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Leisure time physical activity does not moderate the relationship between stress and psychological functioning in Norwegian adolescents

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ABSTRACT

A number of variables have been shown to moderate the relationship between stress and psychological functioning. Physical activity (PA) has the potential to influence some of these variables but there is mixed evidence that PA can moderate the stress and mental well-being relationship among adolescents. The aim of this cross-sectional study was to investigate if leisure time physical activity moderates the relationship between stress and psychological functioning (depression, anxiety, self-esteem) among Norwegian adolescents 13–18 years old ($n = 1508$). The data were analysed using analysis of variance (MANOVA and MANCOVA). In preliminary analyses, girls reported higher scores of depression and anxiety and boys scored higher on self-esteem. Interaction effects of gender by age were found on all outcome variables. Stress was positively associated with depression and anxiety, and negatively associated with self-esteem. Higher frequency of leisure time physical activity was weakly associated with lower levels of depression and anxiety, and higher levels of self-esteem. The primary analyses revealed no support for leisure time physical activity as a moderator of the association between stress and psychological functioning. The differences between the present study and similar ones were discussed.

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1. Introduction

Several moderator variables have been identified which influence the strength of the observed relationship between stress and psychological functioning among adolescents (Grant et al., 2006). However, the review by Grant and colleagues did not consider the moderating role of physical activity (PA) which has the potential to impact on some of these variables, such as resilience. PA has also been shown to moderate the cross-sectional relationship between stress and psychological symptoms (Brown & Lawton, 1986; Carmack, Boudreaux, Amaral-Melendez, Brantley, & de Moor, 1999; Haugland, Wold, & Torsheim, 2003) with a weaker association among the more active. However, not all cross-sectional studies have supported a moderating effect (e.g., Gerber & Pühse, 2008, 2009), so further research is needed to explain these different findings. Also, only one study has investigated the moderator effect of leisure time physical activity on the relation between

school-related stress and subjective health complaints in Norway (Haugland et al., 2003).

Studies have shown that daily physical activity benefits health and protect against a variety of physical and psychological conditions (Gerber & Pühse, 2009). Leisure time physical activity can be defined as “physical activity associated with formal physical training and recreational activities involving elevated breathing frequency and sweating” (Malina, Bouchard, & Bar-Or, 2004, p. 12). Physical activity has been found to be a positive factor in the promotion of perceived health (Piko, 2007; Piko & Noemi, 2006; Sundblad, Jansson, Saartok, Renström, & Engström, 2008) and well-being (Edwards, 2006; Ussher, Owen, Cook, & Whincup, 2007). Physical activity has also been shown to be beneficial in relation to the control of stress (Nguyen-Michel, Unger, Hamilton, & Spruijt-Metz, 2006), depression (Hallal, Victoria, Azevedo, & Wells, 2006; Motl, Birnbaum, Kubik, & Dishman, 2004; Penedo & Dahn, 2005; Sallis, Prochaska, & Taylor, 2000), anxiety (Salmon, 2001) and self-esteem (Ekeland, Heian, & Hagen, 2005; Schmalz, Deane, Birch, & Davison, 2007). Unfortunately, the frequency of leisure time physical activity and physical exercise decreases during adolescence, and girls' overall participation is consistently lower than boys' (Lasheras, Azbar, Merino, & Lopez, 2001; Sagatun, Sjøgaard,

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Bjertness, Selmer, & Heyerdahl, 2007). The present study will further our understanding of the moderating role of leisure time physical activity on the association between overall stress and psychological functioning.

The initial aims of the present study were to:

- (1) Investigate gender and age differences on psychological functioning (anxiety, depression and self-esteem).
- (2) Investigate the association between stress and psychological functioning.
- (3) Investigate the association between leisure time physical activity and psychological functioning.

Finally, the primary aim was to:

- (4) Investigate if physical activity moderates the association between stress and psychological functioning.

2. Method

2.1. Participants

The analyses are based on cross-sectional data from a larger study called "Growing up in rural settings," where public schools in six rural municipalities in Norway participated. A total of 2341 students were asked to participate in the study (693 from elementary school and 1648 from secondary school). A total of 1862 completed questionnaires were returned, giving an overall response rate of 79.5%. Missing responses were mainly due to non-cooperation of classes or students being absent when the questionnaire was administered. In the present study the sample was restricted to junior and senior high school and the data analysis was therefore undertaken for $n = 1508$ (81%); 769 (51.1%) were girls and 735 (48.9%) were boys (gender was not identified for four participants). Participants had an age range of 13–18 years; the mean age for the whole sample was 14.9 ($SD = 1.5$). The mean age for boys was 14.8 ($SD = 1.5$), and for girls, the mean age was 14.9 ($SD = 1.6$).

2.2. Procedure

Permission to carry out the study was obtained from The Norwegian Social Science Data Services (NSD). Consent was given from the municipalities and the schools. The adolescents and their parents received an information letter which explained the purpose of the study. In all stages of the data collection, it was emphasised that participation was voluntary and anonymous, and that all information was confidential. Questionnaire administration was completed in whole class groups during one regular school hour of 45 min, in 2006. Researchers on the project were present during the data collection to inform students about the survey and to administer the questionnaires.

2.3. Measures

Demographics included questions about gender and age.

Adolescent stress was assessed using the Adolescent Stress Questionnaire (ASQ-N). This is a 58-item questionnaire concerning common adolescent stressors rated on a 5-point Likert scale: 1 (*not at all stressful or is irrelevant to me*) to 5 (*very stressful*). Examples of some items are: "lack of respect from teachers," "arguments at home," and "keeping up with school work." The ASQ has been continuously developed and validated since the middle of the 1990s (Byrne, Davenport, & Mazanov, 2007) and the instrument has been successfully tested for use in a Norwegian adolescent sample

(Moksnes, Byrne, Mazanov & Espnes, in press). As in the study of Mazanov and Byrne (2008), the responses were summarised to give a total stress score (range 58–287). Cronbach's alpha coefficient for the scale in the present study was .97.

State anxiety was measured using the Spielberger State-Trait Anxiety Inventory (STAI: Spielberger, 1983). The questionnaire consists of 20 items rated on a 4-point Likert scale ranging from 1 (*not at all*) to 4 (*very much so*). Examples of some items are: "I am tense," "I feel secure," and "I am worried." The sum score of the scale ranged from 20 to 79 and a higher score indicates greater state anxiety. Cronbach's alpha coefficient for the scale in the present study was .91.

State depression was measured using a scale appropriate for measuring non-clinical (state) depressive symptoms developed and used in the study of Byrne et al. (2007). The scale consists of a 15-item questionnaire measuring adolescents' level of current depressive mood. Item choice was informed by reference to commonly experienced depressive features outlined in the Diagnostic and Statistical Manual-Fourth Edition TR (DSM: American Psychiatric Association, 2000). Reference was also made to the Zung Self-Rating Depression Scale (Zung, 1965). The items are measured on a 5-point Likert Scale ranging from 0 (*never*) to 4 (*always*). Examples of some items are: "I have felt sad or unhappy," "I feel guilty without knowing why," and "I have felt uneasy, restless, or irritable." The sum scores of the scale ranged from 0 to 60 and a higher sum score indicates more symptoms of depression. Cronbach's alpha coefficient for the scale in the present study was .94.

Self-esteem was measured using the Rosenberg Self-Esteem Scale (Rosenberg, 1965), a 10-item questionnaire assessing global self-esteem measured on a 4-point Likert scale, ranging from 0 (*strongly disagree*) to 3 (*strongly agree*). Examples of some items are: "On the whole I am satisfied with myself," "At times, I think I am no good at all," and "I take a positive attitude to myself." The sum score ranged from 0 to 30 and a higher sum score indicates higher self-esteem. Cronbach's alpha coefficient for the scale in the present study was .86.

Leisure time physical activity was measured by one item: "During the last four weeks, how many days a week have you participated in sports or physical activity so hard that you had high respiratory frequency, sweated, or had an increased heart rate for 20 min (or more)?" The response options were: 1 (*never*), 2 (*less than one day per week*), 3 (*about one day per week*), 4 (*two to three days per week*) to 5 (*most days per week*).

2.4. Statistics

All statistical analyses were carried out using the SPSS, version 14.0 (SPSS Inc., Chicago, IL). For respondents with up to 10% missing responses within a scale, missing responses were replaced with modes (Mazanov, 2003). For respondents with more than 10% missing responses within a scale, no score was calculated. In the subsequent analyses, pair-wise deletion of missing data was employed where applicable. The active sample size therefore varied between $n = 1237$ and $n = 1381$. Descriptive statistics of frequencies, means and standard deviations were calculated for all continuous variables in the study. Cronbach's alphas were computed to estimate the internal consistency of the instruments used. Moderation hypotheses are commonly examined by including an interaction term in analysis of variance or regression analyses (Baron & Kenny, 1986). Two-way between-groups multivariate analysis of variance (MANOVA) was performed to investigate whether socio-demographics (age, gender), were associated with psychological functioning (depression, anxiety and self-esteem served as outcome variables). In the case of significant

results in the multivariate analyses, univariate analyses (ANOVAs) were then performed separately for each dependent variable. Two-way between-groups multivariate analysis of covariance (MANCOVA) was performed to investigate if stress and leisure time physical activity were associated with psychological functioning and to investigate the potential moderation effects of leisure time physical activity. Bonferroni's post hoc test was applied for comparisons of mean values between groups, with alpha level being adjusted by means of the Bonferroni's technique for multiple comparisons of three groups ($p < .017$). In order to investigate the interaction effect further, simple effect analyses were used. To analyze possible age differences, three age groups were imposed on the sample: 13–14 years, 15–16 years and 17–18 years. The stress scale was divided into three statistically equal sized groups: low stress: 58–100; moderate stress: 101–149 and high stress 150–287. Leisure time physical activity variable was divided into three groups: Low = 1 day per week or less; Moderate = 2–3 days per week; High = most days per week. These categories were based on frequency distributions and an understanding of these categories as reflecting low, moderate and high levels of physical activity.

3. Results

3.1. Descriptive analyses

Table 1 shows the frequency distribution, as well as mean scores and standard deviations for the variables in the study.

3.2. Socio-demographics and psychological functioning

The first aim was to study gender and age differences on psychological functioning (self-esteem, anxiety and depression). The multivariate test of gender was significant (Wilks' $\lambda = 0.94$, $F(3, 1281) = 28.69$, $p < .001$). The results in Table 2 show a significant main effect of gender on all outcome variables, where boys reported higher scores on self-esteem and girls scored higher on depression and anxiety. The multivariate test also showed a significant result for age (Wilks' $\lambda = 0.99$, $F(6, 2562) = 2.60$, $p < .05$), but the main effects of age were non-significant (Table 2). When looking at the interaction effects, the multivariate test showed a significant interaction of gender by age on the combined

Table 1
Frequencies, means and standard deviations for the variables in the study.

Group variables	Anxiety			Depression			Self-esteem		
	n	M	SD	n	M	SD	n	M	SD
Gender									
Girls	713	37.6	10.7	720	19.4	12.3	692	17.8	5.3
Boys	653	35.2	10.6	657	14.2	11.2	630	20.1	5.2
Age									
13–14	622	36.4	10.6	632	16.0	12.1	590	19.0	5.4
15–16	496	37.0	11.2	501	17.7	12.3	491	18.8	5.4
17–18	252	35.6	9.9	248	17.8	11.3	244	18.8	5.6
Stress									
Low	440	30.8	4.9	444	9.0	8.1	427	21.1	4.9
Medium	446	36.3	9.3	446	17.2	10.4	430	19.1	4.8
High	423	42.5	10.6	425	25.0	11.7	406	16.3	5.4
LPA									
1 day per week or less	408	38.7	11.0	411	19.0	12.8	397	17.4	5.4
2–3 days per week	591	36.1	10.2	599	16.4	11.7	571	18.9	5.1
Most days	362	34.5	10.6	362	15.3	11.6	349	20.6	5.5

Note: LPA = leisure time physical activity.

Table 2

Main effects and interaction effects of gender and age on psychological functioning

	Anxiety			Depression			Self-esteem		
	df	F	η^2	df	F	η^2	df	F	η^2
Gender	1	17.70**	.01	1	55.68**	.04	1	67.09**	.05
Age	2	1.65	.00	2	3.41	.01	2	0.29	.00
Gender \times Age	2	5.44*	.01	2	7.39**	.01	2	6.38*	.01

Note: η^2 indicates effect sizes.

* $p < .01$, ** $p < .001$.

dependent variables (Wilks' $\lambda = 0.99$, $F(6, 2562) = 3.45$, $p < .001$), and the interaction effects for each dependent variable were also significant (Table 2). However, the effect sizes of the main effects and interaction effects were not strong (small: $\eta^2 = .01$; medium: $\eta^2 = .09$; large: $\eta^2 = .25$; Cohen, 1988). In order to investigate the interaction further, simple effects were analysed. For self-esteem, there was a significant gender difference in all age groups ($p < .001$) and the gender differences increased with age. There were also significant gender differences in all age groups on depression scores ($p < .001$), where the biggest gender difference was found in the age group 15–16 years. For anxiety, the only significant gender difference was found in the age group 15–16 years ($p < .001$).

3.3. Stress, leisure time physical activity and psychological functioning

A two-way between-groups MANCOVA was performed (1) to investigate the association between stress and psychological functioning, (2) to investigate the association between leisure time physical activity and psychological functioning, and (3) to investigate whether leisure time physical activity moderated the association between stress and psychological functioning. Since there were significant gender \times age interactions on all outcome variables in the preceding analyses, gender and age served as covariates in the present analyses. For stress, the multivariate test was significant (Wilks' $\lambda = 0.71$, $F(6, 2448) = 77.47$, $p < .001$). Significant main effects of stress were found on anxiety, depression and self-esteem (Table 3). The Bonferroni post hoc test showed that there were significant differences between all the stress groups on all the outcome variables ($p < .001$). For leisure time physical activity, the multivariate test was significant (Wilks' $\lambda = 0.96$, $F(6, 2448) = 7.88$, $p < .001$), and significant main effects of leisure time physical activity were found on all outcome variables (Table 3). The effect sizes were however not strong. Again, the post hoc test showed a significant difference between all the physical activity groups ($p < .001$), except for the moderate and high physical activity groups on depression ($p > .50$). Finally, the multivariate test showed no significant interaction effects of stress by leisure time physical activity, indicating that leisure time physical activity did

Table 3

Main effects and interaction effects of stress and leisure time physical activity on psychological functioning.

	Anxiety			Depression			Self-esteem		
	df	F	η^2	df	F	η^2	df	F	η^2
Stress	2	134.97**	.18	2	237.30**	.28	2	75.98**	.11
LPA	2	9.63**	.02	2	5.17*	.01	2	23.07**	.04
Stress \times LPA	4	1.34	.00	4	1.03	.00	4	0.31	.00

Note: η^2 indicates effect sizes.

LPA = leisure time physical activity.

Controlled for gender and age.

* $p < .01$, ** $p < .001$.

not moderate the relation between stress and psychological functioning (Wilks' $\lambda = 0.99$, $F(12, 3238) = 0.67$, $p > .05$) (see Table 3).

4. Discussion

The first initial aim was to investigate gender and age differences in psychological functioning. The results showed that girls reported higher scores on depression and anxiety, and boys scored higher on self-esteem. However, a significant interaction effect of gender by age was also found on all the outcome variables, where boys scored significantly higher on self-esteem in all age groups, and girls scored higher on depression in all age groups. The biggest differences were found in the 15–16 age group. The only significant gender difference on anxiety was found in the 15–16 age group, where girls scored higher than boys. The effect sizes were relatively weak for all of the main effects and interaction effects, indicating that the group differences were not strong. However, the results showed that there is a notable gender difference in symptoms, especially in the 15–16 age group. The present results are in line with previous studies, suggesting that there is an increase in negative psychological functioning during adolescence, and moreover, girls seem to report more psychological complaints than boys (Jose & Ratcliffe, 2004; Marcotte, Fortin, Potvin, & Papillon, 2002; Rudolph, 2002; Waaktaar, Borge, Fundingsrud, Christie, & Torgersen, 2004). During adolescence there is also an increase in self-consciousness, which leads to adolescents beginning to develop an understanding of themselves. Self-esteem is a large part of adolescents' self-understanding. The relationship between gender and self-esteem has been well-researched. Studies have typically found that males have a higher self-esteem than females, particularly during adolescence (Baldwin & Hoffmann, 2002; Jose & Ratcliffe, 2004; Quatman & Watson, 2001). Explanations for why young girls report more negatively on psychological functioning, and especially on depression, have among others included early pubertal transition, dissatisfaction with body image, vulnerability to stressful events and deficits in coping abilities, and challenges regarding social roles (Garber, 2006; Ge, Conger, & Elder, 2001; Hayward & Sandborn, 2002; Sweeting & West, 2003). The reason for why girls report more negatively on the outcome variables in the present study may be related to a higher level of problems for girls, but could also result from the fact that girls have a lower threshold for evaluating and reporting experiences as problematic. The differences may therefore partly result from gender differences in self-reporting styles (Heyerdahl, Kvernmo, & Wichstrøm, 2004). In sum, the results highlight the need to provide support for girls especially, as they seem to be more vulnerable to psychological problems during the adolescent period.

The second initial aim was to investigate the association between stress and psychological functioning. When controlled for gender and age, the results showed a significant association between stress and negative psychological functioning. That is, adolescents who experienced higher levels of stress also reported higher levels of depression and anxiety and lower self-esteem than those who reported experiencing lower stress levels. The significant association clearly reflects the function of stressful life events as conspicuously related to negative psychological functioning.

The possibility of bi-directionality of associations with stress and the outcome variables of the present study cannot, of course, be discounted. Experience of psychological complaints can influence both reporting of stressor experience and assessment of stressor impact, in that adolescents who score higher on emotional problems may perceive the situation as more stressful. Indeed, it is likely that both these types of factors contribute to explanations of the relationships between stress and the psychological outcome variables in the present study (Carter,

Garber, Ciesla, & Cole, 2006; Grant et al., 2003; Kim, Conger, Elder, & Lorenz, 2003). The results are consistent with previous studies (Jose & Ratcliffe, 2004; Murberg & Bru, 2005; Sund, Larsson, & Wichstrøm, 2003; Waaktaar et al., 2004) and underscore the importance of focusing on resources for coping with stressful situations during adolescence, as stress is clearly related to adolescent health and well-being.

The third initial aim was to investigate the association between leisure time physical activity and psychological functioning. The results showed that higher frequency of leisure time physical activity was significantly associated with higher level of self-esteem and lower level of depression and anxiety, when controlled for gender and age; the effect sizes were however not strong. This is in line with the findings of a Norwegian longitudinal study which found that physical activity was weakly associated with mental health at three-year follow-up (Sagatun et al., 2007). Although the associations in the present study were not strong, the significant results give some support to earlier studies investigating physical activity in relation to psychological health and well-being (Edwards, 2006; Ussher, et al., 2007), and more specifically in relation to depression (Hallal, et al., 2006; Nabkasorn et al., 2005; Penedo & Dahn, 2005), anxiety (Penedo & Dahn, 2005; Salmon, 2001), and self-esteem (Ekland et al., 2005; Schmalz et al., 2007; Twisk, 2001). This underscores the importance of promoting leisure time physical activity in the broader adolescent group. The origin of a healthy lifestyle starts early in life (Twisk, 2001). Children and adolescents are, therefore, especially interesting as target populations for disease preventive and health promotional strategies aimed at an increase in physical activity (e.g., report from The Ministry of Health and Care Services, 2008).

Finally, the primary aim of the study was to investigate if leisure time physical activity was a potential modifier of the association between stress and psychological functioning. The results showed no significant interaction effects, indicating that the impact of stress on negative psychological functioning is not dependent on whether adolescents are more or less physically active. Although both physical activity and stress have separate main effects on each outcome variable, they do not interact. These results stand in contrast to previous studies (Brown & Siegel, 1988; Carmack et al., 1999; Haugland et al., 2003; Norris, Carrol, & Cochrane, 1992), but are supported by recent findings (Gerber & Pühse, 2008).

Explanations for the present results are not straightforward. The focus of the study was on overall stress and not on specific stress domains like the study by Haugland et al. (2003), who assessed school-related stress. Stress is a multifaceted construct and is affected by a large number of factors (Byrne et al., 2007). It is plausible to believe that there may be other factors not assessed in the present study that interact with the associations found. But specific criteria that would define this relationship as well as the specific mechanisms by which it would occur still remain unexplored and continued research is needed in this area. It is also important to underline that the present study used other outcome measures than the study of Haugland et al. (2003). Further, while many adolescents in the present sample participated in organized forms of leisure time physical activity, the training schedules were rather fixed, with physical activity taking place irrespective of the student's stress level (Gerber & Pühse, 2008). Also the item used for measuring leisure time physical activity might have accounted for some of the results. This is discussed in more detail in the section headed "Strengths and limitations." It is reasonable to conclude that the non-significant interaction effects in the present study may indicate that there are other, more important moderators in the relation between stress and psychological functioning in adolescents' daily life than physical activity. Previous findings have shown that, e.g., moderators like social support, social competence,

positive peer relationships and positive events/activities are significant protective moderators on the relation between stressors and psychopathology (Grant et al., 2006).

In view of the present findings, one target for preventive interventions will be to reduce adolescents' exposure to potential stressors and help young people develop protective contexts which facilitate development of a number of particular protective factors. Given the limited control that can be gained over young people's exposure to many forms of stressful situations, an important target is to increase children's and adolescents' abilities to cope with stress. Improved skills in problem solving, emotion regulation and access to adequate social support may increase resilience in the face of stress (Compas, Champion, & Reeslund, 2005). This may provide a useful avenue for preventive interventions aimed at improving the lives of adolescents. Resource building can be achieved through school-based health promotion actions, in cooperation with teachers and health nurses in order to reach most of the adolescent group. It is equally important to include parents, family and after-school programs to integrate all environments that adolescents are part of. These interventions could be incorporated in e.g. in physical education classes and in after-school programs where physical activity can be organized in different forms from games to team sport. This may promote social interaction as well as self-esteem and well-being among adolescents. It is however important that the type of physical activity is in accordance with the adolescents' individual interests and preferences, and that the environment is adjusted for different activities. As the discussion sets out, from the perspective of health promotion, lay personal, social and environmental factors all play important roles here. But ultimate success will depend on collaboration between adolescents, school nurses, teachers and parents.

4.1. Strengths and limitations

One strength of the present study is its large sample size. Given the findings of associations between stress and negative psychological functioning among adolescents in the present study and in previous research (Grant et al., 2003; McMahan, Grant, Compas, Thurm, & Ey, 2003), the topic also has high social relevance. However, the study also has some limitations. First, since it used a cross-sectional design, causal direction among the variables cannot be determined. Second, the study combines both "state-constructs" and scales measuring more temporally stable constructs. This should, however be counter-balanced by the fact that the time of reference was more or less the same for all scales used in the study. Third, physical activity was studied by using one single item, which may have contributed to misclassification and self-report bias because of possible varying levels of comprehension of the question. The use of scales or composite measures might have led to an increase in reliability. However, a number of previous studies have measured physical activity by using one single item (Gerber & Pühse, 2008; Gerber & Pühse, 2009; Haugland et al., 2003). The ideal measure of physical activity would include items of frequency, intensity, and duration (Sallis & Saelens, 2000). The one-item index solely assessed frequency and did not distinguish between different intensities of various physical activities. Further, the semantic item formulation (sweating or high respiratory frequency) is a subjective experience, which does not provide objective information about the intensity of a particular activity. This may have resulted in higher reported rates of leisure time physical activity for unfit adolescents. Fourth, all findings were based on self-report data. It is, however, accepted that adolescents are able to evaluate and give reliable information about physical activity (Boot, Okely, Chey, & Bauman, 2001), and subjective health by the use of questionnaires (Haugland & Wold, 2001). The large

sample size of the present study can protect against the influences of potential random error related to self-report (Rothman, 2002). Finally, the study was not able to control for important potential confounders of the relationship between leisure time physical activity and psychological functioning like socio-economic status, smoking, alcohol intake and ethnicity, since these variables were not included in the data set. Including these variables would have strengthened the present findings (Gerber & Pühse, 2008; Haugland et al., 2003; Sagatun, et al., 2007), but would also have added considerably to the length of the questionnaire.

5. Conclusions and future studies

The present research revealed that girls scored higher on depression and anxiety, and boys reported higher scores on self-esteem. A significant interaction effect of gender by age was found on all outcome variables (depression, anxiety and self-esteem). Adolescents, who perceived higher levels of stress, also reported significantly higher scores on depression and anxiety and lower scores on self-esteem. Higher frequency of leisure time physical activity was weakly but significantly associated with lower levels of depression and anxiety and higher levels of self-esteem. The study did not find empirical evidence that individuals who engage in regular leisure time physical activity were less susceptible to negative psychological functioning related to stress than are those who were less active. More research is needed to understand what factors are actually effective in protecting against negative psychological outcomes from the influence of stressful experiences in young people. More emphasis should also be put on different types and intensities of physical activity (competitive vs. recreational, individual vs. team) in relation to specific stressors, and psychological functioning and on valid assessment of physical activity. The associations found in the present study should be investigated further in longitudinal studies designed to provide further insight into the associations between leisure time physical activity, stress and psychological functioning.

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