

## Association Between Participating in Noncompetitive or Competitive Sports and Mental Health among Adolescents – a Norwegian Population-based Cross-sectional Study

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### Abstract

**Background:** Mental health problems in adolescents have become a major public health challenge in many western countries. Many adolescents participate in noncompetitive or competitive sports for leisure. The aim of this study was to examine the association between participation in noncompetitive or competitive sports and mental health problems among Norwegian adolescents.

**Method:** Data from a cross-sectional survey conducted among Norwegian junior high (N=9414) and high school students (N=10,571) aged 13 to 22 years were examined. The Strengths and Difficulties Questionnaire (SDQ) was used for measuring mental health problems, in the form of total symptom scores and impact on daily life. Participation in sports was categorized as follows: 1) not participating; 2) participating in noncompetitive sports; and 3) participating in competitive sports. Sports were divided into individual and team sports. Weekly exercise, healthy diet, and number of friends were investigated as mediating factors, and age, gender, and perceived economic status were controlled for in the analysis.

**Results:** Adolescents participating in either noncompetitive or competitive sports had fewer total symptoms and less impact of problems on their daily life compared with those not participating in sports. In particular, participation in team sports as opposed to participation in individual sports seemed to be associated with fewer mental health problems. Weekly exercise, healthy diet, and number of friends were found to be partially mediating factors, explaining some, but not all, of the association between participation in either sports group. Participation in competitive sports, especially, was associated with fewer mental health problems.

**Conclusions:** Participation in sports, either noncompetitive or competitive, is associated with fewer mental health problems in adolescents. This negative association is strongest for those participating in competitive sports. Further research is needed to explore the mechanisms underlying this relationship.

**Keywords:** psychological distress; physical activity; youth; team sports; exercise

### Introduction

Adolescence is a difficult period for many, and there may be an increased risk of mental health problems developing during those vulnerable years, with a likelihood of such problems persisting well into adulthood. It has been discovered that half of all lifetime cases of mental health disorders emerge by age 14 (1). It is therefore important to examine

factors that may prevent the development of mental problems or may alleviate problems that have already manifested. Participation in noncompetitive or competitive sports, whether in teams or individually, is such a factor that, although optional, can be a part of a young person's everyday life. In Norway, as much as 85% of children and adolescents participate

in organized sports during their childhood and youth (2).

Sports participation increases physical fitness and enhances physical health (3). Less attention has been given to the influence of participation in sports, either noncompetitive or competitive, on mental health during adolescence.

Research showing a positive effect of physical activity on mental health among adolescents is well documented (4-8). A study conducted in Iceland revealed that adolescents who often practiced sports had a more positive body image and were more likely to report a healthy mental condition (9). Further, emotional problems and peer problems have been found to be inversely associated with physical activity in adolescents (10).

Lower incidences of anxiety and depression have been found among adolescents participating in team sports, as compared with those participating in individual sports (11). In addition, Taliaferro et al. (6) found a lower incidence of suicidal thoughts among adolescents participating in team sports. High self-esteem and social support have been found to mediate the association between participation in team sports and lower depression and suicidal tendencies (12). Thus, it has been suggested that the social aspect linked to group exercise in team sports may be the key factor contributing to positive mental health outcomes among adolescents participating in competitive sports (11). Adolescents participating in organized sports in Norway report having the highest number of friends (2), indicating that the strong social support from sports participation might be an important protective factor against the development of mental health problems.

Other factors that have been attributed to the association between participation in sports and good mental health are healthy diet and physical activity. Baumert et al. (13) found adolescent athletes to be more likely to engage in healthy dietary behaviors, and other studies have found a healthy diet to be associated with fewer mental health problems (14,15).

At the same time, there are reasons to question whether participation in competitive sports lays tremendous stress on competition and achievement in a way that does not promote mental health. Participation in sports, and body focus, has, in some studies, been shown to increase the likelihood of developing mental health problems such as eating disorders (16,17), although the association is debated (18).

Parents' socioeconomic status (SES) may be a factor affecting adolescent sports participation, as participation in noncompetitive and, in particular, competitive sports is associated with expense.

Adolescent participation in organized sports in the US was positively associated with higher SES (19,20). As high SES is also associated with fewer mental health problems among adolescents (21), SES may be a confounder variable that affects both sports participation and mental health.

There is a need to expand the knowledge base on the role that participation in competitive and noncompetitive sports plays in mental health problems during adolescent life. The aim of this study was to first examine the association between participation in either noncompetitive or competitive sports and mental health problems in a large representative sample of Norwegian adolescents while controlling for SES. Additionally, the aim was to investigate whether a possible association could be explained either partially or wholly through the mediating role of the variables *weekly exercise, healthy diet, and number of friends*. Further, the study was to investigate whether the possible associations between participation in either noncompetitive or competitive sports and mental health problems differed on the basis of whether it was an individual or a team sport. Finally, the aim was to examine how these characteristics differed, with special emphasis on participation in competitive as opposed to participation in noncompetitive sports.

## Materials and methods

### *Design and subjects*

Data were derived from a cross-sectional health and lifestyle survey undertaken in Akershus County in 2002 by the Norwegian Health Services Research Centre. All 22 municipalities in the county, which surrounds the Norwegian capital, participated. Classes at each junior high school and high school in the county were randomly selected to obtain a sample representative of the county as a whole. Akershus County has urban, suburban, and rural areas with clear differences in SES.

The survey was conducted after obtaining approval from the regional Ethics Committee. Participation in the study was anonymous and voluntary and based on individual informed consent from each student. Parents of students in junior high school were informed and their consent was taken. The students completed the questionnaire during school hours under the supervision of a trained teacher. Students who had completed junior high school but worked as apprentices or for other reasons did not attend high school were excluded because of economic and practical reasons. The response rate in junior high school was 86% (N=9414) and that in high school was 79% (N=10,571). Students older than 22 years were excluded from our sample.

The sample included 19,567 students, aged 13 to 22 years (mean age 16.2), in junior high school (8th to 10th grade) or high school (1st to 3rd grade); among them, 10,002 (51%) were boys and 9565 (49%) were girls.

### Measures

Mental health problems were measured by means of the self-reported Strength and Difficulties Questionnaire (SDQ) developed by Goodman (22). The SDQ (25 items) consists of five subscales covering emotional problems, conduct, hyperactivity, peer problems, and prosocial behavior. In this study, the subscale prosocial behavior was not included. Each subscale consisted of five items and responses were given on a three-point ordinal scale: “not true”; “somewhat true”; and “certainly true.” A total symptom score was calculated on the basis of the four subscales (sdqinfo.com). High scores indicated more problematic attributes.

Norwegian cutoffs suggested by Van Roy (23) were used in order to comply with Goodman’s recommendation of an 80-10-10% distribution of normal, borderline, and abnormal cases (24). The SDQ variables were further dichotomized into the values *normal* and *borderline/abnormal*.

An extended version of the SDQ includes a self-reported impact supplement that assesses chronicity, distress, social impairment (effect on daily life at home, at school, on interaction with friends, and on leisure activities), and burden on others (25). Respondents were asked whether they perceived problems with emotions, concentration, behavior, and relationship with others. Responses were scored on a three-point scale (from no=0, to minor=1, to severe=3). Those responding positively to at least having minor problems were asked to answer the remaining questions relevant to the concept of impact, as defined by DSM-IV (26). The impact questions had four response categories (not at all=0; only a little=1; somewhat=2; and a great deal=3). Scores on the distress and the four impairment questions were summed to generate an impact score, ranging from 0 to 10. The SDQ impact score was further dichotomized such that the value 0= *normal* (coded 0) and >0= *borderline/abnormal* (coded 1).

In the current study, Cronbach’s alpha for the SDQ scale in total (20 items) was .78, and those for the subscales were as follows: emotional, .70; conduct, .57; hyperactivity, .65; and peer problems, .62. The SDQ impact scale gives a Cronbach’s alpha of .99. For variables containing few items, such as the SDQ subscales, values above .6 are considered acceptable (27).

Participation in competitive sports was measured with the question “Do you participate in competitive

sports throughout the year?” Response options were *no/yes*.

The respondents were asked to indicate the type of sport they participated in from a list of 20 individual and team sports. The reported sports were grouped into two categories – individual and team sports – and together formed the variable *type of sport*. Sports participation was coded as follows: 0=no sport, 1=individual sport, and 2=team sports. Those participating in both team and individual sports were classified in this study under team sports, as participants in team sports are often encouraged to participate in individual sports to strengthen individual skills.

The question concerning competitive sports and type of sport was combined for this study into the variable sports participation. Specifically for this study we have defined this variable as follows: not participating in sports =1; participating in noncompetitive sports (individually or in team) =2; and participating in competitive sports (individually or in team) =3. As can be seen in Table 1, the proportion of adolescents reporting that they never exercise or exercise once a month was considerably higher among those participating in noncompetitive sports than among those in competitive sports. Further investigation (data not shown) revealed that these adolescents were primarily those participating in individual sports. Therefore, although individual noncompetitive sports are primarily a part of organized sports, we could not rule out a certain percentage that were participating in non-organized sports activities (such as bicycling or snowboarding) and therefore chose to name this category noncompetitive sports participation.

*Healthy diet* was measured using nine questions on how often the respondents consumed different healthy and unhealthy food products/groups (vegetables, fruit, whole-grain bread, milk/yoghurt, potatoes, sweets, coke/soda, hamburger/french fries, and chips). Response options to these questions were as follows: rarely or never; less than once a week; several times a week; daily; several times a day. Each question was dichotomized into 0 (never or rarely – less than once a week) or 1 (several times a week or more). Vegetables, fruit, whole-grain bread, milk/yoghurt and potatoes were added together to form a healthy diet variable, such that only the response “several times a week or more” qualified as a yes.

*Weekly exercise* was measured with a question on the number of times a week the participants engaged in sports or exercise to the extent that they became breathless and/or began sweating; there were seven response options to this question (see Table 1).

**TABLE 1.** Prevalence of different characteristics in the study population, according to sports participation

	No participation in sports		Noncompetitive sports		Competitive sports		Total	
	N	%	N	%	N	%	N	%
<i>Gender</i>								
Boy	1525 <sub>a</sub>	50	3426 <sub>b</sub>	42.9	4781 <sub>c</sub>	58.3	9732	50.6
Girl	1525 <sub>a</sub>	50	4553 <sub>b</sub>	57.1	3425 <sub>c</sub>	41.7	9503	49.4
Age (Mean (SE))	3066	16.8 (0.03)	8007	16.5 (0.02)	8234	15.89 (0.02)	19,307	16.2 (0.01)
<i>How well off do you think your family is?</i>								
Poor	86 <sub>a</sub>	2.8	126 <sub>b</sub>	1.6	76 <sub>c</sub>	0.9	288	1.5
Not very well off	285 <sub>a</sub>	9.4	507 <sub>b</sub>	6.4	379 <sub>c</sub>	4.6	1171	6.1
Average well off	1048 <sub>a</sub>	34.6	2647 <sub>a</sub>	33.2	2345 <sub>b</sub>	28.7	6040	31.5
Well off	1255 <sub>a</sub>	41.4	3683 <sub>b</sub>	46.2	4167 <sub>c</sub>	50.9	9105	47.5
Very well off	354 <sub>a</sub>	11.7	1007 <sub>a</sub>	12.6	1216 <sub>b</sub>	14.9	2577	13.4
<i>Total symptom score</i>								
Normal	2116 <sub>a</sub>	73	6451 <sub>b</sub>	81.3	6948 <sub>c</sub>	85.1	15,515	81.7
Borderline/abnormal	782 <sub>a</sub>	27	1480 <sub>b</sub>	18.7	1221 <sub>c</sub>	14.9	3483	18.3
<i>Impact on daily life</i>								
Normal	2024 <sub>a</sub>	70.2	5943 <sub>b</sub>	75.3	6704 <sub>c</sub>	82.6	14,671	77.7
Borderline/abnormal	860 <sub>a</sub>	29.8	1948 <sub>b</sub>	24.7	1410 <sub>c</sub>	17.4	4218	22.3
<i>Emotional problems</i>								
Normal	2058 <sub>a</sub>	70.5	6126 <sub>b</sub>	77.1	6910 <sub>c</sub>	84.5	15,094	79.3
Borderline/abnormal	860 <sub>a</sub>	29.5	1817 <sub>b</sub>	22.9	1264 <sub>c</sub>	15.5	3941	20.7
<i>Conduct problems</i>								
Normal	2310 <sub>a</sub>	79.2	6609 <sub>b</sub>	83.2	6841 <sub>b</sub>	83.6	15,760	82.8
Borderline/abnormal	608 <sub>a</sub>	20.8	1335 <sub>b</sub>	16.8	1339 <sub>b</sub>	16.4	3282	17.2
<i>Hyperactivity</i>								
Normal	2388 <sub>a</sub>	82.2	6684 <sub>b</sub>	84.2	7015 <sub>c</sub>	85.8	16,087	84.6
Borderline/abnormal	516 <sub>a</sub>	17.8	1252 <sub>b</sub>	15.8	1158 <sub>c</sub>	14.2	2926	15.4
<i>Peer problems</i>								
Normal	2243 <sub>a</sub>	77.2	6691 <sub>b</sub>	84.3	7130 <sub>c</sub>	87.2	16,064	84.5
Borderline/abnormal	662 <sub>a</sub>	22.8	1250 <sub>b</sub>	15.7	1042 <sub>c</sub>	12.8	2954	15.5
<i>Weekly exercise</i>								
Never	708 <sub>a</sub>	25.0	469 <sub>b</sub>	5.9	37 <sub>c</sub>	0.4	1214	6.4
Less than monthly	449 <sub>a</sub>	15.8	481 <sub>b</sub>	6	33 <sub>c</sub>	0.4	963	5.1
Once a month	259 <sub>a</sub>	9.1	510 <sub>b</sub>	6.4	53 <sub>c</sub>	0.6	822	4.3
Once a week	745 <sub>a</sub>	26.3	2101 <sub>a</sub>	26.4	506 <sub>b</sub>	6.1	3352	17.6
2–3 times a week	473 <sub>a</sub>	16.7	2907 <sub>b</sub>	36.5	3348 <sub>c</sub>	40.7	6728	35.4
4–6 times a week	111 <sub>a</sub>	3.9	1035 <sub>b</sub>	13	3029 <sub>c</sub>	36.8	4175	21.9
Every day	88 <sub>a</sub>	3.1	464 <sub>b</sub>	5.8	1222 <sub>c</sub>	14.9	1774	9.3
<i>Healthy diet</i>								
Unhealthy	2113 <sub>a</sub>	83.1	5436 <sub>b</sub>	73.0	5610 <sub>b</sub>	72.8	13,159	74.3
Healthy	431 <sub>a</sub>	16.9	2015 <sub>b</sub>	27.0	2095 <sub>b</sub>	27.2	4541	25.7
<i>How many good friends do you have in your class?</i>								
None	239 <sub>a</sub>	8	402 <sub>b</sub>	5.1	263 <sub>c</sub>	3.2	904	4.8
1	330 <sub>a</sub>	11.1	696 <sub>b</sub>	8.8	444 <sub>c</sub>	5.5	1470	7.7
2–3	1061 <sub>a</sub>	35.6	2511 <sub>b</sub>	31.8	2213 <sub>c</sub>	27.2	5785	30.4
4–5	571 <sub>a</sub>	19.2	1817 <sub>b</sub>	23	1835 <sub>b</sub>	22.5	4223	22.2
More than 5	778 <sub>a</sub>	26.1	2464 <sub>b</sub>	31.2	3388 <sub>c</sub>	41.6	6630	34.9

Note: Values in the same row and sub-table not sharing the same subscript are significantly different at  $p < .05$  in the two-sided test of equality for column proportions. Cells with no subscript are not included in the test. Tests assume equal variances. Tests are adjusted for all pairwise comparisons within a row of each innermost sub-table using Bonferroni correction.

*Number of friends* was measured with the question “How many good friends do you have in your school grade?” Response options were none, 1, 2 or 3, 4 or 5, and more than 5.

The adolescent participants’ age and gender were controlled for in the analyses. To obtain a proxy for

SES, the adolescents’ perception of their family income or economic situation was obtained using the question “How well off do you think your family is?” There were five response options to this question (see Table 1).

### Statistical analyses

All analyses were performed using SPSS, version 23.0. Hierarchical logistic regressions were used to investigate the association between *sports participation* and mental health problems in terms of SDQ total symptom score, impact on daily life, and the four mental health subscales. Background variables included in the analysis as controls – such as *age*, *gender*, and *perceived economic situation* – were entered in step 1. Sports participation was entered as a categorical variable in step 2. The three mediators were entered in step 3. In some of the analyses they were entered individually, whereas in others they were entered simultaneously. Mediation (of *weekly exercise*, *healthy diet*, and *number of friends*) was determined by examining significant changes in the relationship between *sports participation* and mental health problems after the inclusion of the proposed mediator. The mediating role of weekly exercise, healthy diet, and number of friends was examined by entering all mediators either individually or simultaneously in the PROCESS module in SPSS (28), model 4. Mediation was tested for significance for the direct pathway in addition to the indirect pathways using the bootstrap method and Sobel test.

In multicollinearity testing, the tolerance values were all above .645, and the variance inflation factor was below 1.551 for all items applied in the analysis, which did not violate the multicollinearity assumption (27). The Spearman correlations were consistently minimal, except for between type of sport and participation in competitive sports, for which a correlation of .52 was noted, and between weekly exercise and competitive sports, for which a correlation of .47 was noted.

### Results

Among the participating adolescents, 18% reported a borderline or abnormal total symptom score and 22% indicated that perceived problems had an impact on functioning in daily life. For the subscales, the prevalence of borderline/abnormal was between 15% and 20%. Table 1 shows the prevalence of mental health problems in the three groups “no participation in sports,” “participation in noncompetitive sports,” and “participation in competitive sports.” The general pattern seems to indicate a decreased likelihood of mental health problems in the groups participating in sports, whether noncompetitive or competitive. The trend is especially evident in the group participating in competitive sports.

The majority of adolescents participated in sports; only 16% did not; 41% participated in noncompetitive sports versus 43% in competitive sports. Table 1 shows that boys to a greater degree

participated in competitive sports, and girls in noncompetitive sports. The mean age of adolescents in the group participating in competitive sports was 15.9 years, that in the group participating in noncompetitive sports was 16.5, and that in the group not participating in sports was 16.8 years. Adolescents participating in sports, whether competitive or noncompetitive, followed a healthier diet. Those participating in sports, especially in competitive sports, had, to a greater degree, more than five friends and exercised more frequently than did adolescents not participating in sports. Fewer participants in the groups participating in noncompetitive or competitive sports reported being poor or not very well off and more reported being well off or very well off. This trend was most evident among those participating in competitive sports.

More adolescents reported participating in individual sports (45%) as opposed to team sports (39%) or not participating in sports (16%). Very few adolescents who reported participating in individual sports actually competed. Only 2380 (27%) out of a total of 8670 who participated in individual sports reported that they competed. In team sports 5854 (78%) reported competing, out of a total of 7410.

The relationship between adolescents' participation in noncompetitive or competitive sports and total symptom score and impact of problems on daily life is presented in Table 2. The regression analysis shows a significant negative association ( $p < .001$ ) between participation in sports, whether competitive or noncompetitive, and total symptom score, as well as impact of problems on daily life ( $p < .001$ ). In all cases, the associations in those participating in competitive sports were more negative.

Adding the three potential mediators (*weekly exercise*, *healthy diet*, and *number of friends*) individually in step 3 reduced the negative associations between participation in sports and mental health problems. This was seen for all three mediators, but most prominently for weekly exercise. The three mediators were tested for their role in the relationship using the PROCESS module (28). The results indicated that both the direct and indirect effects of all mediators were significant, both for total symptom score and for impact on daily life. Although a part of the total effect is explained by all mediators separately, there remains a direct relationship between mental health problems and participation in either sports group, but especially participation in competitive sports.



**TABLE 2.** Separate logistic regressions examining the association between participation in either noncompetitive sports or competitive sports against the reference of non-participation in sports, and total symptom score and impact of these symptoms on daily life. These associations are shown as a function of the three types of mediators

	Total symptom score		Impact on daily life	
	Noncompetitive sports OR (95% CI)	Competitive sports OR (95% CI)	Noncompetitive sports OR (95% CI)	Competitive sports OR (95% CI)
	N=18,671		N=18,574	
<i>Step 2</i>				
Unadjusted	0.629 (0.567–0.698)***	0.487 (0.437–0.542)***	0.796 (0.721–0.879)***	0.605 (0.545–0.671)***
<i>Step 3</i>				
Adjusted for <i>weekly exercise</i>	0.759 (0.679–0.848)***	0.645 (0.566–0.735)***	0.998 (0.844–1.044) <sup>NS</sup>	0.799 (0.705–0.905)***
Dir/Bts/Sobel	S/S/S	S/S/S	S/S/S	S/S/S
	N=17,468		N=17,329	
<i>Step 2</i>				
Unadjusted	0.630 (0.565–.703)***	0.483 (0.431–0.452)***	0.774 (0.699–0.859)***	0.576 (0.516–0.642)***
<i>Step 3</i>				
Adjusted for <i>healthy diet</i>	0.661 (0.592–0.737)***	0.512 (0.457–0.575)***	0.797 (0.719–0.884)***	0.597 (0.535–0.606)***
Dir/Bts/Sobel	S/S/S	S/S/S	S/S/S	S/S/S
	N=18,583		N= 18,468	
<i>Step 2</i>				
Unadjusted <sup>†</sup>	0.620 (0.559–0.687)***	0.477 (0.429–0.532)***	0.800 (0.725–0.883)***	0.607 (0.547–0.673)***
<i>Step 3</i>				
Adjusted for <i>number of friends</i>	0.647 (0.583–0.718)***	0.521 (0.467–0.581)**	0.837 (0.758–0.925)***	0.659 (0.593–0.732)***
Dir/Bts/Sobel	S/S/S	S/S/S	S/S/S	S/S/S

S, significant; Dir, direct effect; Bts, Bootstrap; Sob, Sobel test.

The mediators' weekly exercise, healthy diet, and number of friends were entered one by one in step 3.

<sup>†</sup>These values are adjusted for age, gender, and perceived economic situation in step 1. In step 2 sports participation is added. In step 3, sports participation is adjusted for weekly exercise, healthy diet, and number of friends individually. All tests were performed in the module PROCESS for SPSS.

\*\*\* $p > .001$ , \*\* $p > .010$ , \* $p > .050$

**TABLE 3.** Four separate logistic regression analyses examining associations between participation in either noncompetitive or competitive sports against the reference of non-participation in sports, and the four subscales of the SDQ (emotional problems, conduct problems, hyperactivity, and peer problems)

	Emotional N=17,473 OR (95% CI)	Conduct N=17,482 OR (95% CI)	Hyperactivity N=17,464 OR (95% CI)	Peer problems N=17,471 OR (95% CI)
<i>Step 2<sup>†</sup></i>				
Noncompetitive sports	0.689 (0.619–0.768)***	0.800 (0.709–0.903)***	0.853 (0.754–0.964)*	0.641 (0.570–0.720)***
<i>Step 2</i>				
Competitive sports	0.503 (0.449–0.564)***	0.638 (0.563–0.722)***	0.773 (0.681–0.878)***	0.450 (0.398–0.509)***
<i>Step 3</i>				
Noncompetitive sports	0.803 (0.715–0.903)***	1.031 (0.903–01.176) <sup>NS</sup>	1.038 (0.909–01.187) <sup>NS</sup>	0.787 (0.691–0.897)***
<i>Step 3</i>				
Competitive sports	0.655 (0.570–00.751)***	0.906 (0.779–01.05) <sup>NS</sup>	1.008 (0.863–01.177) <sup>NS</sup>	0.656 (0.563–0.764)***

The variables weekly exercise, healthy diet, and number of friends are added in step 3 simultaneously to investigate their possible mediating effect. <sup>†</sup>These values are adjusted for age, gender, and perceived economic situation in step 1. In step 2 sports participation is added. In step 3, sports participation is adjusted for weekly exercise, healthy diet, and number of friends simultaneously.

\*\*\* $p > .001$ , \*\* $p > .010$ , \* $p > .050$

In a separate series of logistic regression analyses (Table 3) examining the association between participation in sports, whether competitive or noncompetitive, and the four subscales of SDQ, participation in competitive sports was significantly associated with the variables emotional problems, conduct problems, peer problems, and hyperactivity. After simultaneously adjusting for *weekly exercise*, *healthy diet*, and *number of friends* the association with both conduct problems and hyperactivity was no longer significant for either group, indicating possibly full mediation. The association between participation in sports and the variables emotional

problems and peer problems was reduced, but was still significant ( $p < .001$ ).

Table 4 presents the results of the logistic regression analysis examining the relationship between *type of sports* and total symptom score and its impact on daily life. Results show weaker associations between total symptom score, and impact on daily life, and participation in either noncompetitive or competitive sports in adolescents participating in individual sports as compared with those participating in team sports. The differences are especially noticeable in those participating in competitive sports.

**TABLE 4.** Separate logistic regressions examining the association between participation in noncompetitive or competitive sports against the reference of non-participation in sports, and total symptom score and the impact of symptoms on daily life in separate analyses for those participating in individual sports and those participating in team sports. These associations are shown as a function of the three types of mediators

	Total symptom score		Impact on daily life	
	Noncompetitive sports OR (95% CI)	Competitive sports OR (95% CI)	Noncompetitive sports OR (95% CI)	Competitive sports OR (95% CI)
<b>Individual sports</b>				
	N=11,335		N=11,284	
Unadjusted	0.639 (0.574–0.712)***	0.578 (0.502–0.666)***	0.786 (0.710–0.871)***	0.765 (0.670–0.873)***
Adjusted for <i>weekly exercise</i>	0.758 (0.675–0.850)***	0.730 (0.622–0.856)***	0.914 (0.820–1.020) <sup>NS</sup>	0.978 (0.842–1.136) <sup>NS</sup>
Dir/Bts/Sobel	S/S/S	S/S/S	S/S/S	NS/S/S
	N=10,554		N=10,467	
Unadjusted	0.644 (0.575–0.720)***	0.567 (0.489–0.658)***	0.774 (0.695–0.861)***	0.716 (0.623–0.822)***
Adjusted for <i>healthy diet</i>	0.676 (0.604–0.758)***	0.609 (0.524–0.708)***	0.798 (0.717–0.888)***	0.747 (0.650–0.859)***
Dir/Bts/Sobel	S/S/S	S/S/S	S/S/S	S/S/S
	N=11,307		N=11,238	
Unadjusted <sup>†</sup>	0.629 (0.566–0.700)***	0.571 (0.496–0.657)***	0.789 (0.713–0.874)***	0.771 (0.675–0.880)***
Adjusted for <i>number of friends</i>	0.657 (0.589–0.732)***	0.600 (0.520–0.692)***	0.824 (0.743–0.914)***	0.810 (0.708–0.925)**
Dir/Bts/Sobel	S/S/S	S/S/S	S/S/S	S/S/S
<b>Team sports</b>				
	N=10,075		N=10,027	
Unadjusted	0.590 (0.504–0.692)***	0.455 (0.404–0.513)***	0.845 (0.729–0.981)*	0.551 (0.490–0.618)***
Adjusted for <i>weekly exercise</i>	0.706 (0.593–0.842)***	0.574 (0.486–0.678)***	0.998 (0.846–0.1.177) <sup>NS</sup>	0.691 (0.588–0.812)***
Dir/Bts/Sobel	S/S/S	S/S/S	NS/S/S	S/S/S
	N=9412		N=9338	
Unadjusted	0.582 (0.493–0.688)***	0.456 (0.402–0.517)***	0.779 (0.666–0.910)**	0.530 (0.469–0.598)***
Adjusted for <i>healthy diet</i>	0.607 (0.513–0.718)***	0.483 (0.425–0.549)***	0.799 (0.683–0.934)**	0.547 (0.484–0.618)***
Dir/Bts/Sobel	S/S/S	S/S/S	S/S/S	S/S/S
	N=10,082		N=10,018	
Unadjusted	0.587 (0.501–0.688)***	0.448 (0.398–0.505)***	0.854 (0.736–0.990)*	0.551 (0.491–0.619)***
Adjusted for <i>number of friends</i>	0.612 (0.522–0.718)***	0.492 (0.436–0.556)**	0.897 (0.772–0.1.043) <sup>NS</sup>	0.606 (0.539–0.682)***
Dir/Bts/Sobel	S/S/S	S/S/S	NS/S/S	S/S/S

S, significant; NS, not significant; Dir, direct effect; Bts, Bootstrap; Sob= Sobel test.

The potentially mediating variables weekly exercise, healthy diet, and number of friends are added in step 3 individually.

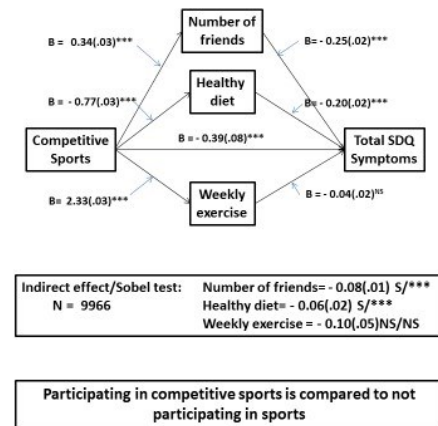
<sup>†</sup>These values are adjusted for age, gender, and perceived economic situation in step 1. In step 2 sports participation is added. In step 3, sports participation is adjusted for weekly exercise, healthy diet, and number of friends simultaneously. Bootstrapping and Sobel test were carried out in the module PROCESS for SPSS.

\*\*\* $p > .001$ , \*\* $p > .010$ , \* $p > .050$

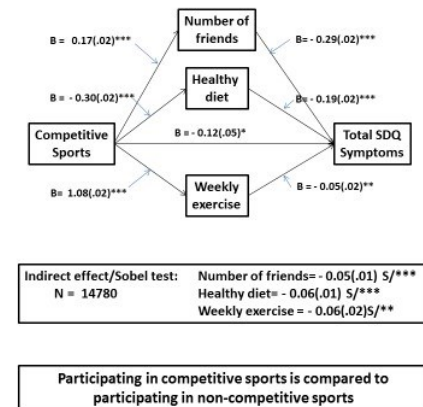
The total symptom score and its impact on daily life were significantly lower among those participating in team sports ( $p < .005$ ) (see Table 4). *Weekly exercise*, *healthy diet*, and *number of friends* were then included individually to investigate whether the associations changed upon addition of the mediators. Despite a decline in significance in the association between participation in either noncompetitive or competitive sports and total symptom score in those participating in team sports, the three regressions remained significant ( $p < .001$ ), indicating only a partial mediation of all three factors. The results of the mediation analysis indicated a significant direct and indirect relationship between participation in either noncompetitive or competitive sports and total symptom score for all three mediators. There was a weaker association between sports participation and impact on daily life than was seen for total symptom scores. The mediation analysis confirmed the significance of both the direct and the indirect pathways for all three mediators indicating only a partial mediation; however, the differences in odds ratios before and after inclusion of the mediators were quite small. For those participating in noncompetitive sports, there was a nonsignificant direct association when weekly exercise or number of friends was included, indicating full mediation.

As shown in Figures 1 and 2, *weekly exercise*, *healthy diet*, and *number of friends*, all served as significant mediators in the association between participating in competitive sports and total symptom score. These associations were seen when comparing participation in competitive sports with nonparticipation in sports (see Figure 1) as well as with participation in noncompetitive sports (see Figure 2). Participating in competitive sports was positively associated with all three mediators, with the relationship with weekly exercise being the strongest. It is not surprising that the relationship was stronger when comparing participation in competitive sports with nonparticipation in sports than when comparing with participation in noncompetitive sports. However, it is of interest that the relationships were still significant when comparing participation in competitive sports with participation in noncompetitive sports. The association between the three mediators and total symptom score was essentially the same regardless of the control.

**FIGURE 1.** Mediation analysis using logistic regression examining associations between adolescents' participation in competitive sports and Strengths and Difficulties Questionnaire total symptoms, and the mediating role of number of friends, healthy diet, and weekly exercise, when participation in competitive sports is compared with nonparticipation in sports. Controlled for gender, age, and perceived socioeconomic status.



**FIGURE 2.** Mediation analysis using logistic regression examining associations between adolescents' participation in competitive sports and Strengths and Difficulties Questionnaire total symptoms, and the mediating role of number of friends, healthy diet, and weekly exercise, when participation in competitive sports is compared with participation in noncompetitive sports. Controlled for gender, age, and perceived socioeconomic status.



## Discussion

There is high degree of participation in sports among adolescents in Norway. Only 16% of adolescents in this study did not participate in sports; 41% participated in noncompetitive sports and 43% in competitive sports. Participation in both noncompetitive and competitive sports was



associated with significantly fewer symptoms of mental health problems and less impact on daily life.

Some studies have suggested the physiological effects of exercise as a possible contributive factor to the strong association between sports participation and mental health (11). Our study also supports the theory that regular exercise plays a positive role in this association. In addition, previous studies have associated participation in noncompetitive sports and mental health to a healthy diet (13), which is also supported in the present study. We found that improvement in eating habits was the same regardless of whether the adolescent participated in noncompetitive or in competitive sports. Still another factor that may be vital is the number of friends or peer support (29). In our study, both those participating in noncompetitive sports and those participating in competitive sports, reported having more than five friends, which is also consistent with the findings of a previous study (2). What is unique in the present study is that the three mediators – weekly exercise, healthy diet, and number of friends – have all been shown to be of significance when they are analyzed in the same model, confirming the importance of all three factors.

This study not only confirms these earlier findings but also ascertains that there are distinctive aspects inherent in participation in noncompetitive and competitive sports beyond these mediating factors that could explain some of the association. Other studies have suggested that sports participation could give adolescents an enhanced sense of mastery, which in turn could increase their self-esteem (8,12,30,31). A heightened feeling of belonging to an extended group, which goes beyond simply increasing the number of friends one has, has also been suggested as a contributing factor (8,12).

In this study we compared adolescents participating either in noncompetitive or in competitive sports against those not participating in sports. We consistently found that, although the benefits of sports participation are seen in groups participating in either form of sport, participating in competitive sports is associated with increased benefits in the form of stronger, more negative associations with total symptoms of mental health problems and impact on daily life. These associations persist when controlling for the mediators regular exercise, healthy diet, and number of friends, indicating that benefits are related to other factors as well. This indicates that there may be factors related to the competitive aspect of sports performance that are especially strongly related to good mental health. We can only speculate as to why there is a difference between participating in noncompetitive sports and participating in competitive ones, but it may be

possible that, through competition, adolescents learn the process of setting goals, and pursue excellence, which involves taking more risks, reducing the fear of failure (32,33). It may also be that a sense of mastery and self-esteem is further developed in this group, although this needs to be examined further.

When investigating the SDQ subscales we found the strongest association between participation in both noncompetitive and competitive sports and reduced emotional and peer problems. These associations were strongest among those participating in competitive sports. The associations were observed both before and after adjusting for weekly exercise, healthy diet, and number of friends. Our findings are in accordance with those of previous studies, which have reported emotional problems and peer problems to be inversely associated with physical activity in adolescents (10). The relationship between participation in either noncompetitive or competitive sports and conduct or hyperactivity problems was less strong in the present study, but it was significant. The association disappeared, however, after adjusting for the mediators, indicating full mediation. We can only speculate as to why participation in sports seems to be most closely related to reduced emotional and peer problems, but one explanation may be the sharing of experiences with peers, strengthening the bond between them (34), which again may contribute to reduced peer problems and greater confidence in one's abilities. Previous studies on adolescents and their mental health problems have found that girls have more emotional problems compared with boys, and boys report conduct and peer problems more frequently than do girls (35). Boys participated to a greater degree in competitive sports compared with girls in the present study, consistent with previous findings (2,36). However, the factors responsible for stronger mental health do not seem to be different among boys and girls participating in sports.

When participation in individual sports was compared with participation in team sports, we found a much stronger association between participation in sports (competitive or not) and reduced mental health problems among those involved in team sports, as compared with the association among those involved in individual sports. These findings may reflect a protection from social isolation in this group (11). On the other hand, it is possible that adolescents with mental health problems such as social anxiety or depression avoid participating in team sports, resulting in a select group with fewer problems participating in noncompetitive or competitive sports (8,29).

On the other hand, the SDQ has low sensitivity in predicting some psychiatric symptoms, such as eating

disorders (37), which could be an overrepresented diagnosis in competitive sports (16,38).

In Norway, participation in competitive sports is regulated, with a greater number of such sports permitted as age increases during adolescence. However, as adolescents become older, their degree of participation in competitive sports decreases. The factors that contribute to this decline are many but include the fact that participation is time-consuming and relatively expensive. Thus, social status may be partly responsible for the association between participation in competitive sports and mental health. A greater number of adolescents participating in competitive sports reported living in a family setup with a strong financial background, consistent with similar findings in other studies (19,20). As a higher SES is generally related to better mental health among adolescents (39), this may explain some of the association. Because of the cross-sectional nature of the study, one cannot determine causality or the direction of association. Good mental health may increase the likelihood of participation, while adolescents with psychological disorders may not have the courage, strength, or ability to engage in competitive sports (40).

### Strengths and limitations

The present study is based on self-reports from a large sample of adolescents and has a high response rate and few missing data. A limitation of a cross-sectional design is that it is impossible to conclude on causation. Moreover, in this study, although we knew which sports the adolescents participated in, we did not know which sport they competed in, or for how long they had been participating in the reported sports. Although the survey was conducted in 2002 and some changes may have occurred, there have been few changes in the organization of sports among adolescents in Norway during this period, and it would be reasonable to expect similar findings among adolescents today.

### Clinical significance

The main finding in this study is that the participation of Norwegian adolescents in noncompetitive or competitive sports is not associated with a risk for mental health problems. On the contrary, the results emphasize that participation in individual and, especially, team sports may be a good avenue for young people to strengthen their mental health.

### Acknowledgments

The data were collected with assistance from EXTRA funds from the Norwegian Foundation for Health and Rehabilitation. We thank all the adolescents who took part in this study.

### Conflict of interest

The authors declare that they have no competing or potential conflicts of interest.

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