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Original Article

Differences between adolescents staying in and dropping out of organized sport: A longitudinal study

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Abstract
Problem Statement: Research show that participation in organised sport seems especially important in relation to several health factors. Unfortunately, dropout from organized sports increases during adolescence. *Approach:* Self-reported activity level and enjoyment in sports training and competitions were measured by questionnaire, and measures of weight, height and cardiorespiratory fitness, were collected among the same 76 adolescents each year from the age of 14 to the age of 19. *Purpose:* The aim of the study was to examine differences between adolescents who continue to participate in organized sport, and those who drop out according to some potential drop out factors from a longitudinal perspective. *Results:* Adolescents dropping out from sport have a lower cardiorespiratory fitness and lower level of well-being in sport taring and competition, than adolescents that continue to participate in organized sport. This finding is relatively stable according to time and sex. Furthermore, boys that drop out from sport have significantly lower height than adolescents that continue to participate in organized sport. Finally, the study partly support other research showing that adolescents that drop out from sport, have significantly lower physical activity level than adolescents that participate in organized sport at the age of 16. *Conclusions:* The findings point to the importance of organizing sport in a way that will not be depending on high levels of cardiorespiratory fitness and being tall to perform and feel well, and also to organize sport in a way that everyone achieve high levels of well-being at both sport training and sport competitions, to prevent drop out.
Keywords: Adolescence; sport; dropout; longitudinal changes.

Introduction

Adolescent participation in physical activity (PA) during youth bestows several health benefits, including positive changes in adiposity, skeletal health, psychological health, and cardiorespiratory fitness (Loprinzi, Cardinal, Loprinzi, & Lee, 2012). However, research indicates that participation in PA declines during adolescence (Aarnio, Winter, Peitonen, Kujala, & Kaprio, 2002; Belanger, Gray-Donald, O`Loughlin, Paradis, & Hanley, 2009; Kolle, Stokke, Hansen, & Anderssen, 2012; Lagestad, Tillaar, & Mamen, 2018), and that many youth do not accumulate the minimum of 60 min of daily PA recommended for health (Belton, Meegan, Woods, & Issartel, 2014; Kolle, Stokke, Hansen, & Anderssen, 2012).

The extant literature demonstrates that participation in organized sport is especially important in relation to certain health factors, such as PA level and cardiorespiratory fitness (Aires et al., 2012; Graham, Sirard, & Neumark-Sztainer, 2011; Lagestad & Mehus, 2018; Pfeiffer, Wowda, Dishman, Sirard, & Pate, 2007; Rangul et al., 2011). However, participation in organized sport also seems to impart other major advantages. For example, in a large Norwegian population study, adolescents that participated in organized sport reported the following: having more good friends; spending more time out with friends; being more pleased with their parents; having a higher level of well-being at school; skipping school less frequently; being more likely to have plans to achieve a higher education; spending less time looking at computer, tablet, and/or cell phone screens; being more satisfied with their own health; having fewer physical complaints; being less depressed; engaging in a healthier diet; using less tobacco and/or illicit drugs; and engaging less frequently in juvenile delinquent activity compared to adolescents that did not participate in organized sport (Bakken, 2017). Participation in organized sports at an early age and continuing through adolescence also appears to increase the probability of having a physically active lifestyle in adulthood (Kjønniksen, Anderssen, & Wold, 2009; Telama, Yang, Hirvensalo, & Raitakari, 2006). A main conclusion in all of the studies above is that adolescents are recommended to participate in different types of sports, and that dropping out from sport constitutes a major health concern.

In Norway, the majority of children participate in organized sport, and most begin before 10 years of age (Seippel, Sletten, & Strandbu, 2011). However, research indicates that dropping out from organized sport increases during adolescence in Norway, as in other countries globally (Bélanger, Gray-Donald, O'Loughlin,

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Paradis, & Hanley, 2009; Lagestad & Sørensen, 2018; Riddoch et al., 2004; Seippel, Strandbu, & Sletten, 2011; Telama & Yang, 2000). For example, Telama and Yang (2000) reported a remarkable decrease in adolescent sport participation after the age of 12. Temple and Crane (2015) found that the dropout rate from one season to the next ranged from 18% to 36% in different studies among soccer players. In Norway, even though almost all children participate in organized sport, a high dropout rate exists with increasing age (Seippel et al., 2011). For instance, new data reveal that while 72% and 69% of Norwegian boys and girls, respectively, are engaged in organized sport at the age of 14, only 42% and 28% report engaging in organized sport at the age of 19. This constitutes a tremendous dropout rate, and is especially pronounced among girls and adolescents of low socioeconomic status (Bakken, 2017). To prevent dropouts, identifying and understanding the precise factors that contribute to dropping out among adolescents is critical.

The extant literature has found that dropouts may attributed to a lack of enjoyment, lack of the opportunity to play, lower perceptions of competence, poor performance, social pressure, slower maturation, injuries, lack of fulfilment of basic psychological needs, poor relationships with teammates and/or coaches, and later birthdate in relation to competitive year (Crane & Temple, 2015; Lagestad & Sørensen, 2018; Ommundsen & Vaglum, 1997; Patriksson, 1988; Temple & Crane, 2015). Imitiaz, Hancock, Vierimaa and Côté (2014) also found that players from larger cities were more likely to drop out. Another investigation reported that, compared with persisting athletes, dropouts were less task-oriented (Le Bars, Gernigon, & Ninot, 2009). It has also been shown that the father's role was important to promote youth to sustain sport participation among families of lower family socioeconomic status (Kwon, Janz, Letuchy, Burns, & Levy, 2016). Lagestad and Sørensen (2018) also demonstrated decreasing levels of reported enjoyment among adolescents who still participated in organized sport. The same study also found that adolescents who did drop out from sport after the age of 14 reported lower levels of enjoyment in sport competition and training than the adolescents who continued their involvement in organized sport. These findings indicate that dropping out from sport is associated with lower levels of well-being in sport.

Although some research exists focusing on dropping out from sport, the knowledge obtained is mostly based on subjective reports from adolescents, and somewhat limited in terms of the variables that may be associated with dropping out. Indeed, a paucity of studies examine the importance of objective factors related to the individual, such as height, weight, body mass index, and cardiorespiratory fitness. Admittedly, Figueiredo, Gonçalves, Silva and Malina (2009) found that dropout soccer players were lower in height and weight than were non-dropout players. Results from Lagestad and Sørensen (2018) strongly indicated that male adolescents who did not participate in organized sport seemed to be shorter than adolescents dropping out from sport.

The importance of height, weight, body mass index, and cardiorespiratory fitness in relation to dropping out from sport could be ascribed to the strong influence of physical factors in relation to performance in some sports, in which biological-maturity and status of height, weight, strength, and power constitute a major element in performance capacity (Baxter-Jones, 1995). The development of such physical factors is highlighted in research concerning the relative age effect (Musch & Grondin, 2001; Wattie, Cobley, & Baker, 2008) and could affect dropping out negatively. Furthermore, dropouts due to lower physical abilities (e.g., height, weight, body mass index, overweightness) could also be explained by the Pygmalion effect and the concept of developmental-advantage socialisation (Harter, 1978; Rosenthal & Jacobson, 1968). Children who naturally perform better because of superior physical abilities may be more frequently defined as 'talents'. These talents are then typically selected for more advanced camps or teams, provided with the best coaches and facilities, and are thus given greater opportunities for development. In this way, children with high physical abilities have better opportunities to experience enjoyment, obtain more opportunities to play, experience high perceptions of competence, and achieve better fulfilment of basic psychological needs, which are factors that may prevent dropping out from sport. According to Harter's (1978) competence motivation theory, adolescents who perceive that they are able to perform at a high level and are talented are more likely to continue developing their abilities and to invest more time and effort into sport, with commensurate results.

Although previous research has focused on some potential factors that may be associated with dropping out from sport, few of these studies have examined differences between adolescents that drop out or choose to participate in sport, utilizing a longitudinal design. To fill this gap in the extant research, a longitudinal research was performed, which includes data about 14-19 year old Norwegians participation in organized sport, and some variables that may prevent or cause dropping out from sport. These variables were: VO_{2peak} ($mlxmin^{-1}xkg^{-1}$ and $Lxmin^{-1)}$, height, weight, body mass index, overweightness, participation in unorganized activity, physical activity level, and well-being related to training and competition. The research question of the present research was: Do differences exist between adolescents who participate in organized sport at the age of 19 and those who drop out from organized sport according to VO_{2peak} ($mlxmin^{-1}xkg^{-1}$ and $Lxmin^{-1)}$, weight, height, body mass index, overweightness, participation in unorganized activity, PA level, well-being in physical education, and well-being at training and competition? Another component of the study was elucidating if such differences vary among the same adolescents at the age of 14 to 19, and whether differences in this pattern existed according to sex.

Materials and Methods

Design

A longitudinal design with repeated measures among adolescents during upper secondary school and high school was utilized to answer the research question. Peak oxygen uptake, weight, height and activity pattern were measured at a pretest in the eighth grade, and retested five times each year until the end of high school. Measures of weight and height were utilized to calculate the body mass index, and the body mass index was used to calculate the percentage of adolescents who were overweight.

Participants

Six eighth-grade school classes (two classes in each of three teams) from upper secondary schools in a medium-sized town in the middle of Norway with 144 adolescents were randomly selected for the study. 124 adolescents agreed to participate in the study, and 116 fulfilled the pretest at 14 years of age. Because of the subjects' dropout rate during testing in the ninth grade and in the first and second year of high school, data were only included from the end of the eighth grade (14 years old), tenth grade (16 years old), and in their third year of high school (19 years old). With such a strategy, 76 adolescents (37 girls and 39 boys) were included in the analysis, constituting an overall response rate of 53%. All of these adolescents reported that they had participated in organized sport at some time in their lives. Among the boys, 36 (92.3%) reported participating weekly in organized sport at 14 years of age, 31 (79.5%) at 16 years of age, and 22 boys (56.4%) at all of 14, 16, and 19 years of age. Among the girls, 31 (86.3%) reported participating weekly in organized sport at 14 years of age, 22 (61.1%) at 16 years of age, and 10 (27.8%) at all of 14, 16, and 19 years of age.

The subjects were fully informed about the protocol prior to participating in the study, and a written consent form was signed by the parents (15 years of age) and the adolescents (16-19 years of age). Approval to use the data and perform the study was given by the Norwegian Social Science Data Services (NSD) and the Norwegian Regional Committees for Medical and Health Research Ethics (REK 488715, 2014). The study was conducted in accordance with the Declaration of Helsinki.

Procedures

Peak oxygen uptake, weight and height were measured in the period of February to April each year, at which time the adolescents were at the end of eighth grade (14 years old), ninth grade (15 years old), tenth grade (16 years old), and also in their first year (17 years old), second year (18 years old), and third year (19 years old) of high school. All of the tests were administered by the same test leader, in the same laboratory, with the same equipment, with the same procedures, and at the same time of the day (during school hours). Peak oxygen uptake was obtained on a treadmill. Only the test leader and the subject were in the test laboratory to ensure air stability and prevent disturbances during the test. In advance, the adolescents had been informed about the procedures and test conditions (i.e., avoid long or high intensity exercise the day prior to the test, avoid food intake 2-3 h before the test, only engage in light activity in physical education (PE) class (if they had physical education on the same day before the test)). The subjects were tested wearing training pants or shorts, a tee-shirt, and running shoes. Peak oxygen uptake was measured by OxyCon Pro (Erich Jaeger GmbH, Hoechberg, Germany), and the treadmill was a Woodway S5 (Woodway Inc., Waukesha, U.S.A.). During the peak oxygen test, the angle of inclination was 10.5º to prevent running technique from becoming a limitative factor in peak oxygen uptake. Prior to the test, the adolescents were asked about their physical activity patterns. Inactive girls or overweight girls started the test at 4 km/h, girls that exercised 1-2 days a week started the test at 4 km/h, and girls that exercised 3-4 days a week started the test at 5 km/h. Boys used the same procedures, but with 1 km/h higher speed at each level, respectively. The speed increased by 1 km/h each minute. At the end of each test, speed was only increased by 0.5 km/h sometimes. The criterion for the highest maximal oxygen uptake was the point at which the maximal oxygen uptake achieved a flattening/decrease of the oxygen uptake curve with increased load (RER > 1.00). Mean oxygen uptake of the two highest measures were registered as peak oxygen uptake. The entire test lasted 5 - 6 min.

Height was measured with a stadiometer (Kawe, NorEngros, Oslo, Norway) that was permanently connected to the wall. The subjects did not wear shoes, and height was converted to the nearest centimetre. Weight was measured using a Seca Digital Weight Scale (Seca Gmbh & Co., Germany, Model 877, accuracy of 0.1 kg). Body mass index was calculated by dividing weight (kg) by height (cm) squared, and then multiplying the result by 10,000, in accordance with international standards (Cole, Bellizzi, Flegal, & Dietz, 2000). The cut-off for being overweight was set at 22.62 for boys and 23.34 for girls at 14 years of age, 23.90 for boys and 24.37 for girls at 16 years of age, and 25 for all adolescents at 19 years of age.

The adolescents ended the test protocol by answering a questionnaire with questions used by Aspvik, Sæther and Ingebrigtsen (2008), which examined the degree of enjoyment in PE of sports and sports competition. Example questions included, "How would you rate your enjoyment in sports workouts?" and "How would you rate your enjoyment in sports competitions?" The response options were: very good, good, poor, and very poor. We also included a question about PA level: "How many days a week are you physically active to a level at which you become sweaty or out of breath?" The response options were: never, 1 day a week, 2-3 days a week, 4-5 days a week, and 6-7 days a week. Finally, questions about participation in organized sport and unorganized PA sport were included. Example questions included, "How often do you participate in sport?" and "How often do you participate in unorganized physical activity?" The response options for both of these

questions were: never, rarely, 1-3 days a month, 1 day a week, 2-3 days a week, 4-6 days a week, and every day. These variables were recoded, and the cut-off value for participating in organized sport and unorganized sport was ≥ 1 day a week.

Statistical analysis

An independent t-test was used to examine differences between adolescents who dropped out or continued participating in organized sport according to absoluteVO_{2peak} ($Lxmin^{-1}$ and $mlxmin^{-1}xkg^{-1}$), height, weight, and body mass index. The non-parametric variables, i.e., being overweight, activity level and well-being, were dichotomized, and a chi square test was utilized to examine differences between adolescents who dropped out or continued participating in organized sport. Statistical analysis was performed with SPSS statistical software version 24 (SPSS Inc., Chicago, IL, U.S.A.).

Results

The results in Table 1 show that soccer is the most frequent sport, according to participation in organized sport. The number of dropouts from soccer is also the highest in relation to all dropouts (37% of all dropouts), while martial arts was the activity with the highest relative dropout, with a 100% dropout during the period.

Table 1. Number of adolescents that reported participation in different types of organized sport activities at the age of 14, 16 and 19 years, and the percentage of dropouts during the age of 14 until 19 from these sports (n = 76).

Sport participation	14 years of age	16 years of age	19 years of age	% dropout in the activity	% dropout of all dropouts
Handball	21	14	6	71 %	18 %
Soccer	49	35	19	61 %	37 %
Other ballgames	6	2	1	83 %	6 %
Skiing activities	16	9	7	54 %	11 %
Athletics	5	2	2	60 %	4 %
Orienteering	2	2	2	0 %	0 %
Gymnastics	4	6	2	50 %	2 %
Martial arts	4	2	0	100 %	4 %
Other sports	19	14	5	74 %	17 %
Total	126	86	44	65 %[a]	100 %

[a] mean value

The results presented in Table 2 show that girls participating in organized sport have a higher VO_{2peak} ($mlxmin^{-1}xkg^{-1}$) at all three measured times, compared with girls not participating in organized sport. Significantly more girls that participate in organized sport report very good well-being related to both training and competition at the age of 19, compared with girls not participating in organized sport. Furthermore, significantly more girls that participate in organized sport report very good well-being related to competition at the age of 14, compared with girls not participating in organized sport. Finally, girls that participate in organized sport report a higher activity level at the age of 16, compared with girls not participating in organized sport.

Table 2. Characteristics and the development of characteristics of girls participating in organized sport at 19 years of age (n = 10) and not participating in organized sport at the age of 19 (n = 27), in the period from 14-19 years old.

	14 years Mean (SD)	16 years Mean (SD)	19 years Mean (SD)
VO_{2peak} ($Lxmin^{-1}$)			
Participating in organized sport	2.49 (0.30)	2.72 (0.28)	2.74 (0.24)
Not participating in organized sport	2.36 (0.45)	2.50 (0.46)	2.48 (0.44)
VO_{2peak} ($mlxmin^{-1}xkg^{-1}$)			
Participating in organized sport	48.89 (5.37)*	48.23 (6.33)**	44.87 (7.36)**
Not participating in organized sport	41.88 (7.83)	40.16 (6.81)	38.18 (4.51)
Weight			
Participating in organized sport	51.42 (7.89)	56.82 (5.86)	62.13 (8.29)
Not participating in organized sport	58.07 (14.91)	63.38 (14.65)	65.95 (14.70)
Height			
Participating in organized sport	162.15 (6.39)	165.45 (5.99)	166.20 (6.09)
Not participating in organized sport	162.59 (7.86)	166.12 (6.20)	167.06 (5.85)
Body mass Index			
Participating in organized sport	19.42 (2.10)	20.74 (1.87)	22.41 (2.52)
Not participating in organized sport	21.73 (4.68)	22.82 (4.53)	23.50 (4.66)
Overweightness, %			
Participating in organized sport	0	10	20
Not participating in organized sport	23.1	26.9	26.9
Activity level > 3 times a week, %			
Participating in organized sport	50	80**	60
Not participating in organized sport	26.9	26.9	28
Weekly unorganized PA, %			

Participating in organized sport	90	80	69.2
Not participating in organized sport	69.2	72	60
Very good well-being related to training, %			
Participating in organized sport	100	90	88.9*
Not participating in organized sport	84	66.7	44
Very good well-being related to competition, %			
Participating in organized sport	100**	80	88.9**
Not participating in organized sport	48	47.6	26.3

*Significant difference from adolescents not participating in organized sport at 19, $p<0.05$

The results in Table 3 show that boys participating in organized sport have a higher VO_{2peak} ($mlxmin^{-1}xkg^{-1}$ and $Lxmin^{-1}$) at all three measured times, compared with boys not participating in organized sport. Significantly more boys that participate in organized sport report very good well-being related to training at all three measured times, compared with boys not participating in organized sport. Furthermore, significantly more boys that participate in organized sport report very good well-being related to competition at the age of 16 and 19, compared with boys not participating in organized sport. Finally, boys that participate in organized sport report a higher activity level at the age of 16, compared with boys not participating in organized sport.

Table 3. Characteristics and the development of characteristics of boys participating in organized sport at 19 years of age (n = 22) and not participating in organized sport at the age of 19 (n = 17), in the period from 14-19 years old.

	14 years of age Mean (SD)	16 years of age Mean (SD)	19 years of age Mean (SD)
VO_{2peak} ($Lxmin^{-1}$)			
Participating in organized sport	3.02 (0.57)*	3.97 (0.68)***	4.28 (0.63)***
Not participating in organized sport	2.67 (0.42)	3.25 (0.61)	3.54 (0.69)
VO_{2peak} ($mlxmin^{-1}xkg^{-1}$)			
Participating in organized sport	56.61 (6.05)*	59.77 (6.47)**	55.60 (6.45)**
Not participating in organized sport	52.21 (5.18)	50.27 (5.45)	47.82 (3.81)
Weight			
Participating in organized sport	53.58 (10.41)	66.68 (10.85)	77.67 (13.56)
Not participating in organized sport	51.48 (7.95)	64.98 (11.77)	74.24 (14.30)
Height			
Participating in organized sport	167.64 (9.42)	180.45 (6.79)*	184.55 (6.70)*
Not participating in organized sport	162.59 (8.96)	174.29 (8.01)	179.44 (8.53)
Body mass Index			
Participating in organized sport	18.87 (2.53)	20.39 (2.98)	22.77 (4.04)
Not participating in organized sport	19.41 (2.60)	21.35 (3.99)	23.02 (4.38)
Overweightness, %			
Participating in organized sport	4.5	9.1	18.2
Not participating in organized sport	11.8	29.4	35.3
Activity level > 3 times a week, %			
Participating in organized sport	68.2	81.8**	66.7
Not participating in organized sport	41.2	35.3	35.3
Weekly unorganized PA, %			
Participating in organized sport	86.4	85.7	77.3
Not participating in organized sport	88.2	70.6	58.8
Very good well-being related to training, %			
Participating in organized sport	100**	90.9**	81**
Not participating in organized sport	56.3	52.9	31.3
Very good well-being related to competition, %			
Participating in organized sport	81.8	85.7**	81***
Not participating in organized sport	68.8	31.3	0

*Significant difference from adolescents not participating in organized sport, $p<0.005$
**Significant difference from adolescents not participating in organized sport, $p<0.01$
***Significant difference from adolescents not participating in organized sport, $p<0.001$

Discussion

The results demonstrate that cardiorespiratory fitness, height, activity level, and perceived well-being in sport differs between adolescents that are participating in organized sport at the age of 19, and those who drop out. These differences are relatively stable in terms of time and sex, and will be discussed further.

The first main finding is that adolescents that participate in organized sport at the age of 19 have a higher level of cardiorespiratory fitness compared with adolescents that have dropped out of organized sport. This finding is stable according to both sex and age level. The finding is supported by several studies, which indicate that participation in organized sport seems especially important in relation to cardiorespiratory fitness level (Aires et al., 2012; Graham, Sirard, & Neumark-Sztainer, 2011; Lagestad & Mehus, 2018; Pfeiffer,

Wowda, Dishman, Sirard, & Pate, 2007; Rangul et al., 2011). In general, all sports comprise movement of the body (e.g., running, jumping, quick movement of the feet), and thereby contribute positively to cardiorespiratory fitness. It is reasonable to assert that in most sports, performance will increase with increased cardiorespiratory fitness and, as a consequence, adolescents with lower levels of cardiorespiratory fitness may exhibit a great possibility to drop out from sport. This is related to the findings of Ommundsen and Vaglum (1997) and Patriksson (1988), who found that low perceived competence and low performance, respectively, was associated with increased dropping out from sport.

The second main finding is that among boys, adolescents that participate in organized sport at the age of 19 are approximately 5 cm taller than adolescents that have dropped out of organized sport. However, this finding is only significant at 16 and 19 years of age, and is not evident among girls. The finding is supported by Figueiredo et al. (2009), who found that dropping out from sport was associated with physical limitations of body size and skeletal development, and that soccer players who dropped out were 7 cm shorter than elite players. In the present study, the dropout adolescents were approximately 5 cm shorter than the non-drop out adolescents (Table 3). Indeed, early research pointed out that performance in many sports (e.g., handball) favoured those who were tall (Khosla, 1983). Moreover, athletes that participated in the Olympic Games in some events were all taller than the mean height; even among the tall, it was the taller participants who won medals. Physical education is a subject that is closely related to sport activities (Dowling, 2016; Moen, Weslie, Brattli, Bjørke, & Vaktskjold, 2015). Dalen et al. (2016) also identified a positive correlation between height and marks among Norwegian boys 14-16 years of age in PE, and also found that height explained approximately 10% of the variance in the PE marks.

The differences according to height may be explained by biological advantage and the concept of developmental-advantage socialisation and the Pygmalion effect or self-fulfilling prophecy (Harter, 1978; Rosenthal & Jacobson, 1968). In sports where height, weight, strength and power constitute an advantage, the early maturing boys are likely to possess a biological advantage over those who mature later (Baxter-Jones, 1995). Anthropometric and physiological characteristics have also been shown to be decisive during the team selection process (Reilly, Bangsbo, & Franks, 2000). Helsen, Winckel and Williams (2005) report that coaches often ascribe more importance to physical characteristics than technical abilities. Consequently, tall boys are given an advantage that might well be mistaken for superior ability. Boys' maturation and performances may also influence adolescents' ability to invest time into practice and to accumulate sport-specific skills and experience, which are factors that are critical for long-term performance (Baker & Horton, 2004). Given the relative age difference in the same cohort (relative age effect, RAE), a 6- to 12-month developmental advantage can be decisive. Children born early in the year, and therefore taller because they have had more time to grow in height, are more frequently defined as 'talents' and selected for advanced camps or teams. The selected children are then provided with the best coaches and facilities, and thus are given the best opportunities for development. The initial selection appears, as such, justified because these children develop more quickly than those not selected. The prophecy, thus, becomes self-fulfilling (Rosenthal & Babad, 1985), and the adolescent will perform better when more is expected of him (the so-called 'Pygmalion effect', see Rosenthal & Jacobson, 1968). Moreover, Harter's (1978) competence motivation theory suggests that athletes who perceive that they are able to perform at a high level and think that they are talented are more likely to continue perfecting their abilities and to invest more time and effort into their sport, with predictable results (Harter, 1978). That the differences according to height are not evident among girls may be due to that there is a lack of intense competition in youth sports due to limited positions for girls (Goldschmied, 2011). This argument is supported by the fact that soccer is the most frequent sport activity among the adolescents (Table 1), but substantially more boys play soccer among adolescents, while the size of the regional team is the same (Lagestad, Steen, & Dalen, 2018). Another explanation is the earlier maturation of girls and the lower variability of maturity status in girls in comparison to boys (Goldschmied, 2011).

The third main finding is that significantly more adolescents at 19 years of age that participate in organized sport report their feeling in relation to both training and competition as very good, compared with adolescents at the same age who do not participate in organized sport. Furthermore, the percentage of adolescents that report very good well-being at sport is substantially reduced from the age of 14 to the age of 19. These results strongly indicate that organizing sport in a way in which all adolescents thrive very well in sport will be a main contributor to preventing adolescents from dropping out of sport. This argument is supported by previous research (Crane & Temple, 2015; Lagestad & Sørensen, 2018; Patriksson, 1988). One of the main findings of Jakobsson (2014) was that adolescents found sports fun in terms of meaningfulness, because they enjoyed the involvement and engagement with others. He concludes that sport clubs should offer activities that attract people with different levels of ambition and abilities.

The fourth and least prominent main finding is that at the age of 16, adolescents that participate in organized sport report a higher activity level, compared with adolescents not participating in organized sport. This is in line with other research (Aires et al., 2012; Graham, Sirard, & Neumark-Sztainer, 2011; Pfeiffer, Wowda, Dishman, Sirard, & Pate, 2007; Rangul et al., 2011). It is currently undetermined why this finding is not evident at the ages of 14 and 19, but could be due to too few subjects in each group.

Strengths and limitations of the study

The strength of the study is that it is based on a longitudinal design with the same participants, at the same time of year, using the same questions and test each year, performed in the same room, using the same test procedures, using the same test equipment, and with the same test leader at all of the three test measures included in the study. Furthermore, most of the variables (i.e., $VO2_{peak}$, height, weight, body mass index, overweightness, and sex) are based on high quality standard procedures. However, there are several limitations of the study. The number of participants is somewhat low. Moreover, a response rate of 53% could be considered problematic, but not if it is random. Taking the results in Table 1 into account, the adolescents with valid data seem to represent Norwegian adolescents - both according to the number of adolescents that report participation in different types of organized sport activities at the age of 14, 16 and 19 years, as well as according to drop out patterns. Furthermore, the activity level is measured using self-reported data instead of objectively measured data, which would have been preferable. Another critical argument of the study is that other variables that are not included in this study may be better predictors of participation in sport than the included variables. However, such variables were not available.

Conclusion

This study shows that adolescents that drop out from sport have lower cardiorespiratory fitness than adolescents that continue to participate in organized sport, and that lower levels of cardiorespiratory fitness may cause dropping out from sport. The fact that significantly fewer adolescents that drop out from sport report their feeling in relation to sport participation as very good, compared with adolescents that continue to participate in organized sport, indicates that lower levels of well-being in sport may cause dropping out from sport. With a longitudinal approach, these findings seem to be relatively stable in terms of time and sex. Furthermore, boys that drop out from sport have significantly lower height than adolescents that continue to participate in organized sport – a finding that indicates that low height may cause boys to drop out from sport. Finally, the study supports other research showing that adolescents that drop out from sport have a significantly lower physical activity level than adolescents that participate in organized sport at the age of 16. The findings point to the importance of organizing sport in a way that not only depends on high levels of cardiorespiratory fitness and being tall to perform and feel well, as well as in a way in which everyone achieves high levels of well-being to prevent dropping out.

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