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# Socioeconomic status, sport participation, and school-related outcomes among Norwegian adolescents: a cross-sectional analysis

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**Background:** Extensive research highlights the critical role of sport and physical activity (PA) engagement during adolescence, as it is strongly associated with enhanced subjective well-being, reduced risk of mental health problems, and prevention of chronic diseases in adulthood. Thus, it is highly important to identify key barriers of sport participation in adolescence. The present study aimed to; (1) describe socioeconomic status (SES) across different sport disciplines among current participants and sport dropouts, (2) examine possible associations between sport participation and sport dropouts on school-related outcomes.

**Methods:** School-based cross-sectional data among 90,091 adolescents aged 16–19 years were collected across Norway between 2021 and 2023. A self-report questionnaire was used to assess information about sociodemographic background, current and previous sport participation, and school-related factors, including perceived school stress, teacher care, feeling tired at school and sense of belonging at school. Adjusted binary logistic regressions were conducted using IBM SPSS Statistics.

**Results:** Adolescents currently participating in sport reported higher SES compared to sport dropouts ( $2.13 \pm 0.51$  vs.  $1.97 \pm 0.61$ ,  $p < 0.01$ ). Tennis participants demonstrated the highest SES of  $2.39 \pm 0.44$ , while motorsport participants revealed the lowest score ( $1.82 \pm 0.49$ ). The highest sport attrition rate (80.2%) was revealed among adolescents from the lowest SES level. Current sport participants reported favorable school-related outcomes and PA engagement compared to sport dropouts (all,  $p < 0.01$ ). Adjusted logistic analyses showed that participation in sport activities was associated with lower odds of perceived school stress [OR = 0.83; 95% CI (0.81–0.86)] and being tired during school hours [OR = 0.74; 95% CI (0.71–0.77)], and higher odds for perceived teacher care [OR = 1.17; 95% CI (1.12–1.22)] and perceived sense of belonging [OR = 1.36; 95% CI (1.31–1.42)].

**Conclusions:** Higher SES was found among adolescents participating in sport compared to sport dropouts, underscoring the importance of promoting affordable sport opportunities during adolescence. Current sport participation was associated with favorable school-related outcomes compared to sport dropouts, such as lower odds for perceived school stress and tiredness in school, and higher odds of perceived sense of belonging in school and perceived teacher care.

#### KEYWORDS

adolescence, socioeconomic status, school, sport, physical activity, academic measures

## 1 Introduction

Participation in sport and physical activity (PA) during adolescence contributes to numerous positive outcomes including higher subjective well-being, improved cardiovascular health, mental health and academic performance (1–5), yielding longer lifespan and healthier adulthood (6, 7). Despite extensive research evidence which fortifies adolescents' health through PA and sport participation, most adolescents do not meet the daily recommendation of at least 60 min of moderate-to-vigorous intensity PA per day conveyed by WHO (8). According to Guthold and colleagues, who investigated global PA trends among 1.6 million participants. Findings revealed about 2 out of 10 adolescents adhered to the PA recommendations, with girls being less active than boys (9). A recent Norwegian study revealed similar findings of low adherence to PA recommendations among Norwegian adolescents, also with girls being considerable less active than boys (10). While there are numerous reasons for low PA adherence in adolescence, it is pivotal from a public health perspective to identify and understand barriers to advance the field (11).

According to a systematic review by Stalsberg and Pedersen conducted in 2010, socioeconomic status (SES) could be a relevant barrier, as adolescents from higher-SES families were often more physically active than those from lower-SES families (12). However, the findings were far from uniform, as forty-two percent of the studies included revealed no association or a negative association between SES and PA. Research has also pointed to changes in inequalities over time related to PA and sports participation. A repeated European cross-sectional measures from 2005 to 2019 revealed an overall increase in inequalities (13). Furthermore, other related factors such as demographic factors may also influence adolescents' options for organized sports, due to fewer facilities and options in communities characterized by high proportion of lower SES residents (14). Studies have shown that higher SES levels in adolescence have been linked to higher participation in sport, but

also inversely linked to time spent in sedentary behaviors (15). According to Pooja and colleagues, younger US adolescents from high-SES families had three times higher odds of adhering to PA recommendations and three times higher odds of ever participating in sport compared to adolescents from low-SES families (16). Still, the infrastructure of communities and set-up of clubs differ across countries, which should be taken into consideration when addressing sport participation in adolescence (17).

While Norway has a solid welfare system, previous research indicates that participation in organized sport activities is associated with SES (18). Sport participation in Norway is organized through sports clubs, voluntary work, wherein a certain extent of parental involvement is required (19). Therefore, competence, time and resources of parents are usually needed to fulfill the given requirements within the sports disciplines. According to the Norwegian Sports Federation survey, describing cost and cost drivers for youth in 2024, findings revealed a mean annual cost for a 15 year-old cross country skier of 11.700 NOK (equivalent to \$1,000) (20). Higher economic demands in sport presumably impact the attrition among lower SES families. These assumptions are interesting to pursue, as the Norwegian Social Research (NOVA), have reported that over half of those who engaged in organized sport at beginning of adolescence, had quit by the age of 17 (21). In addition, there exist some evidence of a social gradient for lower inactivity and non-participation in sports among Norwegian adolescents (22). However, further research is needed to identify differences in SES across all sports disciplines in Norway and explore differences between current sport participants and sport dropouts (no longer participating in their most active sport as of the survey date).

In Norway, there is also lack of knowledge regarding how sport participation may affect school participation and school engagement. The obvious upside of sport participation is higher PA levels, which have been proven robust positive relations to academic performance (23–28). However, these are presumably bidirectional relationships, where better academic engagement might lead to both higher sport participation and teacher attention. There are also reported downsides in young athletes (29). Specifically, sport participation concentrated on one sport during adolescence has shown to increase the risk of burnout, sport-related injuries and attrition (30). Moreover, findings indicate that the positive outcomes of sport participation differ among boys and girls in terms of personal, peer and

#### Abbreviations

PA, physical activity; SES, socioeconomic status; CI, confident intervals; SD, standard deviation; GDPR, general data protection regulation; OR, odds ratio; NOVA, Norwegian Social Research; Korus, regional center for drug rehabilitation; KS, the municipal sector's organization; SIKT, Norwegian Agency for Shared Services in Education and Research; XC, cross-country; STROBE, strengthening the reporting of observational studies.

environmental factors (31), which could impact the perception of school environment as well. PA is shown to enhance adolescents' psychological resilience and boost self-efficacy, which could be underlying mechanisms explaining a higher sense of belonging in school (32). Hence, accounting for not only SES and PA, but also gender should be considered appropriate when understanding the impact of sport participation and school-related outcomes. The PA engagement within the respective sport disciplines is described elsewhere (33), which could give a broader understanding of sport participation and school outcomes. To clarify, there are research gaps related to identifying key barriers to sport participation and to providing insights into the everyday lives of current sport participants and sport dropouts. Therefore, this study aimed to (1) describe SES across different sport disciplines among current participants and sport dropouts, (2) examine possible associations between sport participation and sport dropouts on school-related factors, such as perceived school stress, perceived teacher care, sense of belonging in school and perceived tiredness in school.

We hypothesized that current sport participants would have higher socioeconomic status (SES) levels than sport dropouts across all sport disciplines and that current sport participation, compared to sport dropout, would be associated with more favorable school-related outcomes.

## 2 Material and methods

### 2.1 Study design and participants

This study utilized cross-sectional data aggregated from the Norwegian Ungdata Survey from 2021 to 2023. The Ungdata study has been conducted annually since 2010. Every year, different Norwegian counties are invited to participate and within a three-year period, all Norwegian counties are represented. According to the Ungdata study, their data provides nationwide information on Norwegian adolescents' health and lifestyle (34). Due to general data protection regulation (GDPR) restrictions, this current dataset, which includes specific sports disciplines, does not include information regarding specific counties, municipalities, schools, ethnicity or age.

The study includes Norwegian adolescents attending 1st to 3rd year of high school, equivalent to an age of 16–19 years. A total of 90,091 adolescents were included in this study, which consisted of current sport participants and sport dropouts. This current dataset included the nineteen following sports: 1. Football, 2. Handball, 3. Basketball, 4. Volleyball, 5. Bandy, 6. Ice-Hockey, 7. Cross-country (XC) skiing, 8. Alpine skiing, 9. Athletics, 10. Swimming, 11. Gymnastics, 12. Dancing, 13. Cheerleading, 14. Tennis, 15. Martial art, 16. Horse-riding, 17. Climbing, 18. Motorsport, 19. Other.

### 2.2 Data collection

The Norwegian Social Research (NOVA) at Oslo Metropolitan University, the regional center for drug rehabilitation (KoRus) and

the municipal sector's organization (KS) oversee the Ungdata study, which is financed through the national budget by funds from the Norwegian Directorate of Health (34). The Ungdata survey is an electronic survey conducted in the classroom during a regular school hour. Participation is voluntary and if the adolescents do not choose to participate, they are assigned with regular schoolwork. The Ungdata comprises a mandatory module (for all counties) and an optional module, wherein the counties and municipalities may choose to include additional health-related questions and statements.

### 2.3 Variables

The Ungdata study includes sociodemographic measures and various health-related questions and statements. The following study variables are included in this cross-sectional analysis.

#### 2.3.1 Socioeconomic status

The Ungdata study provides a validated construct for SES (34). The instrument is presented by using a continuous scale from 0.00 to 3.00, whereas 0.00 represents the lowest level of SES and 3.00 the highest level of SES. To provide a natural categorization of low, medium and high SES levels related to attrition rate, the following categories were used: 0.00 to 1.00, 1.00 to 2.00, and 2.00 to 3.00. The validated SES measure in Ungdata stems from the Family Affluence Scale II, which originates from WHO by Currie and colleagues (35, 36). The SES measure includes numerous factors such as the adolescents' perception of the family economy, parental educational level and level of prosperity.

#### 2.3.2 Current sport participants or sport dropouts

Sport participation was measured by using the following question: *"What sport are you participating in? If you are participating in several sports, choose the one you are most active in"*. The participants could choose from the abovementioned 22 different sport disciplines or the "other" category. Sport dropout (previous sport participation) was measured by the following question: *"What sport did you quit? If you are involved in several sports, choose the one you most recently participated in"*. The participants could choose from the same sport disciplines or the "other" category. This question is included in numerous Ungdata collection waves, but not formally validated. In addition, due to low number of participants attending certain sports activities, such as lacrosse, snowboarding, cricket and golf, participation in these specific sports disciplines were merged by the distributor into the "other" category.

#### 2.3.3 Physical activity levels

PA levels were assessed using the question, *"How often are you so physically active that you become short of breath or sweaty?"*. Adolescents could choose from six response alternatives: *"never active"*, *"rarely"*, *"1–2 times a month"*, *"1–2 times a week"*, *"3–4 times a week"*, and *"at least 5 times a week"*. These respective categories were merged and dichotomized, whereas the latter two categories represented *"PA several times a week"*. Due to the mandatory weekly physical education among these school-based adolescents, *"PA several times a week"* was considered the most

appropriate dichotomization to assess relevant differences between groups. Independent PA training was measured using the following question: “Do you exercise or train on your own” (run, swim, cycle or walk). The participants could choose from the same six response alternatives, whereas the latter three and first three categories were merged into “weekly independent PA” or not, respectively. Single-item measures of PA have previously shown considerable validity and reliability (37), making them indispensable in contexts settings when device-based measurements are impracticable (38).

### 2.3.4 School-related outcomes

Perceived school stress was measured by using the statement “I get stressed by schoolwork”. Participants could choose from five response alternatives that were provided, “never”, “seldom”, “sometimes”, “often” and “very often”. The variable was dichotomized, wherein the latter two categories were recoded as “often perceived school stress”. Psychological variables from the Nordic countries have shown that a single-item stress symptom measure demonstrated satisfactory content, criterion and construct validity (39). Perceived teacher care was assessed by the statement “My teachers care about me.” The statement had four response alternatives: “totally agree”, “somewhat agree”, “somewhat disagree”, and “totally disagree”, wherein agreeing to the statements was recoded as “High perceived teacher care”. Sense of belonging in school was measured by the statement: “I feel like I fit in with the pupils at school”. The statement had four response alternatives: “totally agree”, “somewhat agree”, “somewhat disagree”, and “totally disagree”, wherein agreeing to the statements was recoded as “High sense of belonging in school”. Perceived tiredness in school was assessed with the statement: “I have been so sleepy/tired that it has affected school or leisure activities”. The participants could choose from the following response alternatives: “No days” “1–2 days” “3–4 days” or “5 days or more”. The two latter categories represented “Often perceived tiredness in school”. The school-related variables are used in several data collection waves in Ungdata and “Young in Oslo”, but not formally validated. The school-related outcomes are treated as dichotomous variables in the analysis.

## 2.4 Ethical consideration

All participation in the Ungdata survey is voluntary. As the adolescents were 16 years and older, they were allowed to make independent decision regarding consenting to participation (parental consent not needed). Informed written consent was obtained from all participating adolescents. The included question in the Ungdata survey has been approved by the Norwegian Agency for Shared Services in Education and Research (ref. 821474), known as SIKT (40). To receive data regarding specific organized sport, an additional application was sent to The Norwegian Social Research (NOVA) at Oslo Metropolitan University. The application was approved (ref. 24–22), however due to GDPR and privacy regulations, this current study does not possess all the variables as otherwise are accessible in the national dataset. This current study is reported in accordance to the

Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (Supplementary File 1) (41).

## 2.5 Statistical analyses

All statistical analyses were performed using IBM SPSS Statistics for Mac, Version 29.0 (IBM Corp., Armonk, NY, USA). Descriptive measures for continuous variables are presented as means and standard deviations (SDs). Chi-square tests and independent *t*-test were conducted to test differences in study variables between adolescents currently participating in sport and sport dropouts. Binary logistic regression analyses were conducted to estimate the associations between the independent dichotomized variable (current or former participant of sport) and the dichotomized dependent school-related outcome variables by controlling for socioeconomic status and PA levels, stratified by gender. Regressions are presented with beta coefficient with 95% confidence intervals with *p*-values < 0.05 considered statistically significant. Given the large sample size and high response rate, neither bootstrapping or imputation was employed.

## 3 Results

### 3.1 Participants

A total of 90,091 Norwegian adolescents participated in this study, of which 67.9% (*N* = 61,151) were sport dropouts and 32.1% (*N* = 28,940) current sport participants. Among the sport dropouts, 55.8% were girls (*N* = 33,509) and 44.2% were boys (*N* = 26,587), whereas for the adolescents currently participating in sport, 54.2% were boys (*N* = 15,490) and 45.8% were girls (*N* = 13,110). The included study variables revealed a high response rate (>98%, Appendix 1), except the variable related to sleep, which was part of the optional module in Ungdata (67.7%).

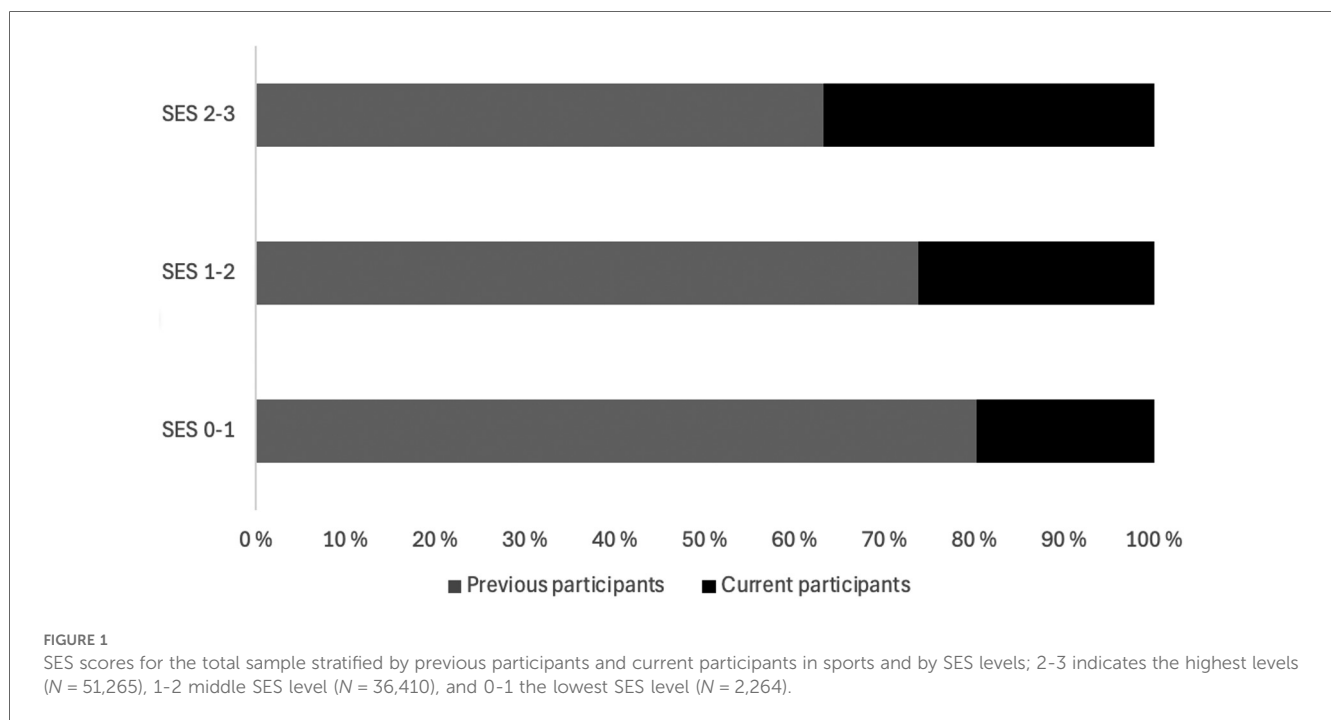
### 3.2 Descriptive statistics

Adolescents currently participating in sport reported higher SES across all disciplines compared to those who had dropped out of the respective sport, except for participants in motorsport (mean/SD 1.83 ± 0.50) vs. 1.82 ± 0.49). Tennis participants demonstrated the highest SES, with a mean/SD score of 2.39 ± 0.44 on a 0.00–3.00 scale, while motorsport participants showed the lowest mean score (Table 1).

The trend of lower SES levels among sport dropouts is depicted in Figure 1, illustrated by a stacked area plot of the respective SES categories (0–3). Among adolescents from lowest SES levels (0–1), about four out of five adolescents dropped out of sport (80.2%). Whereas adolescents from middle SES levels, about three out of four dropped out (73.7%). While about two out of three (63.2%) of the adolescents from the highest levels of SES dropped out, underscoring the relatively higher retention levels among adolescents from higher SES levels and the worrying drop-out trend related to adolescents from lower SES categories.

TABLE 1 Socioeconomic status across sports disciplines expressed as mean/SD.

Sport disciplines	Previous participants	Counts (% of total)	Current participants	Counts (% of total)
Football	1.93 (0.55)	26,648 (43.6%)	2.09 (0.52)	12,232 (42.3%)
Handball	1.98 (0.54)	10,001 (16.4%)	2.16 (0.47)	4,783 (16.6%)
Basketball	1.97 (0.61)	1,220 (2.0%)	2.08 (0.57)	637 (2.2%)
Volleyball	1.95 (0.57)	1,321 (2.2%)	2.15 (0.51)	1,161 (4.0%)
Bandy	2.00 (0.55)	588 (1%)	2.18 (0.50)	246 (0.9%)
Ice hockey	1.99 (0.53)	413 (0.7%)	2.07 (0.50)	384 (1.3%)
XC skiing	2.23 (0.50)	796 (1.3%)	2.33 (0.42)	804 (2.8%)
Alpine skiing	2.25 (0.48)	274 (0.4%)	2.27 (0.44)	189 (0.7%)
Athletics	2.11 (0.53)	1,418 (2.3%)	2.28 (0.48)	631 (2.2%)
Swimming	2.05 (0.53)	2,028 (3.3%)	2.21 (0.48)	556 (1.9%)
Gymnastics	1.98 (0.54)	3,323 (5.4%)	2.15 (0.50)	651 (2.3%)
Dancing	2.04 (0.55)	3,304 (5.4%)	2.23 (0.47)	734 (2.5%)
Cheerleading	1.99 (0.55)	470 (0.8%)	2.10 (0.53)	178 (0.6%)
Tennis	2.28 (0.48)	669 (1.1%)	2.39 (0.44)	324 (1.1%)
Martial art	1.93 (0.56)	3,012 (4.9%)	2.06 (0.53)	1,156 (4.0%)
Climbing	2.17 (0.48)	484 (0.8%)	2.29 (0.46)	240 (0.8%)
Horse-riding	1.97 (0.53)	1,159 (1.9%)	2.08 (0.49)	925 (3.2%)
Motorsport	1.83 (0.50)	335 (0.5%)	1.82 (0.49)	296 (1.0%)
Other sports	1.99 (0.54)	3,594 (5.9%)	2.17 (0.51)	2,767 (9.6%)



### 3.3 Comparison between current sport participants and sport dropouts

Higher SES mean score was revealed among adolescents participating in sport compared to sport dropouts ( $p < 0.01$ ). Favorable school-related outcomes were unveiled among adolescents currently participating in sport (Table 2), by higher perception of teacher care, sense of belonging of the school environment and lower perceived school stress and less tiredness in school compared to sport dropouts (all  $p < 0.01$ ). Higher PA levels were revealed among adolescents participating in sport compared to sport

TABLE 2 Study variables stratified by previous participants and current participants in sports expressed as mean/SD.

Study variables	Previously participated	Currently participating
SES (mean/SD)	1.97 (0.61)	2.13 (0.51)*
Often perceived school stress	56.0%	50.0%*
High perceived teacher care	82.9%	85.5%*
High perceived sense of belonging	80.9%	87.3%*
Often perceived tiredness in school	32.4%	23.8%*
Weekly independent PA	39.3%	45.9%*
PA several times a week	42.9%	82.4%*

\* $p < 0.01$ ,  $t$ -test for continuous variable (SES) and chi-square tests used to compare groups.



dropouts in addition to higher weekly independent training such as running, cycling, swimming or walking (both  $p < 0.01$ ).

### 3.4 Associations between sport participation and school-related outcomes

Regressions revealed that being currently active in sport rather than being previously active were associated with favorable school-related outcomes (Table 3), including lower odds ratio (OR) for perceived school stress [OR = 0.79; 95% CI (0.77–0.81)], and tiredness in school [OR = 0.65; 95% CI (0.63–0.68)], higher odds for perceived teacher care [OR = 1.21; 95% CI (1.16–1.26)] and higher perceived sense of belonging of the school environment [OR = 1.63; 95% CI (1.56–1.69)]. Associations remained significant after adjusting for socioeconomic status and PA levels (all  $p < 0.01$ ).

Adjusted regressions stratified by gender revealed that sport participation was associated with favorable school outcomes for boys and girls (Table 4). Being a current sport participant revealed twice as high odds for high perceived sense of belonging of the school environment among boys (38%) than in girls (19%), after adjusting for SES and PA. While girls in sports reported twice the odds of higher perceived teacher care [OR = 1.18; 95% CI (1.11–1.25)] than boys [OR = 1.09; 95% CI (1.02 to 1.15)] and over twice the lower odds for perceived school stress [OR = 0.84; 95% CI (0.80–0.88)] than boys [OR = 0.94; 95% CI (0.89–0.98)].

## 4 Discussion

The aims of the current study were to describe SES across sport disciplines in current sport participants and in sport dropouts and to examine possible associations between sport participation and sport dropouts on school-related outcomes. The main findings were as follows: (1) We found higher SES among adolescents participating in sport compared to sport dropouts and (2) participation in sport was associated with favorable school-related outcomes, such as lower odds for perceived school stress and tiredness in school, and higher odds of perceived sense of belonging in school and perceived teacher care.

Results from the present study show that current sport participants had higher socioeconomic status (SES) levels than sport dropouts across all sport disciplines, except for adolescents in motorsports. Our findings indicating that participants in tennis and XC skiing have higher SES levels than participants in other sports aligns with results from a repeated cross-sectional study among adults (13). These findings indicate that historical and cultural aspects related to sport participation and socioeconomic class may to some extent be preserved to this day in Norway. Most worrying is our findings showing highest attrition rate among adolescents with the lowest SES levels. Barriers to PA among adolescents are often reported due to the lack of time, lack of motivation, and lack of accessible places (42). On the other hand, a systematic review of qualitative studies reported the main PA barriers and facilitators in the following order: individual factors, social and relational factors, PA nature, life factors and sociocultural and environmental factors

TABLE 3 Binary logistic regressions between sport participation or not (independent variable) and school-related outcomes (dependent variables) for the total sample.

Total sample	School stress	Teacher' support	Sense of belonging at school	Tiredness in school
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
<b>Crude</b>				
Current sport participants (ref)	1	1	1	1
Sport dropouts	0.79 (0.77–0.81)**	1.21 (1.16–1.26)**	1.63 (1.56–1.69)**	0.65 (0.63–0.68)**
<b>Adjusted*</b>				
Current sport participants (ref)	1	1	1	1
Sport dropouts	0.83 (0.81–0.86)**	1.17 (1.12–1.22)**	1.36 (1.31–1.42)**	0.74 (0.71–0.77)**

Adjusted for socioeconomic status and physical activity levels, \* $p < 0.05$ , \*\* $p < 0.01$ .

TABLE 4 Adjusted binary logistic regressions between sport participation or not (independent variable) and school-related outcomes (dependent variables) for boys and girls.

Gender	School stress	Teacher' support	Sense of belonging at school	Tiredness in school
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
<b>Girls</b>				
Current sport participants (ref)	1	1	1	1
Sport dropouts	0.84 (0.80–0.88)**	1.18 (1.11–1.25)**	1.19 (1.12–1.26)**	0.76 (0.72–0.81)**
<b>Boys</b>				
Current sport participants (ref)	1	1	1	1
Sport dropouts	0.94 (0.89–0.98)**	1.09 (1.02–1.15)**	1.38 (1.30–1.48)**	0.80 (0.75–0.85)**

Adjusted for socioeconomic status and physical activity levels, \* $p < 0.05$ , \*\* $p < 0.01$ .

(43). However, in the systematic review and meta-analyses by Owen colleagues (44), investigating the socioeconomic disparity in PA between low and high SES households, found even greater disparity in children than in adolescents. To elucidate, there is a need for concerted efforts to accommodate the complex need and barriers in an early life phase.

While our results revealed favorable school-outcomes and PA among adolescents participating in sport compared to sport dropouts, the picture is complex with several underlying conditions. Besides differences in SES, clear contrasts in PA engagement between groups should be highlighted, as sport participation and higher PA engagement presumably have complementary roles. While PA provide a broad range of physiological beneficial responses that could be beneficial in a school setting such as enhancing cognitive function, memory and attention (45–47), sport participation presumably provides structural long-term engagement, collaboration with peers and goal setting, which are also transferable to a school context (2, 48). Hence, both PA engagement and sport participation seem to mutually reinforce their positive impact on academic outcomes. Moreover, it is interesting that among adolescents currently participating in sport, fewer reported tiredness in school compared to sport dropouts, despite several mandatory practices during the weekdays, often late at night. These findings align with previous research revealing overall better health-related outcomes among adolescent in sport vs. adolescents not in organized sport, despite sport participants even reported less sleep duration than adolescents not active in sport (49).

Despite robust associations of favorable school outcomes among current sport participants for the total sample, which aligns with current research evidence underscoring the importance of PA engagement for positive relations to academic performance (23–28). It is interesting to discuss the nuances according to gender. Being a current sport participant revealed twice as high odds for higher perceived sense of belonging of the school environment among boys than in girls. These findings are presumably attributed by social and cultural aspects in adolescence. Boys in adolescence tend to be more competitive in sport compared to girls and physical competitiveness and capacities among boys are socially linked to a source of pride and admiration (50, 51). Therefore, the cultural valuation of being a sport participant can in some cases be boys-dominated and provide more explicit status. However, being a sport participant among girls and seems to be more strongly associated with lower odds of perceived school stress, which might indicate that sport participation, especially in girls is an essential arena for building resilience and capacities that could reduce the feeling of stress, which is a key finding as girls tend to report more perceived school stress compared to boys during adolescence (52, 53). In addition, girls reported higher odds of perceived teacher care than boys, which may presumably be explained to some extent by larger vocabulary (54) and often more openness regarding emotional struggles and concerns among girls than boys (55). These findings are in accordance with the research literature, revealing that girls tend to be more active in the classrooms and higher engagement in teacher-student relations (56–58) regardless of sport participation.

## 4.1 Implications

This paper expands upon previous research by identifying SES levels across sport disciplines and uncovering the highest attrition rate among adolescents from the lowest SES levels and further provide insight into how sport participation impacts academic outcomes, while adjusting for relevant covariates. Although high dropout rates from sport activities during adolescence are expected, high attrition rates among low SES groups are especially concerning as they face additional challenges that may partly be reduced due to the positive impact participating in PA may have in tackling everyday life in this critical life phase. In the period ahead, policymakers and decision-makers should prioritize coordinated efforts to facilitate sport participation, particularly among adolescents from lower socioeconomic backgrounds. Such targeted strategies are essential for promoting equity in access to PA. Furthermore, future observational and experimental research is needed to better understand the mechanisms underlying participation disparities and to evaluate the effectiveness of intervention strategies.

## 4.2 Strengths and limitations

Several key factors have contributed to the study's credibility. The study benefits from using a sample aggregated from all parts of Norway, which increases the validity and representativeness of the findings. Moreover, the high response rate and large sample size should be considered a strength. Further, the Ungdata study have a stringent and rigor procedure of data cleaning (34), which identifies and excludes unserious responses. These well-established procedures mitigate corrupt data and thereby increase the study's credibility (60). Finally, by following the STROBE guidelines, this study provides structural transparency in the reporting, which enhances the reliability of the study.

Although data were aggregated over time, this study is using a cross-sectional design, which does not provide any causal interactions nor understanding of trends over time. In addition, cross-sectional study design relies on self-reported data, which introduces potential biases such as like recall and social desirability bias. Recall bias and social desirability bias could be relevant even though the adolescents reported their PA levels and school-related factors on a weekly basis, as some might for instance overreport their PA levels to better fit in (59). Moreover, as we needed to exclude certain demographic variables (e.g., age, ethnicity, municipality) due to GDPR restrictions, this limits the ability to control for important confounders. Further, the variable tiredness in school had a lower response rate (67.7%), which should be consider a limitation. Grouping certain sports under the broad "Other" category due to small sample sizes may mask sport-specific differences. One major limitation is that key measures such as PA, and school-related outcomes, rely on single-item self-reports, which lack formal validation. Although the interpretation of data could be easier to convey with dichotomization of categoric data, it reduces the statistical power and obscures more nuanced relationships, which should be considered a limitation. Adolescents currently

participating in sport may be more engaged or interested in questions related to PA compared to sport dropouts, which could introduce response bias and should therefore be considered a limitation of the study. Due to the limitation in the dataset, we were not able to assess the duration or intensity of previous participation nor reasons for quitting, or whether individuals transitioned to other forms of activity. Clearer insight in abovementioned aspects would provide a more holistic picture of dropout's pattern among Norwegian adolescents. The rationale for dichotomize was underpinned by the need for clear interpretation of regressions analyses across school-related outcome variables, as it simplifies the implications of findings to a broader readership, such as teacher, trainers, stakeholders and decision makers. Considering the large sample size and statistical strength, we allowed us to focus on the general positive or negative response (e.g., agree vs. disagree) rather than minor variations of agreement of disagreement. However, dichotomization may mask nuances and could therefore be considered a limitation. In this study period, the pandemic restrictions may have disproportionately affected adolescents' sport participation, SES and school-related factors. Despite the universal restrictions in school, adolescents from lower SES backgrounds may have faced greater barrier in sport participation and school, due to less access to resources in their home setting. These contextual factors may limit the generalizability of our findings to non-pandemic periods.

## 5 Conclusions

In conclusion, this study unveiled higher SES among adolescents in sport than in sport dropouts, underscoring the importance of promoting accessible and affordable sport opportunities during adolescence. Current sport participation was associated with favorable school-related outcomes compared to sport dropouts, such as lower odds for perceived school stress and tiredness in school, and higher odds of perceived sense of belonging in school and perceived teacher care. This indicates a positive role of sport participation in fostering positive school experiences which should be considered when policymakers prioritize future strategies. It is concerning that the highest attrition rate was uncovered among adolescents derived from the lowest SES levels. Thus, future observational and experimental studies are suggested, with the hope of focusing on concerted efforts to reduce barriers for sport participation and PA engagement in adolescence.

## Data availability statement

Publicly available datasets were analyzed in this study. This data can be found here: Data supporting the results of this study is available upon request from the Norwegian Agency for Shared Services in Education and Research (SIKT) and NOVA (40). Reference to dataset from SIKT: [<https://doi.org/10.18712/NSD-NSD3157-V1>]. Request to access these datasets should be directed to <https://sikt.no> and <https://www.ungdata.no/den-nasjonale-databasen/>.

## Author contributions

EG: Resources, Project administration, Investigation, Conceptualization, Methodology, Writing – original draft, Formal analysis, Software, Writing – review & editing. ØS: Writing – review & editing, Methodology, Writing – original draft, Investigation. SO: Methodology, Investigation, Writing – review & editing, Writing – original draft. MH: Investigation, Writing – review & editing, Writing – original draft, Methodology. TS: Writing – review & editing, Methodology, Writing – original draft, Investigation.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

## Generative AI statement

The author(s) declare that no Generative AI was used in the creation of this manuscript.

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## Supplementary material

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fspor.2025.1613391/full#supplementary-material>



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Appendix 1

Sample size and response rate in study variables.

Study variable	N	Response rate
SES	89,939	99.8%
School stress	89,819	99.7%
Teacher care	89,199	99.0%
Sense of belonging	89,025	98.8%
Tiredness in school	60,982	67.7%
Leisure time PA	88,321	98.0%
PA levels	89,598	99.5%
Gender	88,696	98.5%