-economic background) in the relationship between fitness and fitness enjoyment.

Our results also show significant differences among the groups with different fitness-enjoyment based profiles in terms of weekly time spent in organized sports, even when controlling for sex and age. In line with our hypothesis (Silva et al., 2013; Gardner, Magee, & Vella, 2017), children with relatively high levels of both physical fitness and enjoyment were found to spend significantly more time in organized sports than their peers with relatively low levels of both. Furthermore, we found that within the group of children with relatively moderate levels of enjoyment, those with higher physical fitness levels participated more in organized sports than those with lower physical fitness levels. This shows that, among children who moderately enjoy fitness-related exercise, actual physical fitness may be a decisive factor for (the degree of) participation in organized sports. Given the cross-sectional design of the current study, it is also possible that organized sports participation may lead to increased physical fitness levels but not necessarily to a greater enjoyment of fitness-related exercise. Either way, the current findings provide further evidence for the reciprocal and positive relationship between physical fitness and organized sports participation in children and young adolescents in general (Agata & Monyeki, 2018; Zahner et al., 2009).

Practical implications and recommendations for future research

Based on the current study, it is highly recommended that health practitioners, physical education teachers and youth sports coaches focus on increasing children's physical fitness levels and simultaneously promoting organized sports participation. Special attention should be paid to increasing fitness levels and organized sports participation among children with low or moderate levels of enjoyment as the results indicate a positive relationship between improved physical fitness and increased sports participation within this group with sub-optimal enjoyment levels. This positive relationship could then (further) reinforce the so called positive spiral of engagement (Stodden et al., 2008) resulting in higher levels of (actual and perceived) motor competence, physical fitness, and general physical activity engagement, and a healthier body weight.

The combination of physical fitness and enjoyment seems to be an important factor in the involvement of children in organized sport. Previous studies have shown decreasing participation rates in sports with increasing age (Brettschneider & Naul, 2007). Moreover, the proportion of 15- to 19- year-old adolescents regularly participating in sports has dropped in several sports (e.g., Eime et al., 2016). As such, more research is needed to inform teaching and coaching practices, and to increase (structured and unstructured) physical activity engagement, especially as children trainsition into adolescence. Taking into account the challenges of physical activity enjoyment research in children (see Barnett et al., 2019), future studies should investigate potential individual and environmental factors associated with enjoyment and participation.

Strengths and limitations

A major strength of this study is the use of a person-centered approach, which allows us to identify profiles of physical fitness and enjoyment among children and to investigate how these profiles differ with respect to sports participation. Furthermore, we used aligned measurements of fitness performance and enjoyment (i.e., enjoyment was measured for the seven specific fitness tasks), whereas previous studies that examined associations between physical fitness and enjoyment used more general measurements of enjoyment like enjoyment for physical activity (Eberline et al., 2018) or enjoyment in physical education (Gao, 2008). Additionally, this study has a large sample size, which improves cluster reliability when conducting cluster analyses and allows generalization of the study results (Breckenridge, 2000). A limitation of this study is its cross-sectional design, which prevents us from determining any causality between physical fitness, enjoyment, and sports participation. Future studies should involve a longitudinal, interventional or experimental design to gain more insight into the direction of these relationships. Another limitation is the sole focus on organized sports participation. Associations between enjoyment and unstructured forms of physical activity should be further explored as well in future investigations, as these tend to be more self-directed (Ennis, 2017). Furthermore, whilst the pictorial fitness enjoyment scale is childfriendly and well aligned with the physical fitness measures in the present study, the psychometric properties have not been fully investigated. Despite preliminary evidence of the pictorial fitness enjoyment scale's validity (established by a team of four motor development experts) and reliability (with a good internal consistency and ICC's indicating fair to excellent agreement for each of the seven tests), more research to further validate and confirm reliability of the scale is warranted, especially considering the importance of enjoyment in youth sport participation and the potential value of this pictorial scale in practice. Finally, while the current study provided valuable insight on fitness enjoyment in children, future research should explore multiple sources of enjoyment in sports participation to further refine the design of engaging youth sports programs.

Conclusion

This study provided us with general information on the levels of physical fitness and enjoyment among primary school children. Four different groups with respect to the level of physical fitness and enjoyment were identified, with the two groups with a better score on physical fitness displaying the highest weekly time spent in organized sport. Increasing physical fitness levels (especially among those children with suboptimal enjoyment levels) may lead to increased organized sports participation, while organized sports participation in its turn may lead to higher fitness levels. As such, it is recommended that youth sports programs take physical fitness and enjoyment into consideration in order to support optimal level of participation among children, especially as they transition into adolescence. This will potentially increase autonomous motivation for sports and lead to sustained sports participation and a healthy lifestyle in later life. Given the potential positive impact that organized sports participation may have on children's fitness levels, it is crucial to promote sports programs in children of all age groups.

What Does This Article Add?

Fitness-related exercises such as curl-ups or endurance running are common in most types of sports participation. The extent to which children enjoy these exercises is linked to their physical fitness and might play a part in sustained sports participation, but has not been explored before. This study highlights that moderate and high fitness enjoyment, when combined with high levels of physical fitness, relates to higher levels of sports participation among children.

In contrast to the more traditional variable-centered approach that is based upon correlations between several variables collected in the total group, the person-centered approach used in the current study provides a direct gateway towards the development of physical activity and sports programs that are tailored to the needs of the child. Furthermore, it provides a more nuanced understanding on how physical fitness and enjoyment interact and how this affects sports participation.

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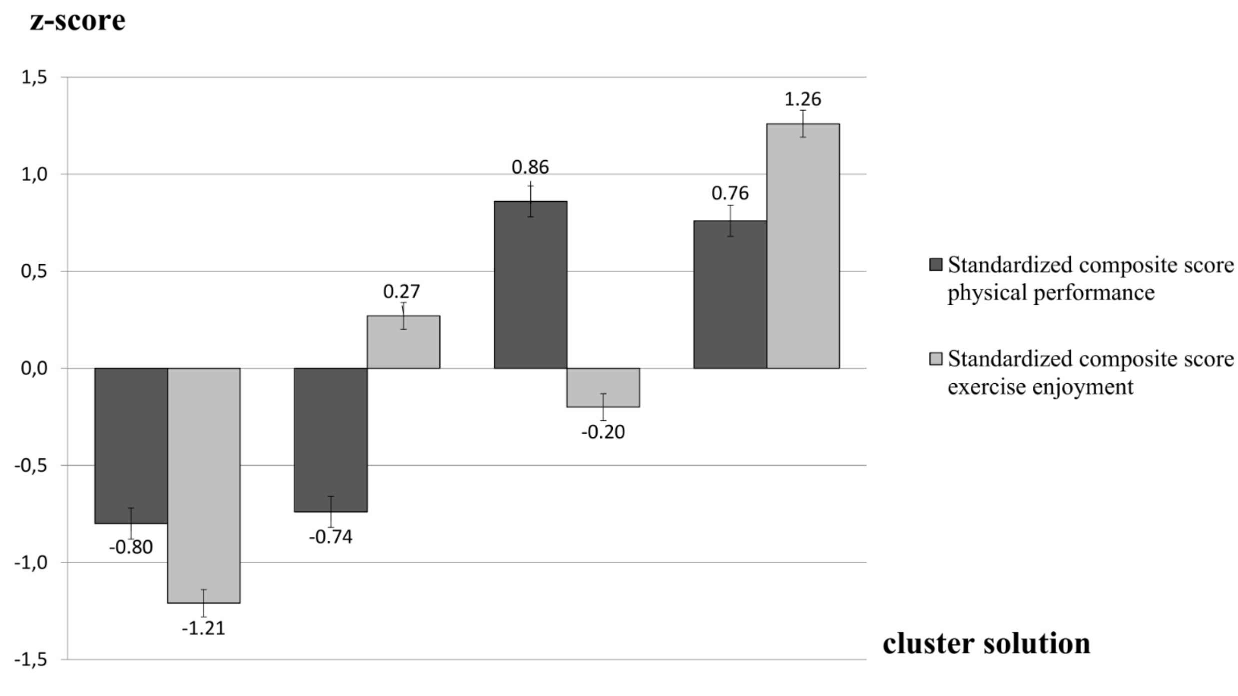

Figure 1. Four cluster solution based on z-scores for physical fitness and fitness enjoyment.

Table 1. Descriptive statistics and correlations among physical fitness, fitness enjoyment and organized sports participation.

Variables	***M***	***SD***	***Min***	***Max***	***1***	***2***	***3***
1. Physical fitness (percentile)	50.03	17.86	9.46	90.72			
2. Fitness enjoyment (percentile)	50.34	17.08	8.72	87.31	.35***		
3. Weekly organized sports participation (hours/week)	1.56	1.90	0.00	13.00	.37***	.19***	
4. Age (years)	10.14	1.06	8.17	12.00	.33***	.03	.17***

Note. N=549 (318 boys); ***p < .001.

Table 2. Descriptive statistics and correlations among the physical fitness test scores and the fitness enjoyment scores

Variables	**Physical fitness (actual score)**		**Fitness enjoyment (Scale 1-10)**		**Pearson Correlation**
	Mean	**SD**	**Mean**	**SD**	
Sit-and-reach	17.5 cm	6.7	5.5	2.7	0.223**
Sit-up	24.7 rep	7.5	6.3	2.8	0.231**
Knee push-up	21.9 rep	7.5	6.9	2.5	0.256**
Hand grip	18.0 kg	4.6	7.7	2.5	0.128**
Standing broad jump	136.8 cm	19.9	7.2	2.3	0.134**
Shuttle run	24.6 s	2.2	7.8	2.2	-0.171**
Endurance shuttle run	4.8 min	2.2	7.4	2.7	0.420**

**indicates a significant difference between groups ($p<0.01$). SD= Standard deviation

Table 3. Mean scores and cluster comparisons for the four clusters (*N*=549).

	Cluster			
	Cluster 1: Low-low	**Cluster 2: Low-moderate**	**Cluster 3: High-moderate**	**Cluster 4: High-high**
	n=133 51 boys 82 girls 24.2%	*n=151* 81 boys 70 girls 27.5%	*n=142* 85 boys 57 girls 25.9%	*n=123* 101 boys 22 girls 22.4%
Variable				
Cluster dimensions (z-scores)				
Physical fitness	-0.80 (0.68)[a]	-0.74 (0.53)[a]	0.86 (0.55)[b]	0.76 (0.60)[b]
Fitness enjoyment	-1.21 (0.44)[a]	0.27 (0.49)[b]	-0.20 (0.54)[c]	1.26 (0.42)[d]
Cluster dimensions (percentile scores)				
Physical fitness	35.65 (12.26)[a]	36.67 (9.58)[a]	65.71 (10.02)[b]	63.88 (10.76)[b]
Fitness enjoyment	29.14 (7.57)[a]	54.81 (8.44)[b]	46.65 (9.45)[c]	72.03 (7.23)[d]
Child outcomes				
Weekly organized sports participation (hrs/week)	1.08 (1.34)[a]	0.98 (1.36)[a]	2.01 (2.07)[b]	2.29(2.37)[b]

Note. Values in parentheses are standard errors. A cluster mean is significantly different from another mean if they have different superscripts. Differences between the four clusters were tested by means of post hoc analyses.