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WEEKLY PHYSICAL ACTIVITY AND SCHOOL BURNOUT AMONG FINNISH UPPER SECONDARY SCHOOL STUDENTS

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ABSTRACT

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Existing literature has shown physical activity to be associated with a reduced risk of stress and burnout. However, most of this research has focused on university students and working adult populations, with very little being known about the association among younger students. This thesis investigated the relationship between weekly physical activity and school burnout among Finnish upper-secondary school students from the Helsinki metropolitan region.

Physical activity was measured based on the amount of weekly activity in free time, while the School Burnout Inventory (SBI) was used to determine school burnout. The data used for this study was provided by the 2016 MetLoFIN study and was analyzed using SPSS statistics. A one-way ANOVA with a post-hoc Bonferroni test was conducted, followed by a univariate general linear model. Background variables were accounted for, including gender, socioeconomic status, immigrant background, academic achievement, and school track. In addition, a Cronbach's Alpha test was conducted to test for the reliability of the SBI scale.

The results showed physical activity level and school burnout to be associated among participants who exercised "Rarely or never", with this group experiencing less school burnout compared to their peers. No significant differences in school burnout were found among the remaining participant groups. In addition, gender, socioeconomic status, academic achievement and school track were found to be associated with school burnout. The findings differ from previous research in this area of study, which suggests physical activity to reduce and even prevent burnout. Further research is needed to better comprehend the connection between physical activity and school burnout among students in upper secondary education.

Keywords: School burnout, Physical activity, Upper secondary school

TIIVISTELMÄ

Iisa Antola: Viikoittainen liikunta ja koulu-uupumus suomalaisten toisen asteen opiskelijoiden parissa
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Aikaisemmat tutkimukset viittaavat siihen, että liikunta on yhteydessä pienempään stressin ja uupumuksen riskiin. Suuri osa tästä kirjallisuudesta on kuitenkin keskittynyt työssäkäyviin aikuisiin sekä yliopisto-opiskelijoihin, mistä johtuen aiheesta on hyvin vähän tietoa nuorempiin oppilaisiin liittyen. Tämän tutkimuksen tarkoituksena oli selvittää viikoittaisen liikunnan ja koulu-uupumuksen välistä yhteyttä suomalaisten pääkaupunkiseudulla opiskelevien toisen asteen oppilaiden parissa.

Liikunnan määrä mitattiin viikoittaisen vapaa-ajalla tapahtuvan liikunnan perusteella. Koulu-uupumus puolestaan mitattiin käyttämällä School Burnout Inventorya (SBI). Tutkimuksessa käytetty aineisto oli peräisin 2016 MetLoFIN tutkimuksesta, ja sitä analysoitiin SPSS-tilasto-ohjelman avulla. Analyysissä toteutettiin yksisuuntainen varianssianalyysi (ANOVA) ja Bonferroni testi, sekä yksisuuntainen yleistetty lineaarinen malli. Taustamuuttujat otettiin analyysissä huomioon, ja niihin kuuluivat sukupuoli, koulusuuntaus, sosioekonominen tausta, koulumenestys, sekä maahanmuuttajatausta. Lisäksi toteutettiin Cronbach's Alpha -testi SBI:n luotettavuuden varmistamiseksi.

Tutkimuksen tulokset osoittivat, että liikunta ja koulu-uupumus olivat yhteydessä niillä osallistujilla, jotka liikkuivat "Harvoin tai ei lainkaan". Nämä opiskelijat kokivat koulu-uupumusta vähemmän verrattuna muihin osallistujiin. Muiden osallistujaryhmien välillä ei nähty tilastollisesti merkittävää eroa koulu-uupumuksessa. Lisäksi taustamuuttujista sukupuoli, sosioekonominen tausta, koulumenestys, sekä koulusuuntaus nähtiin vaikuttavan liikunnan ja koulu-uupumuksen väliseen yhteyteen. Nämä tulokset eroavat aikaisemmista tutkimuksista, joka viittaavat liikunnan vähentävät ja jopa ehkäisevän uupumusta. Lisää tutkimusta tarvitaan, jotta liikunnan ja koulu-uupumuksen välistä yhteyttä toisen asteen opiskelijoiden parissa voidaan paremmin ymmärtää.

Avainsanat: Koulu-uupumus, liikunta, toisen asteen koulutus

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1 INTRODUCTION

Having an unhealthy culture of stress is common in many areas of today's world, particularly in high-income Western countries. This is true not only for working adults, but among the youth as well, as the prevalence of long-term stress continues to increase (Walburg 2014). According to the American Institute of Stress (2022), an increasing number of adolescents are reporting stress levels similar to those of adults, and significantly over the level which is considered healthy. This trend is visible in Finland as well and has been documented by the Finnish School Health Promotion Survey as a steady increase of school burnout among upper secondary school students around the country (THL 2022a). The phenomenon has been further aggravated by the COVID-19 pandemic, where pre-existing stress stemming from work and school has been added to by the uncertainty of such unprecedented times (APA 2020). This is concerning, as school burnout is shown to predict lower academic achievement and school dropout (May et al. 2015; Walburg 2014). In addition, school burnout has been connected to lower life satisfaction, as well as a higher risk of mental health issues and health-damaging behaviors (OECD 2017; Walburg 2014; Pérez-Fuentes et al. 2021).

Along with school burnout, the lack of physical activity among youth has raised some concern. The extent of insufficient physical activity among adolescents is large, with a high percentage of youth reporting levels which are considered too low. Globally, 81% of students between the ages of 11 and 17 are insufficiently active. Physical inactivity is higher among girls, with 84.7% not reaching the recommended weekly amount of exercise, compared to 77.6% among boys. In Finland, insufficient physical activity among adolescents is 75.4% overall, 82.1% among girls, and 69% among boys. (Guthold et al. 2020.) These numbers are high and suggest a concerning trend of lack of exercise among youth, both globally and in Finland.

Physical activity has a wide range of benefits, including positive effects on mental health and stress (WHO 2022). Physical activity interventions have been shown to significantly increase mental well-being, and to reduce levels of anxiety, depression, and psychological distress (Singh et al. 2023). More specifically, participating in regular exercise has been shown to both help prevent and mitigate the effects of burnout (Taylor et al. 2022). In addition, spending time among recreational activities and hobbies such as sports has been shown to be beneficial for overall well-being, and is considered an efficient way to balance out stress in other areas of life (Luo et al. 2016).

The association between physical activity, stress and burnout has been determined by a variety of existing literature. However, much of this research has been conducted among university students and working adults and is not necessarily applicable to adolescents. Currently, there is very limited knowledge as to whether school burnout is affected by physical activity among adolescents, and if so, what type of relationship exists between the two factors. In addition, the connection between physical activity and burnout has not been researched much among Finnish populations specifically. Therefore, this thesis will focus on the relationship between weekly physical activity and school burnout among Finnish adolescents in upper secondary school and attempt to fill in the research gaps existing in this area.

2 BURNOUT

2.1 What is burnout?

Burnout is defined as persistent feelings of cynicism, inadequacy, and exhaustion, as well as lowered efficiency in one's work, often following a period of high stress and pressure (Salmela-Aro et al. 2009a). The term was first used by an American psychotherapist in the 1970's to describe the mental fatigue experienced by those working in the social sector. From there, the concept spread to other occupational sectors, and was soon widely accepted as an official diagnosis. (Schaffner 2016.) Burnout has traditionally been recognized in the context of a working environment, where it describes the phenomenon of exhaustion caused by chronic job-related stress (Salmela-Aro et al. 2009a). In recent decades, however, researchers have started to apply the term to an academic context as well, arguing that students can be overrun by overwhelming stress the same way working adults can (Salmela-Aro et al. 2010). Like those under pressure from work, students are expected to actively participate, meet deadlines, and produce certain outcomes during their studies. It can therefore be argued that the psychological demands of studying strongly resemble those of having a job. (Salmela-Aro et al. 2009b.)

Burnout which occurs in the context of education is referred to as school burnout. Its distinctive features include feelings of cynicism and inadequacy towards one's studies, as well as exhaustion at schoolwork. (Salmela-Aro et al. 2009a.) Exhaustion is considered the most obvious symptom of school burnout and is often accompanied by inefficacy. This is because those suffering from burnout tend to distance themselves from schoolwork and find it difficult to be motivated towards their studies. (Maslach et al. 2001.) Cynicism is defined as indifference towards one's studies, and a sense of discouragement towards academic effort (Maslach et al. 2001). Students suffering from burnout often lose their interest and motivation towards school and may contemplate quitting. Finally, feelings of inadequacy are often presented by those with school burnout, with students feeling like their achievement and own expectations have been lowered. (Salmela-Aro et al. 2009a.) These feelings tend to be made worse by exhaustion and cynicism, as the lack of energy and motivation towards school makes it difficult to perform well academically (Maslach et al. 2001).

Though burnout is not considered a medical condition, it is classified in the ICD-11 as an occupational phenomenon (WHO 2019). When diagnosing burnout, a variety of existing

diagnostic tools can be used. Many of the existing tools measure burnout based on its definition in a workplace setting and are not always applicable to an educational context (Salmela-Aro et al. 2009b). However, questionnaires have been developed specifically for assessing school burnout, such as the school burnout inventory (SBI) by Salmela-Aro et al. (2009a), which allow for a more appropriate measurement among students.

2.2 Prevalence of burnout

School-related stress is a common phenomenon, and studies have identified similar patterns of school burnout in various countries around the world (Walburg 2014). A survey conducted in OECD countries showed that the majority of 15-year-olds had experienced some form of school-related anxiety, with 66% of participants reporting worry about poor grades (OECD 2017). Similarly, the Stress in America survey by APA (2014) found the average American teenager to report their stress level as much higher than the perceived healthy limit during the school year. In addition, 31% of the participants reported a significant increase in their stress level during the past year, while 34% believed their level of stress was likely to increase further during the upcoming year. (APA 2014.)

This trend is also visible among the Finnish student population. Figure 1 shows the percentage of Finnish students who reported having school burnout in the School Health Promotion surveys between the years 2008 and 2021 (THL 2022a). As shown in the figure, the prevalence of burnout among responders has increased over the years, reaching a peak in 2021. This suggests that the number of students who experience burnout due to school is increasing in Finland. When surveyed, most Finnish upper secondary school students report school burnout as a prevalent issue among their peers (Huvila and Mittilä, 2019). This was highlighted by data from the Health Behaviour in School-aged Children study collected between 2002–2014, in which Finland ranked the highest in the prevalence of school burnout among the Nordic countries (Löfstedt et al. 2019).

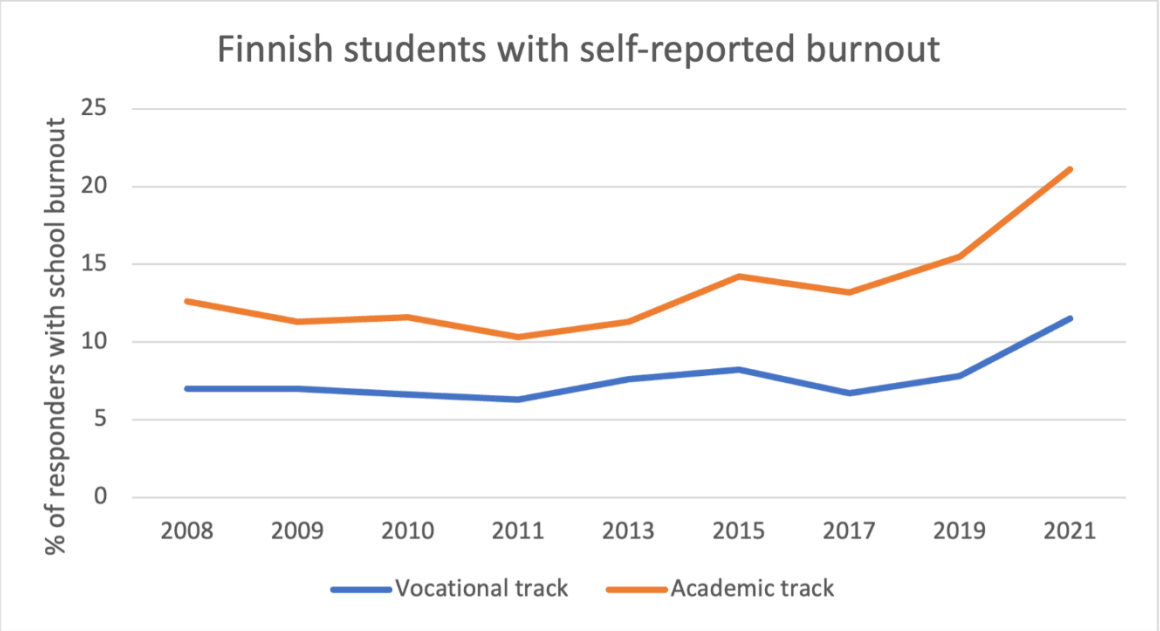

FIGURE 1: Proportion (%) of respondents of the THL school health promotion survey with burnout, according to SBI score (THL 2022c)

One of the likely contributors to the recent rapid increase in school burnout is the COVID-19 pandemic. It has been well-documented that the pandemic resulted in a dramatic increase in mental health problems, as well as academic- and career-related stress. When surveyed during the pandemic, 43% of generation Z teenagers in the United States reported having experienced higher stress in the past year as compared to before the pandemic (APA 2020). Similarly, surveys among college students found the levels of perceived stress to have increased during the pandemic, which was largely driven by academic workload and psychological separation from school (Yang et al. 2021). In addition to this, the transition to an online learning format which occurred during the pandemic has been connected with an increased risk of anxiety and school burnout (Gomez et al. 2022). The increasing trend of burnout among Finnish upper secondary students, in addition to the further impacts caused by the COVID-19 pandemic, therefore, makes school burnout a very current topic, and one which needs to be better investigated.

2.3 Why is burnout an issue?

School burnout is not a new phenomenon, however, the rapid increase in its prevalence over the past years has made it an issue of rising concern. Stress and the resulting school burnout have negative effects on various aspects of a student's academic success and well-being, and can lead to large, worrisome issues if not addressed (Walburg 2014).

One of the many areas negatively impacted by school burnout is academic achievement. Surveys conducted in OECD countries have shown students with higher levels of school-related anxiety to perform worse in their studies, particularly in sciences (OECD 2017). Burnout has also been associated with reduced attentional capacity and problem-solving ability (May et al. 2015). As the risk of school burnout tends to be higher among students whose academic achievement is poorer, there is a large risk for these students to be left behind in terms of education (Herrmann et al. 2019). Studies have shown that presenting features of school burnout, especially cynicism, predict school dropout (Walburg 2014). In particular, learning difficulties, lower achievement in school, and poor academic well-being increase the risk of dropout in secondary education (Korhonen et al. 2014). In addition, school burnout has been found to predict burnout in future work, as students' experiences of exhaustion and cynicism at school increase the risk of career-related experiences of exhaustion and cynicism, respectively (Robins et al. 2017).

As well as hindering academic achievement, school-related stress impacts life outside of academics. According to data from the PISA 2015 survey, school-related anxiety is associated with reduced life satisfaction among adolescent students (OECD 2017). Stress caused by school is believed to increase the risk of mental health issues, not only during school years but also in the future. Longitudinal follow-up of Finnish adolescents has shown that suffering from school burnout may increase the chances of experiencing symptoms of depression later on in life (Salmela-Aro et al. 2009b). Studies have also found school burnout to increase the risk of other mental health issues, such as anxiety, along with the presentation of psychosomatic symptoms (Walburg 2014).

Burnout and academic stress have also been shown to increase the risk of health damaging behaviors among students. Analysis of data from the SILNE-survey in 2016 showed school burnout to be associated with daily smoking in high school students. This association was found in all six European countries in the study, and it remained significant regardless of academic

achievement and socioeconomic background. (Kinnunen et al. 2016.) Students with higher school-related stress are more likely to part-take in substance abuse, and to turn to illegal substances as a coping strategy against academic pressure (Leonard et al. 2015). In addition, school burnout is associated with alcohol consumption and poor attitudes towards authorities among high school students. This is particularly true for cynicism and poor engagement, two of the central features of school burnout. (Pérez-Fuentes et al. 2021.)

As shown by research, school-related anxiety and burnout impact students both in terms of their academic success as well as their well-being outside of school. It is therefore important to address these issues, as they may have a detrimental effect on the quality of life and future of students.

2.4 School burnout in upper secondary school

Though students can experience academic stress and pressure to perform well at any level of their studies, research indicates that school burnout tends to be the highest during upper secondary school. Older students report having higher levels of school-related stress in comparison to younger students, as well as more signs of school burnout (Lee et al. 2013). In particular, burnout has been found to be prevalent among students aged 17 to 19 (Gabola et al. 2021). Though this age-mediated difference in school burnout risk is present in both genders, it is more emphasized among girls. Among Finnish students, girls tend to experience a larger increase in school burnout after starting upper secondary school. Though boys experience school burnout as well, the change in the prevalence of burnout between comprehensive and upper secondary school is much smaller as compared to girls. (Read et al. 2022.)

The reason for upper secondary school students reporting higher levels of school burnout is likely to be multifaceted. Moving on to upper secondary school often involves a large increase in academic requirements and competition, which may be overwhelming for many students. Upper secondary school also tends to require more from students in terms of autonomy and responsibility for one's own studies. (Löfstedt et al. 2019.) In addition, many students begin to feel pressure about their future studies and applying for higher education while in upper secondary school (Lee et al. 2013). When surveyed, Finnish upper secondary students have cited large workloads, issues with time management, as well as high expectations from themselves, teachers, and society, as the main reasons for their school burnout (Huvila and

Mittilä, 2019). In addition, many adolescents experience reduced self-esteem after their transition to upper secondary education, with self-perception of their academic and social abilities becoming more negative (Wigfield et al. 1991).

Peak burnout does not occur at the beginning of upper secondary school but instead tends to increase throughout upper secondary education (Salmela-Aro and Tynkkynen 2012). This is most likely due to the increase in the intensity of studies throughout upper secondary education, in particular on an academic track (Salmela-Aro et al. 2009b). This trend has been found among all upper secondary school students, however, it is most emphasized among girls (Salmela-Aro et al. 2010).

2.5 Factors associated with school burnout

The pressure caused by school can affect all students, however, certain background factors are believed increase the risk of school burnout. These include gender, socioeconomic status, immigrant status, and academic achievement. (Walburg 2014.) In addition, in the context of the Finnish upper secondary educational system, the school track chosen by the student is associated with the risk of developing school burnout (Salmela-Aro et al. 2010).

2.5.1 Gender

A study among OECD countries showed that, in most of the countries surveyed, girls reported more school-related anxiety than boys. This was particularly true in Nordic countries such as Denmark, Sweden and Iceland. (OECD 2017.) This is applicable to Finland as well, where evidence suggests a strong gender difference in the risk of school stress and burnout. Analysis of trends in school burnout between the years 2006 and 2019 has shown a gendered division among Finnish students, with girls consistently reporting more experiences of school burnout in comparison to boys (Read et al. 2022).

Though girls on an academic track report experiencing more burnout than girls on a vocational track, the difference between genders is present regardless (Salmela-Aro et al. 2010). Girls in both school tracks report higher levels of burnout, in particular feelings of inadequacy and exhaustion, in comparison to boys (Salmela-Aro and Tynkkynen 2012). The reason for this

trend is not well studied, however there is some evidence that the phenomenon is linked to self-image and high expectations of academic success which tend to be placed on girls. Academic achievement has been found to be more strongly connected to self-worth among girls as compared to boys. Attempting to improve self-worth through academic achievement increases the risk of school burnout, which is reflected in the higher rates of reported exhaustion among girls. (Herrmann et al. 2019.) In addition, girls have been shown to have lower self-confidence in certain school subjects, in particular sciences and mathematics (Saß and Kampa 2019). As poor self-image and anxiety are predictors of burnout, having lower self-confidence in academics poses an increased risk of school burnout among girls (Slivar 2001).

2.5.2 Socioeconomic status

Another factor which has been found to impact the risk of school burnout is family socioeconomic status and the educational background of parents. Socioeconomic status has been associated of school burnout, with students from lower socioeconomic backgrounds at a greater risk (Luo et al. 2016). Data from the Finnish School Health Promotion Survey (FSHPS) has shown parental education and employment status to influence the risk of school burnout among Finnish students, particularly among boys (Read et al. 2022). Lower parental education is also associated with higher perceived stress in adolescence. Students with less educated parents tend to exhibit less optimism and poor engagement coping in comparison to students with more educated parents. These characteristics have been suggested to act as mediators between socioeconomic status and stress in adolescence. (Finkelstein et al. 2007.)

Family socioeconomic status impacts the resources and opportunities available to a student, thereby playing a role in the student's well-being and burnout risk. Having a lower socioeconomic status may also place more pressure on a student to succeed and build a secure future for themselves. (Spera et al. 2008.) Having a secure socioeconomic status allows students to focus more on their studies instead of worrying about issues in their home environment (Wu et al. 2022).

Students from higher-income families are also more likely to participate in recreational, social, and cultural activities outside of school, which are believed to mediate the effects of school stress (Luo et al. 2016). In addition, family socioeconomic status has been associated with access to better educational resources, as well as better academic self-confidence, which may

mediate the effects of school-related stress and anxiety (Xu et al. 2021). This suggests that the support and resources available to a student due to family monetary status could play a central role in the development of school burnout.

2.5.3 Immigrant background

Having an immigrant background has been shown to influence academic pressure and school burnout. Data from the Finnish School Health Promotion Survey (FSHPS) shows that boys with immigrant parents are at a higher risk of presenting school burnout symptoms than other students (Read et al. 2022). Boys who have immigrated to Finland in the past five years tend to present with higher levels of burnout in comprehensive school as compared their peers. In particular, these students show an increase in cynicism, one of the central traits of burnout. (Salmela-Aro et al. 2017a.) Meanwhile, among girls, having one parent of an immigrant background increases the risk of school burnout. In addition, the correlation between these factors is mediated by the educational level of the parents, as well as the time elapsed since immigration. (Read et al. 2022.)

This phenomenon may be explained through a variety of possible factors. One of these is the extent of the students' aspirations and pressures which are driven by their background. The PISA 2015 survey found students in OECD countries who were first- or second-generation immigrants to be more motivated to succeed well in school, as compared to their peers (OECD 2017). Having an immigrant background is associated with lower employment rates and income, which may prompt immigrant parents to put more pressure on their children to become well educated and successful in their future careers (Spera et al. 2008). In addition, ethnicity has been shown to influence the aspirations parents have for their children's academic success, which is likely driven by the belief that school is a route towards a better socioeconomic status (Spera et al. 2009). Students who have an immigrant background tend to place a greater value on attaining good grades, with a majority reporting that their attitudes are shaped by those of their families. However, this ambition is often not reflected in the actual grades of the students, which increases the risk of school burnout further. (Strand 2007.)

There is also evidence suggesting that the risk of burnout among students with an immigrant background is related to barriers in language and culture. Recently immigrated students with limited language proficiency have been shown to have lower educational attainment compared

to their peers with better language skills (Suárez-Orozco et al. 2010). Results from a study conducted among American students found that those with limited English proficiency had a higher level of anxiety related to school, as compared to those with fluent English skills. Of those experiencing anxiety, the majority reported it to be caused by the worry of performing well in school. (Kremer and House 2020.) In addition, experiences of cultural isolation and discrimination among recently immigrated students increases the risk of academic maladaptation and poor academic motivation (Weva et al. 2022). This suggests that the factors influencing school stress and burnout may not be the immigrant background itself, but rather the cultural and language barriers which hinder academic achievement.

2.5.4 Academic achievement

There is plenty of research which identifies the association between academic achievement and the risk of school burnout. Results from a survey among German students in academic track schools show lower achievement in school to be associated with higher levels of burnout (Herrmann et al. 2019). Similarly, Finnish students with poorer academic achievement have been found to report more experiences of cynicism, feelings of inadequacy, and exhaustion, regardless of their school track (Salmela-Aro et al 2010).

Burnout may also be predicted by previous academic achievement and academic well-being. Data from the First Steps study indicates that children who present exhaustion and cynicism in primary school are more likely to report them in upper secondary school as well. In addition, students with poorer arithmetic skills in grade 6 present with more symptoms of burnout in upper secondary school. (Parviainen et al. 2021.)

It should be noted that there has also been evidence that contradicts this. The previously mentioned First Steps study also found a better level of reading skills in grade 6 to be associated with more cynicism in upper secondary school (Parviainen et al. 2021). This contradicts the idea that poor academic achievement is directly related to higher school burnout. However, this could be explained by individual traits among students. Longitudinal follow-up has shown students with maladaptive patterns of functioning to lack the connection between academic achievement and well-being at school found among other groups. This lack of association may be explained by the impact maladaptive patterns of functioning have on academic well-being, regardless of academic achievement. (Korhonen et al. 2014.) This is likely to apply not only to

maladaptive functioning patterns, but to other traits as well. Success- and performance-oriented students show a higher tendency for burnout, depressive symptoms, as well as low self-esteem. Meanwhile, students without strong performance tendencies show better subjective well-being despite performing equally well in their studies. (Tuominen-Soini et al. 2008.) In addition, lower mental toughness has been found to increase the risk of academic burnout (Cheung and Li 2019). The risk of school burnout among students could therefore be strongly influenced by personality traits and personal pressure to succeed in school, rather than academic achievement itself.

2.5.5 School track

As was shown in Figure 1, the prevalence of school burnout tends to be lower among vocational track students, as compared to those studying on an academic track. Though the number of Finnish students with burnout has increased in both groups over the past years, the overall prevalence has been significantly lower among vocational track students (THL, 2022a).

Follow-up of students throughout comprehensive and upper secondary school has shown a significantly lower experience of burnout among students who continue to vocational education in comparison to students who choose an academic track. In addition, the prevalence of reported cynicism, exhaustion, and feelings of inadequacy at school has been found to decrease over time for vocational track students, a trend opposite to that found among academic track students. (Salmela-Aro et al. 2010.)

Students on an academic track have been shown to report a constant increase in school burnout over time, with girls reporting the highest level of burnout, and boys reporting the largest increase in burnout symptoms over time. Meanwhile, students on a vocational track report an initial decrease in school burnout, followed by a slight increase still significantly lower than that of academic track students. (Salmela-Aro and Tynkkynen, 2012.) The trends in school burnout and academic pressure therefore seem to differ depending on the academic track chosen.

The reason for these differences may be the different levels of demand placed on students depending on their school track. Expectations of academic achievement tend to be lower on the vocational track, while the academic track tends to be more competitive (Salmela-Aro et

al. 2010). Many of those who take the academic track intend to continue to higher education and may feel pressure to succeed well in order to secure their future education (Read et al. 2022). Students who apply for the academic track are also more likely to be academically driven and place higher expectations upon themselves, as compared to those who opt for the vocational track (Salmela-Aro et al. 2010).

In addition, there tends to be a gendered division between the two school tracks in Finland. Attending the vocational track is more common among boys, while attending the academic track is more common among girls (THL 2022a). As discussed previously, girls are more likely to experience academic pressure and burnout, which may explain some of the differences in prevalence of school burnout between the school tracks (Read et al. 2022).

3 PHYSICAL ACTIVITY

Physical activity is defined as all types of exercise performed by the body and can include a variety of activities done at work, for transport, or in leisure time (WHO 2022). Guidelines published by the World Health Organization recommend children and adolescents to exercise an average of one hour per day throughout the week, including both muscle-strengthening and aerobic exercises (WHO 2022). In Finland, the recommended amount of exercise for adolescents is 1–1.5 hours per day, which should include several moments of exertion where breathing and heart rate are increased (THL 2022b).

In recent decades, the lack of sufficient physical activity has become a global phenomenon, particularly in high-income countries. A 2016 report by the WHO noted that globally, 81% of adolescents failed to reach the recommended amount of physical activity. This was especially true among adolescent girls, of whom 85% were insufficiently active compared to 78% of adolescent boys. (WHO 2022.) Surveys among upper secondary school students have shown similar trends to be taking place in Finland. In 2021, the proportion of students who reached the daily recommendation of one hour of physical activity was only 17.5% among academic track students, and 15.4% among vocational track students (THL 2022b).

3.1 Benefits of physical activity on burnout

Physical activity has a wide variety of benefits related to health and well-being (Lundber and Cooper 2011). In accordance with this, research has shown physical activity to be beneficial in preventing and reducing the effects of stress. The Stress in America survey (2014) found American teenagers who participated in exercise at least once per week to report lower stress levels than their more sedentary peers. Of the more active group, 30% reported to have experienced an increase in stress during the past year, as opposed to 38% in the more sedentary group (APA 2014). It has also been suggested that being physically fit due to regular exercise may reduce the negative effects caused by stress. More athletically trained individuals have been shown to present less autonomous nervous system reactivity when presented with acute mental stress. Meanwhile, less trained individuals have presented with a higher heart rate, as well as increased cortisol secretion and state anxiety responses, with untrained individuals having the strongest reactions. (Rimmele et al. 2009.) Physically fit individuals have also been

found to have a reduced inflammatory cytokine response when presented with acute mental stress, as compared to less fit individuals. This is suggested to be due to better parasympathetic control achieved through physical activity and improved fitness levels. (Hamer and Steptoe 2007.)

In addition to reducing stress, there is plenty of research which suggests that being physically active can mediate the effects of burnout itself. Longitudinal research has found a lack of physical activity to be associated with poor mental health, including experiences of anxiety, depression, and burnout. This effect has been perceived both at baseline and after follow-up, suggesting that the two factors are closely linked. (Lindwall et al. 2014.) In addition, studies have shown an association between physical activity and reduced symptoms of burnout. This is particularly true for exhaustion, which is one of the key features of burnout. (Naczenski et al. 2017.)

The connection between physical activity and burnout has also been investigated in the context of academics. Being more sedentary has been associated with an increased risk of burnout among comprehensive school students (Chang and Li 2019). Meanwhile, participating in recreational activities, including physical activity, has been shown to mediate the effects of school-related burnout (Luo et al. 2016). Among higher education students, being physically active has been associated with a less experiences school burnout, as well as a better life quality (Taylor et al. 2022). As shown by these studies, there is plenty of evidence to suggest that physical activity has an effect on the reduction and prevention of school-related stress and burnout.

3.2 Potential pathways

The way in which physical activity reduces the effects of stress and burnout is complicated and is believed to occur through a variety of mechanisms. One potential pathway is the positive impact exercise has on cognitive function and memory. Individuals with higher fitness levels have been shown to perform better in tasks measuring cognitive ability. In addition, being physically active has been associated with better academic achievement. (Alghadir et al. 2020.) Individuals participating in daily exercise have been found to possess better executive functioning, as compared to their more sedentary peers. Meanwhile, burnout has been

associated with inefficient executive functioning, as well as difficulties completing daily tasks requiring some level of executive function. (Pihlaja et al. 2022).

Regular participation in physical activity is also believed to have a protective effect against mental decline and cognitive disorders such as Alzheimer's disease and dementia (Reiner et al., 2013). In addition, research has shown physical activity to promote the formation of new cells in the hippocampus, thereby further supporting cognitive function (Lundber and Cooper 2011).

Research also suggests that physical activity may reduce burnout through its positive effects on the regulation of stress hormones. Burnout has been shown to involve changes in stress hormones levels, in particular cortisol (Bayes et al. 2021). However, this effect is believed to be reduced by physical activity. Several studies have shown regular physical activity to be an effective way of reducing cortisol levels (De Nys et al. 2022). Research among students has shown more active individuals to have lower salivary cortisol levels and higher serum serotonin levels, as compared to less active individuals. Among more active students, higher levels of serum serotonin have also been linked with better academic achievement. (Alghadir et al. 2020.) Physical activity and higher fitness levels have also been associated with reduced secretion of cortisol during the presence of psychosocial stress (Wood et al. 2017). This suggests that regular exercise may impact burnout through the mediation of stress hormones, in particular cortisol.

It is also believed that the autonomic nervous system is involved in the connection between physical activity and burnout. Burnout has been shown to involve prolonged activation of the autonomic nervous system, as well as dysfunction of the sympathetic nervous system (Bayes et al. 2021). Individuals suffering from burnout are often seen to have an overactive sympathetic nervous system, which negatively affects the overall functioning of the body (Pihlaja et al. 2022). However, research suggests that participation in physical activity can mediate this effect. A single session of intense physical effort has been shown to reduce autonomic nervous system activity, as well as lower the level of perceived mental stress (Martinez-Gonzalez-Moro et al. 2022). More physically active individuals have also been found to have better regulation of the sympathetic nervous system, as well as reduced sympathoexcitation. This is in line with the cross-stressor adaptation hypothesis, which proposes that participating in regular exercise can lead to changes in the body's nervous system,

which in turn reduces the nervous system's reactivity to stressors outside of physical activity. (Mueller 2007.)

Finally, research has also noted the intermediate role of sleep in the connection between physical activity and burnout. Insufficient sleep, which is defined as fewer than six hours of sleep per night, has been found to increase the risk of burnout (Söderström et al. 2012). This is especially true for adolescents, as they have an increased need for sleep as well as a sleep cycle which differs from that of adults. Students with sleep problems have been found to be more likely to develop school burnout in the future, as compared to students who get sufficient sleep. (Liu et al. 2021.) This risk can be indirectly affected through physical activity, as participating in exercise is believed to improve both the quantity and the quality of sleep. Previous research has shown physical activity to be associated with improved sleep outcomes, regardless of the type of exercise performed. (De Nys et al. 2017.) Both regular and acute bouts of exercise have been perceived to be beneficial, though participating in physical activity for a longer duration has been suggested to have the best outcome in terms of sleep (Kline et al. 2021). Therefore, being physically active may indirectly reduce the chance of school burnout, through the positive effects improved sleep quality has on burnout risk.

4 RESEARCH QUESTION AND STUDY AIM

The study aimed to investigate the relationship between physical activity and school burnout among Finnish upper secondary school students. Previous literature suggests there to be an association between physical activity and burnout, where individuals taking part in more exercise tend to experience less stress and lower levels of burnout. However, much of this research has been conducted among university students and working populations. Very little is known of the potential association among younger populations, particularly in upper secondary school students.

The purpose of this study was to fill this gap in research using data from the MetLoFIN study conducted in the Helsinki Metropolitan region in 2016. The research question was: "What type of association is there between the level of physical activity and school burnout among Finnish upper secondary school students in the Helsinki Metropolitan region?"

5 MATERIALS AND METHODS

5.1 Data source and study design

5.1.1 The MetLoFIN study

The data used in this study was sourced from the MetLoFIN survey conducted in 2016. The MetLoFIN study was a set of surveys conducted among students in the Helsinki metropolitan region over the period of several years, with previous surveys having been conducted in 2011 and 2014. Participants in the 2016 survey were recruited from upper secondary schools to which participants of the previous surveys had continued to. All students, including previous participants and the other students in those schools, were invited to participate. In total, 17 916 students were invited to the survey, of which 8935 participated.

The purpose of the survey was to investigate the learning, health, and well-being of students. It included a long list of questions, of which the most central to this study were those related to lifestyle habits and well-being at school. These questions were placed towards the end of the survey.

The surveys were conducted during regular school hours, in a classroom setting. The sessions were supervised by teachers, who were only given the information necessary to ensure the proper protocol of the study. Surveys were in an electronic format and completed using computers. Students were given randomized participant ID numbers by the supervising teachers, which were used in the place of names to maintain participant anonymity. The total time for the survey session was 90 minutes, after which students returned to regular school activities.

The MetLoFIN study was given approval by the ethical committee of the National Institute of Health and Welfare of Finland, as well as the educational authorities of each participating municipality. Parental permission was received from students who required it, and students were clearly informed that participation was voluntary. The collection of data was performed during regular school hours, with teachers supervising the sessions. Participant anonymity was ensured through the use of participant ID numbers instead of names.

5.1.2 Study design

This study investigated the relationship between weekly physical activity levels and school burnout among upper secondary school students using a cross-sectional design. The study utilized data from the 2016 survey, which was conducted among Finnish adolescents studying in upper secondary schools in the Helsinki metropolitan region. This data was chosen based on the interest to specifically study upper secondary school students, as literature shows that students are at a higher risk of suffering from school-related stress during this phase of their studies. The 2016 MetLoFIN questionnaire included a large variety of questions regarding learning, lifestyle, and well-being. For this study, the results of the survey were filtered for data regarding physical activity level and school burnout, as well as data regarding background variables.

5.2 Study population

The participants in this study were upper secondary school students from the Helsinki metropolitan region. Participants included students who had taken part in the previous MetLoFIN studies, as well as other students from their schools. A total of 8935 students answered the 2016 survey.

The data of participants who were missing a participant number was removed from the dataset. In addition, the data of participants who had missing answers on any of the questions measuring the two main variables, SBI score and weekly physical activity, was removed. Though some of the participants were also missing data on the background variables, their data was kept in the dataset. The final study sample consisted of 6695 participants, of which 55% were female and 45% male. Participants were in their second year of upper secondary education, with 68% studying on an academic track and 32% on a vocational track. The mean age of participants was 17.8 years.

5.3 Variables

To determine the participants' school burnout, the School Burnout Inventory (SBI) by Salmela-Aro et al. (2009a) was used (See Appendix 1). The inventory consisted of a set of 9 questions, which were answered on a scale of 1 = completely disagree to 5 = completely agree. The scores were added to a total, in which a higher score indicated a higher level of school burnout.

Physical activity level was measured using the question "How often do you participate in sports or perform physical activity in your free time for at least 30 minutes?". Participants could answer the multiple-choice question with "Never", "Rarely", "Once a week", "2–3 times per week", "4–6 times per week", "Once a day", or "Multiple times per day". This did not include any physical activity the students may have taken part in during school hours, such as gym class. The categories "Never" and "Rarely" were combined to produce a single category "Rarely or never" in order to simplify analysis.

Background variables included gender, socioeconomic status, immigrant background, academic achievement, and whether students were enrolled in an academic or vocational track. The background variables were selected based on existing literature, which suggests these factors play a role in the increased risk of school burnout.

Since the exact socioeconomic status of participants was hard to determine, parental employment status and participants' experience of having sufficient money were used as approximate indicators. Immigrant status was based on either the participant or their parent being born outside of Finland. Academic achievement was determined using grades from Finnish, math, history, chemistry, and the student's A1 language. The grades used were those given in the final report card of comprehensive school, which were used to calculate a grade-point average to represent the academic achievement of each student. The background variables and their indicators are shown in Table 1.

TABLE 1. Background variables used in study and the questions used for data collection during the MetLoFIN study.

Background variable	Question	Available answers
Gender	"I am a…"	"Girl" "Boy"
Socioeconomic status	"What do your parents do mainly?" (mother/father)	"Work outside the home" "Works at home" "Is at home, does not work" "Is unemployed or temporarily laid off" "Is retired" "Studies" "I do not have a mother/father"
	"Do you have trouble having enough money?"	"Very often" "Quite often" "Somewhat" "Quite rarely" "Not at all"
Immigrant background	"Where were you born?" "Where was your mother born?" "Where was your father born?"	"In Finland" "Somewhere else, where? ____"
Academic achievement	"Grades in the following subjects:" Finnish (mother tongue) Math A1-language History Chemistry	Grade scale from 4 to 10 for each subject, which was then used to calculate a total grade point average.
School track	"I study in…"	"An academic track" "A vocational track"

5.4 Statistical methods

Data analysis was performed using IBM SPSS statistics version 28.0. The statistical significance of the results was determined using a p-value of 0.05. Descriptive statistics of each variable were produced, and the even distribution of each variable was determined. A one-way ANOVA was conducted to determine the unadjusted association between SBI score and weekly frequency of physical activity. The rule for examining standard deviations in ANOVA was applied, as the test for the homogeneity of variances produced a significant result (Moore and McCabe, 2006). The robust equality of means was also checked. For post-hoc analysis, a Bonferroni test was conducted to compare the association between SBI score and each separate category of physical activity level. To determine the impact of the background variables on school burnout, a univariate general linear model was conducted. The even distribution of the

residual produced during the univariate general linear model was determined using descriptive statistics. A Cronbach's Alpha test was conducted to determine the reliability of the SBI scale. Finally, due to the significant result produced by the homogeneity of variances test, nonparametric tests were conducted to confirm the findings were indeed accurate. Nonparametric tests included the independent-samples Kruskal-Wallis test, followed by a pairwise comparison of physical activity level categories. The results of these were then compared to the outcome of the Bonferroni test to determine the similarity of the outcomes.

6 RESULTS

Table 2 shows the frequency distributions of the background variables, including gender, measures of socioeconomic status, immigrant background, academic achievement, and school track. Both genders were equally represented, with 54.5% of participants being female and 45.5% being male. Of the participants, 67.7% were enrolled in an academic track, while 32.3% were attending a vocational track. A total of 25.7% of students were from an immigrant background, and 5.3% had been born outside of Finland themselves (Table 2).

TABLE 2. The frequency distributions (N and %) of background variables among participants.

Background variable	Characteristic	N = 6695	%
Gender	Female	3647	54.5
	Male	3040	45.5
Mother's working situation	Works outside the home	5430	81.1
	Works from home	331	4.9
	Is at home, does not work	300	4.5
	Is unemployed or temporarily laid off	183	2.7
	Is retired	157	2.3
	Studies	174	2.6
	No mother	74	1.1
Father's working situation	Works outside the home	5227	78.1
	Works from home	297	4.4
	Is at home, does not work	124	1.9
	Is unemployed or temporarily laid off	280	4.2
	Is retired	331	4.9
	Studies	42	0.6
	No father	248	3.7
Struggling to have sufficient money	Very often	383	5.7
	Quite often	640	9.6
	Somewhat	1651	24.7
	Quite rarely	2261	33.8
	Not at all	1739	26
Immigrant background	Born outside Finland	358	5.3
	Born in Finland	4969	74.3
	Mother born outside Finland	652	9.7
	Father born outside Finland	716	10.7
Grade point average	10	208	3.1
	9	1568	23.4
	8	2260	33.8
	7	1845	27.6
	6	709	10.6
	5	97	1.4
	4	8	0.1
School track	Academic	2161	67.7
	Vocational	4534	32.3

Table 3 shows the frequency distributions of SBI score and weekly physical activity level in free time. The most frequent SBI score was 30–39 points, which was attained by 41.7% of the participants. A score of 20-29 points was scored by 39.4% of the participants, placing the majority of participants between 20 and 39 points. In terms of physical activity level, most participants reported taking part in some level of exercise on a weekly basis, with only 12.7% exercising rarely or never. The most common frequency of physical activity was 2–3 times per week, which was reported by 27.3% of participants (Table 3).

TABLE 3. The frequency distributions (N and %) of SBI score and physical activity level

Characteristic	N = 6695	%
SBI score		
<10	120	1.8
10–19	456	6.8
20–29	2632	39.4
30–39	2794	41.7
>40	691	10.3
PA level		
Rarely or never	848	12.7
Once per week	668	10
2–3 times per week	1828	27.3
4–6 times per week	1806	27
Once or more per day	1545	23.1

As shown in Table 4, the mean SBI scores for the different levels of weekly physical activity did not differ much from each other. Among the participants, the Rarely or never group had the lowest mean SBI score of 28.52, while the 4–6 times per week had the highest mean SBI score of 30.46. The mean SBI score for all participants was 29.98. The ANOVA produced a between group difference of <0.001, suggesting that at least one of the groups differed from others at a level of statistical significance. The homogeneity of variances produced a statistically significant score of <0.001, however, the standard deviations of each group were relatively close to one another, and the rule for examining standard deviations in ANOVA was applied.

TABLE 4. Mean SBI scores, standard deviations, and 95% confidence intervals according to physical activity levels.

PA level	Mean SBI score	SD	95% CI
Rarely or never	28.52	8.3	[27.96, 29.08]
Once per week	30.03	6.92	[29.50, 30.56]
2–3 times per week	29.96	7.35	[29.62, 30.29]
4–6 times per week	30.46	7.31	[30.12, 30.79]
Once or more per day	30.23	7.73	[29.84, 30.62]
All participants	29.98	7.53	[29.80, 30.16]

The post-hoc Bonferroni test showed the Rarely or never group to significantly differ from other groups, with a p-value of 0.001 when compared to the Once per week group, and a p-value of <0.001 when compared to the 2–3 times per week, 4–6 times per week, and once or more per day groups (Table 5). The 95% confidence interval of the Rarely or never group did not overlap with those of other groups, suggesting the mean was significantly different from the means of the other groups. As indicated by the negative values of the differences in means, the mean score of the Rarely or never group was less than the mean scores of the other groups.

TABLE 5. Mean differences between each level of weekly physical activity, produced by the post-hoc Bonferroni test.

PA level	Comparison group	Differences in means	95% CI	p-value
Rarely or never	Once or more per day or	-1.71*	[-2.61, -0.81]	<0.001
	4–6 times per week	-1.93*	[-2.81, -1.05]	<0.001
	2–3 times per week	-1.45*	[-2.31, -0.56]	<0.001
	Once per week	-1.51*	[-2.60, -0.42]	0.001
Once per week	Once or more per day	-0.20	[-1.18, 0.78]	1.000
	4–6 times per week	-0.43	[-1.38, 0.53]	1.000
	2–3 times per week	0.07	[-0.88, 1.03]	1.000
	Rarely or never	1.51*	[0.42, 2.56]	0.001
2–3 times per week	Once or more per day	-2.73	[-1.00, 0.46]	1.000
	4–6 times per week	-0.50	[-1.20, 0.20]	0.460
	Once per week	-0.07	[-1.03, 0.88]	1.000
	Rarely or never	1.44*	[0.56, 2.31]	<0.001
4–6 times per week	Once per day or more	0.23	[-0.51, 0.96]	1.000
	2–3 times per week	0.50	[-0.20, 1.20]	0.460
	Once per week	0.43	[-0.53, 1.38]	1.000
	Rarely or never	1.93*	[1.06, 2.81]	<0.001
Once or more per day	4–6 times per week	-0.23	[-0.96, 0.51]	1.000
	2–3 times per week	0.27	[-0.46, 1.00]	1.000
	Once per week	0.20	[-0.78, 1.18]	1.000
	Rarely or never	1.71*	[0.81, 2.61]	0.001

*the mean difference is significant at a level of 0.05 or less

Figure 2 shows the mean SBI scores for each level of weekly physical activity drawn on to a box plot. As shown in Table 4, the mean scores of the groups were very close to one another, with Rarely or never being the only group with a statistically significant difference.

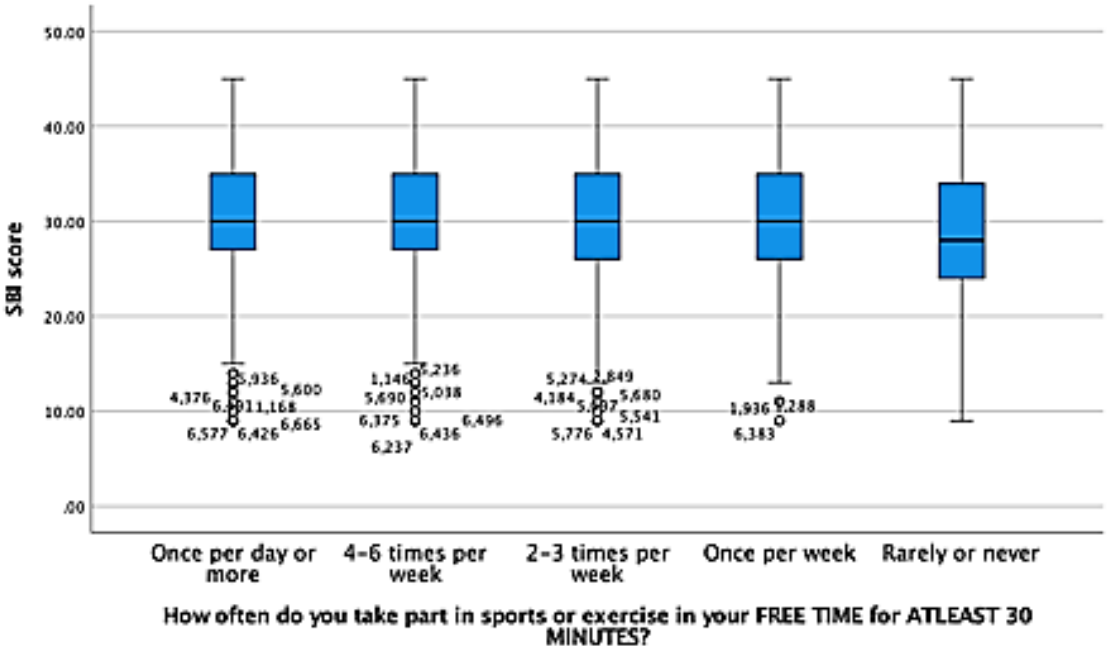

FIGURE 2: Boxplot of the mean SBI scores for each level of weekly physical activity

Table 6 shows the mean SBI scores for each group within each background variable. Significant between group differences were found for all of the background variables. Males were found to have a higher SBI score than females, with scores of 30.69 and 29.40, respectively. Participants with a father born outside of Finland had a significantly lower SBI score of 29.44 than that of other participants with an immigrant background. In addition, between group differences were statistically significant among different groups of grade point average and measures of socioeconomic status. Vocational track students had a score of 31.21, which was significantly higher than the score of 29.39 found among academic track students.

TABLE 6. Mean SBI scores for each category of the background variables and the statistical significance of between group differences.

Background variable	Category	Mean SBI score	p-value*
Gender	Female	29.40	<0.001
	Male	30.69	
Mother's working situation	Works outside home	29.95	0.008
	Works from home	29.91	
	Is at home, does not work	30.46	
	Unemployed or temporarily laid off	28.77	
	Is retired	31.47	
	Studies	29.25	
	No mother	32.01	
Father's working situation	Works outside home	30.03	0.049
	Works from home	29.22	
	Is at home, does not work	28.97	
	Unemployed or temporarily laid off	29.32	
	Is retired	30.69	
	Studies	29.02	
	No father	30.37	
Struggling to have sufficient money	Very often	26.23	<0.001
	Quite often	28.08	
	Somewhat	28.97	
	Quite rarely	30.20	
	Not at all	31.81	
Immigrant background	Born outside Finland	30.01	0.296
	Mother born outside Finland	29.84	0.565
	Father born outside Finland	29.44	0.013
Grade point average	10	30.53	0.002
	9	31.48	
	8	29.59	
	7	30.23	
	6	30.17	
	5	27.66	
	4	28.38	
School track	Academic	29.39	<0.001
	Vocational	31.21	

*Significance of between group difference as determined by one-way ANOVA analysis.

After adjusting for background variables through the univariate general linear model, the between-group difference for physical activity level remained statistically significant, with a p-value of <0.001. Background variables which were shown to be significantly associated with SBI score were gender (p<0.001), academic achievement (p<0.001), and school track (p<0.001). Of the indicators used to account for socioeconomic status, struggling to have sufficient money (p<0.001), and mother's working situation (p=0.024) were also found to be significantly associated with SBI score. Father's working situation (p=0.081) was found to not

be significantly associated. In addition, no indicator of immigrant status, which were participant's the country of birth (p=0.538), the country of the participant's mother's birth (p=0.284), and the country of participant's father's birth (p=0.491), was found to be significantly associated with SBI score. The Cronbach's Alpha test produced a value of 0.899 for the reliability of the SBI scale.

In addition to the results described above, nonparametric tests were conducted during data analysis. This was done in order to confirm the results from the primary data analysis, as the homogeneity of variances test had produced a significant result. However, the nonparametric tests showed similar results to the primary statistical analysis, and therefore this study only focused on the results obtained from the primary data analysis, as discussed above.

7 DISCUSSION

7.1 Summary of key findings

The purpose of this study was to investigate the relationship between weekly physical activity level and school burnout among upper secondary students. Participants who exercised rarely or never were shown to have a lower mean SBI score compared to other groups, suggesting that students who exercised rarely or never experienced less school burnout compared to their peers. For the rest of the physical activity groups, the differences remained statistically insignificant. Of the background variables, gender, academic achievement, and school track were associated with school burnout. In addition, one of the indicators of socioeconomic status, struggling to have sufficient money, was associated with school burnout. Between group differences in SBI score were found for each of the background variables.

7.2 Comparison to previous research

The results of this study differed from what was expected, as previous research has shown physical activity to be associated with stress and school burnout (Naczenski et al. 2017). As was expected, gender was associated with school burnout. However, males were shown to have a higher SBI score than females. This did not align with previous research, which indicates that females tend to have higher school burnout than males (Read et al. 2022). There are some studies which have shown similar outcomes, for example, Gabola et al. (2021) found there to be no significant differences between genders when investigating school burnout among Italian and Swiss students. In addition, research suggests that among students with an immigrant background, boys are at a greater risk of suffering from school burnout than girls (Read et al. 2022). However, these studies do not provide an explanation as to why males presented with a higher SBI score than females in this study.

Only one of the indicators for socioeconomic status, struggling to have sufficient money, was associated with school burnout. Based on previous literature, it would have been expected for participants with a lower socioeconomic status to have a higher SBI score (Luo et al. 2016; Spera et al. 2008). This was not the case, however, as the results showed students who struggled

less with money to have a higher SBI score than those who struggled more. A potential explanation for this could be the effect socioeconomic status has on academic motivation and ambition for the future. Studies have found students with a lower socioeconomic background to be more likely to have low motivation towards academics, and less likely to attend further education after upper secondary school (Rogelberg 2021). Due to this mindset of a less ambitious future, it is possible that lower socioeconomic status students find school less stressful, and therefore experience less school burnout.

No significant association was found between immigrant status and SBI score. This differs from previous literature, which suggests those with an immigrant background are more likely to experience pressure over succeeding well in school (Read et al. 2022). However, there were between group differences, as participants with a father born outside of Finland had a higher SBI score compared to other students with an immigrant background. This lack of association between immigrant background and SBI score could be explained by the various other factors which influence the relationship. In particular, factors such as poor adaptation to Finland, low academic achievement, and absences from school are believed to affect the risk of school burnout among adolescents with an immigrant background (Salmela-Aro et al. 2017a). These were not controlled for when looking at the association between SBI score and immigrant status, and therefore may have influenced the outcome.

Academic achievement was found to be associated with SBI score, and a difference was found between groups based on grade point average. Students who performed better in school had a higher mean SBI score compared to students who had lower grade point averages. This is in line with previous literature, which suggests academic achievement to impact the risk of school burnout (Salmela-Aro et al. 2010).

The results also showed school track to be associated with school burnout, which is in alignment with existing research. However, vocational track students were shown to have a higher SBI score as compared to academic track students. This differs from previous literature, which shows academic track students to have a higher risk of burnout as compared to vocational track students (THL 2022a). The reason for this is unclear, as no previous studies have found vocational track students to have higher levels of burnout than students in an academic track.

The research questioned of this thesis was “What type of association is there between the level of physical activity and school burnout among Finnish upper secondary school students in the

Helsinki Metropolitan region?". Based on the results, the answer to the research question is that a slight association can be found between physical activity level and school burnout, with those exercising "Rarely or never" having a lower mean SBI score compared to other groups. In addition, gender, academic achievement, school track, and one of the indicators for socioeconomic status are associated with school burnout.

7.3 Possible explanations of results

As this study was of a cross-sectional design, it was not possible to assess whether physical activity that affected school burnout, or if school burnout in fact affected physical activity. Based on existing literature, it was assumed that physical activity would act as the variable affecting school burnout. However, whether stress and burnout would affect physical activity instead, was not considered. Studies have shown occupational burnout to be associated with reduced participation in exercise in daily life (Pihlaja et al. 2022). In addition, experiencing stress has been found to impair the ability to take part in regular physical activity (Stults-Kolehmainen and Sinha 2014). It is therefore possible, that the stress and burnout experienced by the participants in the MetLoFIN study reduced their participation in physical activity, as opposed to it being the other way around.

There is also evidence which points to physical activity itself acting as a stressor. A systematic review by Stults-Kolehmainen and Sinha (2014) found that, though most of the included studies supported the theory of exercise being beneficial in reducing stress and burnout, there were a few which found physical activity to be associated with increased stress. A possible explanation for this is that, for individuals who are under pressure in other areas of their life, taking time to exercise may feel like an additional burden. The association may also be explained by individuals participating in more physical activity than usual during stressful periods in order to cope or destress (Stults-Kolehmainen and Sinha 2014).

Additional variables which may have impacted the study's outcome were factors related to overall health and well-being, which were not controlled for. A study by Huvila and Mittilä (2019) found upper secondary school students to state various health factors, such as poor lifestyle habits, insufficient sleep, poor mental health, and strain in personal relationships, as having the largest influence on school burnout. In accordance with this, previous research has shown poor sleep to be associated with school burnout, with the two variables influencing each

other both ways (Liu et al. 2021). Electronics use may also have impacted the outcome of this study, as excessive internet use has been connected with experiencing school burnout (Salmela-Aro et al. 2017b). Survey data has shown the average Finnish youth to use the internet for 31-40 hours per week, of which 15-20 hours is spent on social media (Ebrand Oy and the City of Oulu's education and culture services 2019). Due to such high usage among adolescents and young adults, future studies should consider the role of internet and social media use on school burnout.

7.4 Reliability of the results

A key issue in the data used to perform this study was the high prevalence of students who, when answering questions on a scale from "1-5", had answered "3". Though the data remained evenly distributed, the frequency of the answer "3" was unproportionally represented among the data points. The exact reason for this is unknown, however, it is likely that survey fatigue combined with edge aversion played a role. The MetLoFIN questionnaire, from which the data of the study was sourced, was very long, with the study session lasting multiple hours. In addition, the questions regarding school burnout and physical activity were placed towards the end of the survey. It is therefore highly likely that many of the participants did not reach these questions, and that those who did were students with a higher tendency towards motivation, school-orientation and perfectionism. It is also likely that many of the participating students experienced survey fatigue, and started to put less thought into their answers as the questionnaire went on. If so, it is also likely that participants selected the middle answer, in this case, "3", as studies have shown middle answers to be the most common choices when answering questions at random or without knowledge. When answering a single, multiple-choice question for which they do not know the answer, individuals tend to select the middle options 75-80% of the time. In addition to this, when unsure of the correct answer, individuals tend to avoid the first and last options, a phenomenon which is called edge aversion. (Attali and Bar-Hillel 2003.) This may explain the high prevalence of the answer "3" in the data of this study, as well as the lack of differences in SBI score between all but one of the physical activity groups.

Another factor which may have impacted the reliability of the data was the extent to which the SBI scale detects cases of school burnout. As shown by previous literature, stress and burnout

can manifest differently among individuals, with each person reacting in an individual manner (Mäkikangas and Kinnunen 2016). In addition, personality traits such as resilience and goal orientation have been shown to mediate burnout but are not taken into account in the SBI scale (Wu et al., 2022; Tuominen-Soini et al. 2008). Literature suggests that the SBI scale is a reliable method to measure school burnout (Salmela-Aro et al. 2009a), in addition to which the Cronbach's Alpha test conducted during data-analysis produced a score suggesting good reliability. However, it is still possible for many students with burnout to go undiagnosed when the SBI scale is used as the only form of measurement. Studies have also found burnout to be more of a dynamic process, rather than a stable, linear occurrence (Mäkikangas and Kinnunen 2016). This may make identifying school burnout more difficult, as the severity of the reported symptoms may depend on the timing of the questionnaire. Therefore, the extent of school burnout among the participants of this study may have differed from that measured by the survey.

Finally, the lack of information on the type and intensity of exercise performed by participants may have impacted the outcome of this study. The question used to measure the level of physical activity among participants was "How often do you participate in sports or perform physical activity in your free time for at least 30 minutes?". Though this gave a general idea of the amount of exercise performed outside of school, it did not specify the type of exercise in question, or how intense the exercise was. Research suggests that there is a difference between exercising in a casual, hobby-like manner and practicing a sport at a more intense, competitive level. Practicing sports at an amateur level has been associated with lowered sensitivity to stress and reduced burnout (Tukaiev et al. 2019). Meanwhile, students who practice sports at a competitive level while simultaneously completing their studies have a higher risk of suffering from burnout as compared to their peers. This is most likely due to the double burden of performing well, which achievement-oriented student athletes tend to suffer from. In addition, experiencing burnout in one area of life may spill over to other areas, making students more prone to stress and exhaustion in both school and sports. (Sorkkila et al. 2018.) In terms of exercise intensity, studies have suggested more frequent, higher intensity exercise to be more beneficial in preventing and reducing stress than lighter exercise (Taylor et al. 2022). However, the evidence on this topic is still fairly limited (Naczenski et al. 2017). More research is needed before more definitive conclusions can be drawn.

7.5 Future research

Future studies should investigate the impact different types of physical activity, as well as different intensities of exercise, have on school burnout. As is the case for many cause-effect relationships, achieving a desired outcome may require reaching a threshold point in the input variable. If that is the case for physical activity and school burnout, more research is needed to investigate where this threshold lies. In addition, a larger variety of variables should be considered when investigating school burnout. These should include variables such as sleep, electronics use, mental well-being, as well as other health and lifestyle factors. The influence of these variables on each other, and the potential of certain variable combinations producing different outcomes, should be looked into further. Finally, ways in which the increasing trend in school burnout among Finnish upper secondary school students can be addressed should be identified. The reduction and potential prevention of school burnout should be investigated, in order to create a change in the concerning upward trend.

7.6 Strengths and limitations

This study had multiple limitations. The most significant of these was the unreliability of the data due to potential survey fatigue and random answers given by participants. The data analysis did not take into account the type and intensity of exercise performed by participants, as this information was not available, which could have impacted the study outcome. Additional background factors such as sleep and electronics use, which have been shown to influence stress and burnout, were not taken into account. In addition, due to the cross-sectional design of the study, it was not possible to distinguish whether the level of exercise affected the level of school burnout of participants or vice versa. To better investigate the cause-effect relationship between the two factors, a different study design could have been used to determine the change in variables over time. Finally, as the participant population of the MetLoFIN study was recruited from schools in the Helsinki metropolitan region, the results produced by this study are not necessarily applicable to populations outside of this region.

Despite having limitations, this study also had strengths. These included the large participant population, and the equal representation of both genders among participants. Students from both academic and vocational tracks were represented within the participant group. In addition,

a large variety of background factors, including gender, socioeconomic status, immigrant background, academic achievement, and school track, were taken into account during data analysis. Overall, the data set provided by the 2016 MetLoFIN study was a good cross-sectional representation of school burnout and physical activity levels among upper secondary school students in the Helsinki metropolitan region.

7.7 Ethical considerations

This study was conducted according to the research guidelines of Tampere University. Permission to use data was granted by those in charge of the MetLoFIN study material. All literature, research, and information used in this study was appropriately referenced using the APA referencing format.

The MetLoFIN study was given approval by the ethical committee of the National Institute of Health and Welfare of Finland, as well as the educational authorities of each participating municipality. Parental permission was received from students who required it, and students were clearly informed that participation was voluntary. The collection of data was performed during regular school hours, with teachers supervising the sessions. Participant anonymity was ensured through the use of participant ID numbers instead of names.

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APPENDIX

Appendix 1: School Burnout Inventory (SBI) by Salmela-Aro et al. (2009a)

Please choose the alternative that best describes your situation (estimation from previous month)

Completely disagree	Partly disagree	Disagree	Partly agree	Agree	Completely agree
1	2	3	4	5	6

1. I feel overwhelmed by my schoolwork (EXH1)
2. I feel a lack of motivation in my schoolwork and often think of giving up (CYN1)
3. I often have feelings of inadequacy in my schoolwork (INAD1)
4. I often sleep badly because of matters related to my schoolwork. (EXH2)
5. I feel that I am losing interest in my schoolwork (CYN2)
6. I'm continually wondering whether my schoolwork has any meaning (CYN3)
7. I brood over matters related to my schoolwork a lot during my free time (EXH3)
8. I used to have higher expectations of my schoolwork than I do now (INAD2)
9. The pressure of my schoolwork causes me problems in my close relationships with others (EXH4)

Note. EXH = exhaustion at schoolwork; CYN = cynicism toward the meaning of school; INAD = sense of inadequacy at school.