

Stress-Related Symptoms in Swedish Adolescents: A Study in Two Upper Secondary Schools

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Abstract

Aims: Psychiatric symptoms, sleeping problems and stress are increasing in Swedish adolescents. The aim of this study was to test the hypothesis that a combination of two potential stressors (i.e., high academic proficiency and high urbanicity) in a school setting would be related to increased stress levels and stress-related symptoms among pupils. Our second aim was to evaluate correlations between perceived stress and psychiatric symptoms, sleep quality and personality traits. **Methods:** 202 Swedish high-school students from two schools, one with high academic proficiency in the Metropolitan Malmö area and one of average academic proficiency in a medium-sized town, participated. We used Internet-based versions of the following questionnaires: Symptoms Checklist 90 (SCL-90) for general psychiatric symptoms, Perceived Stress Scale (PSS-14) for stress, Pittsburgh Sleep Quality Index (PSQI) for sleep quality and Eysenck Personality Index (EPI) for personality traits. **Results:** There was no significant difference between the schools in any of the measured scales. Significant correlations between perceived stress and GSI score, PSQI score and the personality trait Neuroticism were observed. **Conclusions:** This study suggests no difference between the high academic proficiency/metropolitan school and the average academic proficiency/medium-sized town school in perceived stress levels or stress-related psychiatric symptoms.

Keywords: stress, adolescents, personality, academic proficiency, urbanicity

1. Introduction

Psychiatric symptoms and stress have increased among Swedish adolescents in recent decades (Bremberg, 2006; Petersen, 2007; Wiklund, Malmgren-Olsson, Öhman, Bergström, & F. Wiklund, 2012). Furthermore, there is evidence of a significant association between stress and psychopathology in children and adolescents from cross-sectional studies (Compas, 1987; Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001) and longitudinal studies (Hammen & Goodman-Brown, 1990; Hilsman & Garber, 1995; Rudolph, Lambert, Clark, & Kurlakowsky, 2001; Schmeelk-Cone & Zimmerman, 2003).

In Sweden, adolescents reported that school is the most important stressor (Bremberg, 2006). According to Ollfors and Andersson, most of adolescents' stress appears to be connected with their schoolwork. Regression analysis showed that stress contributed 4 % to final grades (Ollfors & Andersson, 2007). Chronic perceived stress was associated with lower final grades in two highly ranked high schools in the urban Stockholm area (Schraml, Perski, Grossi, & Makower, 2012).

There has been some speculation concerning whether students attending upper secondary schools with high academic proficiencies are more "stressed out" than other students. While there is no Swedish evidence covering this suggestion, in the USA, Suldo et al showed that students following the high achieving International Baccalaureate curriculum perceived more stress than students in the general education curriculum due to higher academic demands, but this higher perceived stress did not reduce academic performance. The absence of a reduction in performance was suggested to be due to adaptive coping strategies (Suldo, Shaunessy, & Hardesty,

2008). Kaplan et al, on the other hand, state that for students in high stress school environments in the USA an increase in academic expectations may serve to increase school-related stress and reduce academic performance (Kaplan, Liu, & Kaplan, 2005). Swedish adolescents, regardless of whether they attend a theoretical or vocational program, believe that those attending theoretical programs are more stressed than those attending vocational programs (Bremberg, 2006).

Urbanicity is another potential stress factor. The majority of young Swedish people report that they think that living in a city has a large impact on perceived stress. They believe that closeness to nature means that you are not experiencing the same stress as in a bigger city. The larger amount of sensory information, and the processing thereof, in bigger cities are believed to explain higher stress levels in their inhabitants (Bremberg, 2006). One Swedish study done on this subject states that high levels of urbanization were correlated with high incidences of psychosis and depression in the total adult Swedish population aged 25-64 (4.4 million individuals) (Sundquist, Frank, & Sundquist, 2004). Psychiatric disorders in the mood and anxiety spectra as well as overall psychiatric disorder prevalence have been shown to be more common/higher in urban areas (Peen, Schoevers, Beekman, & Dekker, 2010).

Very few studies on stress and psychiatric symptoms have been performed on Swedish adolescents using well-validated, reliable scales and none, to our knowledge, has focused on schools that differ in academic proficiency or urbanicity.

1.1 Aims

This study is part of a larger study that aims to evaluate psychiatric symptoms and stress in adolescents and interventions directed towards stress. The first aim of this part of the study was to determine whether perceived stress and psychiatric symptoms, sleep quality and personality traits differ between students in a school with high academic proficiency located in an urban area and a school of average academic proficiency located in a medium-sized town. We hypothesized that a combination of two potential stressors in one of the schools (i.e., high academic proficiency and high urbanicity) would be related to increased stress levels and stress-related psychiatric symptoms. The second aim was to evaluate correlations between perceived stress and psychiatric symptoms, sleep quality and personality traits.

2. Method

2.1 Study Population

The study population was selected from two upper secondary schools in Sweden that, in order to test our hypothesis, differed in terms of both urbanicity and academic proficiency. When looking for a high academic proficiency/metropolitan school we singled out five different schools in the Metropolitan Malmö area. After a negative response regarding participation from one school, a second school, Gymnasieskolan Spyken in Lund with 1018 students, agreed to participate. The first average academic proficiency/medium-sized town school we contacted for comparison, Bergska skolan in Finspång with 385 students, agreed to participate. The schools' academic proficiencies were assessed in terms of grades at graduation and were found to meet our criteria (see Table 1) (Skolverket, 2013).

Table 1. Average mean grades at graduation for the two participating schools and all upper secondary schools in Sweden

Year	Bergska skolan		Spyken		All Swedish schools	
	<i>Scientific program</i>	<i>All programs</i>	<i>Scientific program</i>	<i>All programs</i>	<i>Scientific program</i>	<i>All programs</i>
	Grade (n)		Grade (n)		Grade (n)	
2010	Too few*	12.5 (88)	17.6 (100)	15.7 (364)	16.2 (8656)	14.0 (64 020)
2011	16.3 (11)	13.6 (134)	17.5 (109)	16.1 (370)	16.3 (8691)	14.0 (62 344)

Data were obtained from the Swedish National Agency for Education (Skolverket)

Mean grade at graduation is on a scale between 0 (worst) and 20 (best). The totals are based on all national programs available at the school(s).

*No data are shown when fewer than 11 students graduated

Bergska skolan is the only upper secondary school in Finspång with the standardized national study programs and is considered average with respect to academic results. Finspång is a medium-sized town (Kunzmann, 2010) (20 747 inhabitants in 2010) with a tradition of heavy industry. Spyken is one of four larger secondary upper schools with national study programs in Lund (110 488 inhabitants in 2010) and is considered a top-end school concerning academic results. Lund is a traditional university city and is part of the densely populated Malmö Metropolitan area (662 941 inhabitants in 2011) (Statistiska Centralbyrån, 2013). The numbers of licensed physicians living in the two municipalities were 2011 in Lund versus 31 in Finspång (18.2 versus 1.5 per 1000 inhabitants, respectively) as reported in an e-mail from Birgitta Ollars, who is responsible for the register of licensed physicians at Statistics Sweden.

All students enrolled at the schools received information initially through letters sent to their home addresses and thereafter lectures in the schools (10 minutes of oral information from the researchers in groups of 10-100 with the possibility to ask questions) and finally articles about the study published in the two largest local newspapers. The only exclusion criterion was inability to understand written Swedish, which resulted in the exclusion of one exchange student. Of 1403 possible participants, 283 gave written informed consent. The study consisted of the first part of a pilot study evaluating stress and psychiatric symptoms in upper secondary school students. The present study concerns baseline differences between the schools.

2.2 Questionnaires and Computer Programs

We used four well-validated psychometric tests that had previously been used on adolescents: the Symptoms Checklist 90 (SCL-90), the Perceived Stress Scale (PSS-14), the Pittsburgh Sleep Quality Index (PSQI) and the Eysenck Personality Index (EPI). The combination of scales was chosen to give an insight into the students' perceived stress (PSS-14) and likely outcomes of that stress, expressed as low-quality sleep (PSQI), increased general mental illness (SCL-90), and the personality trait "Neuroticism" (EPI). The time required to fill in the questionnaires was measured to be less than 45 minutes. This was deemed appropriate to avoid questionnaire fatigue in order to have good test-retest reliability.

To measure general mental symptoms we used the 90-item SCL-90, which uses a five-point Likert scale to assess overall mental health, including somatization. The main outcome of the scale is called the Global Severity Index (GSI) and is calculated as the total sum of the weights for each individual item divided by the total number of questions answered (with a minimum answer rate of 80%). The SCL-90 is commonly used in mental evaluations and has a subscale measuring somatization (Derogatis, 1994).

For measurement of perceived stress we used the widely accepted 14-item PSS, also constructed as a five-point Likert scale (Cohen, Janicki-Deverts, & Miller, 2007). The PSS does not measure the magnitude of stressors, only how the individual experiences them.

To measure sleep quality, we used the PSQI (Buysse, Reynolds III, Monk, Berman, & Kupfer, 1989). This index is an algorithm that calculates sleep quality based on nine parameters (one of which is divided into eight sub-items) and results in a numerical value with a cut-off level for low-quality sleep of less than five.

To measure the personality dimensions "Neuroticism" and "Extraversion", a 46-item version of the EPI, with the L-questions excluded, was used. The EPI is a well-used personality trait questionnaire that was constructed in 1964, and that has since been widely used (Poropat, 2011). The personality dimensions are constructed as a scale with one extreme of the trait at one end and the other extreme diametrically opposite. Neuroticism measures emotional (in)stability and disposition towards anxiety. Extraversion is the disposition towards sociable, friendly, impulsive and risk-taking behaviour (Pervin & Cervone, 2010). Neuroticism is strongly linked to negative affect and Extraversion to positive affect. Neuroticism is strongly linked to multiple psychiatric diagnoses. Indeed, a high Neuroticism score has been shown to be at the core of almost all psychiatric diagnoses, while a low Extraversion value has strong relationships with dysthymia and social phobia (Kotov, Gamez, Schmidt, & Watson, 2010). Neuroticism has been shown to partially account for the relationship between depression and stress, as well as that between social phobia and stress (Uliaszek et al., 2010).

The tests were e-mailed to the address given by each student when signing the informed consent document. The students were able to answer the tests when it suited them during a window of 10 consecutive days, and only one answer per student, test and test period was possible. All questionnaires were copied from paper forms to the Internet-based survey program Inquisite Survey System (Inquisite Inc., Copenhagen, Denmark). Using the Inquisite Survey System allowed for the incoming answers to directly be transferred to the university department database and further exported to statistical software without any human involvement at this stage, thus reducing

errors due to data transfer. Data were stored unidentified to guarantee privacy.

2.3 Statistics

All statistical analysis was done using Stata MP12 (Stata Corp, Texas, USA). Comparisons between pure Likert scales were made with a non-parametric test, the Wilcoxon rank-sum test, because of the ordinal nature of our data. The GSI and PSQI are calculated scales and hence we used the parametric Student's t-test to analyse them. To calculate correlations we used the Spearman's rank correlation coefficient as the data were non-parametric. Confidence intervals were calculated with a confidence level of 95%.

2.4 Ethical Standards

We acquired the legally required permission for the study from the local ethics committee (Etikprövningsnämnden) in Lund, Sweden (reference no. 2011/345). The study was registered at www.clinicaltrials.gov before it was started (reference no. NCT 01 457 222), and was designed and performed in accordance with the Declaration of Helsinki and Swedish law. The authors thus assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Declaration of Helsinki, as revised in 2008.

3. Results

In total 202 students – 142 female, 50 male, and 10 that did not specify their gender—of the 283 giving written consent answered the questionnaires thus giving a response rate of 71% of those who gave informed consent for the two schools. This represents 14% of the total number of students at the two schools. Forty-five students were from the average academic proficiency/medium-sized town school (11.7% of the total number of students) and 147 from the high academic proficiency/metropolitan school (14.4% of the total number of students). All but four students were assigned to programs intended as preparation for university studies. The mean age was 16.9 years and the median age 17 (range: 15-19 years). There was a tendency towards a higher percentage of female subjects at the high academic proficiency/metropolitan school Spyken (77%) compared to the average academic proficiency/medium-sized town school Bergska skolan (64%), although the difference was non-significant ($p=0.08$).

Table 2. Comparison between the schools in terms of the main outcome variables

Variable	Spyken*			Bergska skolan*			
	Median	IQR	n	Median	IQR	n	p
GSI	0.76	0.7	144	0.7	0.66	43	0.31
PSS	29	12	132	27	9	41	0.57
	Mean (S.D.)	C.I.	n	Mean (S.D.)	C.I.	n	p
PSQI	6.49 (2.93)	5.99-6.99	134	7.19 (2.81)	6.31-8.07	42	0.088
Neuroticism	11.98 (4.76)	11.16-12.7	140	11.25 (5.47)	9.50-13.00	40	0.79
Extraversion	13.08 (3.84)	12.44-13.7	142	11.25 (5.47)	13.00-15.5	41	0.04

*Spyken is the name of the high academic proficiency/metropolitan school and Bergska skolan is the name of the average academic proficiency/medium-sized town school.

Table 2 shows the results for the different psychometric tests. Analysis of the SCL-90 data showed no difference between the schools in general mental health (GSI) or any of the subscales. No difference in PSS score between the schools was observed either. Participants from the average academic proficiency/medium-sized town school did, however, report higher values on the PSQI subscales “sleep duration” and “habitual sleep efficiency”, indicating poorer sleep quality, compared to participants from the high academic proficiency/metropolitan school. Thirteen participants from the high academic proficiency/metropolitan school used hypnotics on at least a

weekly basis, three of them every day. No participants from the average academic proficiency/medium-sized town school reported using hypnotic agents. There was no difference between the total PSQI scores for the two schools.

Results for the EPI showed that the students at the average academic proficiency/medium-sized town school had a significantly higher score for Extraversion than those at the high academic proficiency/metropolitan school. No difference in Neuroticism score was observed.

Table 3. Correlation of perceived stress with the other outcome variables at the two schools

PSS	GSI			Extraversion			Neuroticism			PSQI		
	n	ρ	p	n	ρ	p	n	ρ	p	n	ρ	p
Bergska*	39	0.56	<0.001	36	0.21	0.23	36	0.34	0.043	39	0.34	0.033
Spyken*	135	0.69	<0.001	131	-0.025	0.77	128	0.47	<0.001	124	0.34	0.0001

ρ = Spearman rank correlation coefficient

*Spyken is the name of the high academic proficiency/metropolitan school and Bergska skolan is the name of the average academic proficiency/medium-sized town school.

Table 3 shows correlations between perceived stress and other outcome variables for the two schools. There was a clear positive correlation between PSS score and GSI overall and, in each school, with highly significant p-values. Similar correlations were found for all the other outcome variables except for Extraversion, for which no correlation with PSS score was observed. PSS score was most strongly correlated with GSI, followed by Neuroticism and PSQI, in decreasing order.

4. Discussion

The main finding of this study was the absence of a difference between a high academic proficiency/metropolitan school and an average academic proficiency/medium-sized town school in any of the measured scales. Significant correlations between perceived stress and GSI, PSQI and Neuroticism were observed in the student samples from both schools. We had hypothesized that a combination of two potential stressors in one of the schools (i.e., high academic proficiency and high urbanicity) would be related to increased stress-levels and symptoms, but we found no evidence for this.

This study suggests that stress levels and psychiatric symptoms in Swedish upper secondary school students may not be due to the combination of high urbanicity and high academic proficiency of the school. Our findings thus seems contradictory to US findings that individuals attending schools with higher academic demands experience more perceived stress (Kaplan et al., 2005; Suldo et al., 2008). However, there are important differences between the studies: there are cultural differences between the US and Swedish schools and the two Swedish schools are fully comparable in terms of curriculum, which is not the case in the study of American schools by Suldo et al.

To attend a certain upper secondary school in Sweden the students compete for entry by means of grades: the higher the academic proficiency of the school, the higher the grades that are normally needed for enrolment. The suggested association between high stress and reduced academic performance (Kaplan et al., 2005) is thus not supported by our study, although it is possible that reduced academic performance might occur at a later stage.

Since there has been some speculation concerning whether students attending schools of high academic proficiency are more “stressed out” than other students, we opted for two very different schools when choosing the population in order to have differences in academic performance and urbanicity. The response rates of the schools were fairly similar. No difference in stress-related symptoms was observed in this study when results from the two schools were compared. Even though Spyken, with its higher academic proficiency and higher urbanicity, had a non-significant tendency towards a somewhat higher female contribution, there were no differences between the schools. This is in spite of the fact that females are known to suffer more from psychiatric problems than males at this age and normally also show a higher degree of psychosocial stress (Bremberg, 2006; Petersen, 2007; Wiklund et al., 2012).

Notably, 13 of the students at the high academic proficiency/metropolitan school had used hypnotics and none at the average academic proficiency/medium-sized town school had done so. This observation could possibly

explain the significant differences between the two schools in the subscales, which show shorter sleep duration and lower habitual sleep efficiency at the average academic proficiency/medium-sized town school. The reason for the difference in prescribed hypnotic use may be due to the fact that Lund has one of the largest university hospitals in Sweden, whereas Finspång doesn't have any local child and adolescent psychiatric care at all, apart from general practitioners, and the fact that the number of physicians per capita is approximately 12 times higher in Lund.

Our study shows a clear correlation between stress, sleep quality, neuroticism and psychiatric symptoms measured by the SCL-90. Our findings are thus well in line with current research in adults. Low sleep quality drives stress levels and vice versa, something that could end up in a "vicious circle" (Akerstedt, 2006). Stress is also thought to be both caused by and the cause of internalizing psychopathology (Carter, Garber, Ciesla, & Cole, 2006). Neuroticism has been shown to partially account for the relationship between depression and stress, as well as that between social phobia and stress (Uliaszek et al., 2010).

4.1 Limitations

The study population was at risk of selection bias since only 14.4% of the total students chose to answer the questionnaires. This is relatively consistent with another study on adolescents in the Nordic region this millennium, a study from Norway with a participation rate of 23.6% (Breidablik, Meland, & Lydersen, 2009). The male students' participation rate was also lower than that of the female students, although the gender distributions of the participants from the two schools were not significantly different. The low participation rate and low proportion of males limit our ability to generalize the results to the schools as a whole. However, we have no reason to believe that this potential bias differed between the two schools. The study is cross-sectional and can thus not provide clues on causality. All the data is subjective in that it was reported by the participants, even though a good correlation between self-reporting and general health has been found in upper secondary school students in the Nordic countries (Breidablik et al., 2009). Another limitation is that the two potential stressors, high academic proficiency and high urbanicity, were mutually confounded, i.e., it was not possible to disentangle the separate effects of these two variables.

4.2 Strengths

The strengths of this study outweigh its limitations. This is the first study to compare a school with high academic proficiency located in an urban area and a school of average academic proficiency located in a medium-sized town. The non-response rates for the two schools were similar. All students followed the same curriculum, which allowed good comparisons between the schools.

The questionnaires used in this study are well-defined, well-validated, and reliable, and had previously been used in clinically relevant studies on adolescents. Some of the references concerning reliability and validation date back to 1971. This reflects the length of time for which the tests have been used and could be seen as a token of their ecological validity (Bech, Bille, Møller, Hellström, & Ostergaard, 2014). The SCL-90 has satisfactory internal consistency reliability, with correlation coefficients for the subscales of 0.77-0.90 (Derogatis, Rickels, & Rock, 1976; Horowitz, Rosenberg, Baer, Ureño, & Villaseñor, 1988). Test-retest reliability coefficients for the subscales were 0.80-0.90 over a week without any intervention (Derogatis, 1994) and 0.68-0.83 when measured with a 10 week pause (Horowitz et al., 1988). The latter study also showed a test-retest reliability coefficient of 0.84 for the GSI. The validity of the scale has been confirmed with regard to internal structure, factorial invariance and convergent-discriminant validity (Derogatis, 1994; Derogatis et al., 1976; Koeter, 1992; Wiznitzer, Verhulst, Van den Brink, & Koeter, 1992). Most validity and reliability studies on the SCL-90 date back 20 to 40 years; more recent studies are generally on subgroups. The ecological validity of the SCL-90 should be viewed from this perspective as it has been cited approximately 3500 times since its introduction in 1973. One recent Danish study showed good discriminant validity for the three SCL-90 subscales Depression, Anxiety and Inter-personal sensitivity, as confirmed by comparison with the corresponding ICD-10 diagnoses (depression, anxiety and unspecified personality disorder, respectively) (Bech et al., 2014). Also, a Spanish study comparing pen-and-paper and on-line versions of the test showed good validity and test-retest reliability (Vallejo, Jordan, Diaz, Comeche, & Ortega, 2007).

The PSS-14 scale was shown in a review to have good internal consistency reliability in 11 studies (Cronbach's alpha 0.75-0.89) and to have good test-retest reliability over 2 days to 4 weeks. Moreover, it has been empirically validated in college students (Lee, 2012). Measurements of perceived stress have higher ecological validity than physiological response parameters, self-report of psychiatric symptoms, behavioural changes or stressors such as major life changes (Lavoie & Douglas, 2012).

The PSQI has been shown to have good test-retest reliability for both the global score and the sub-scores in both the short term (2 days) and long term (1-2 months), with an overall Cronbach's alpha of 0.87. The PSQI has also shown good correlation with sleep logs and lower but significant correlations with polysomnography, confirming its validity (Backhaus, Junghanns, Broocks, Hohagen, & Riemann, 2002).

The construct validity of the EPI was supported by comparisons with the MMPI and Rotter's Internal-External Control Scale (Platt, Pomeranz, & Eisenman, 1971). Test-retest reliability in a study of computerized and pen and paper administration was comparable to the reliability values given in the EPI manual (Sanitioso & Reynolds, 1992).

5. Conclusion

Our findings suggest that there are no differences in perceived stress, bi-directionally stress-associated impairments in psychiatric symptoms and sleep, or the mediating personality trait Neuroticism between a high academic proficiency/metropolitan school and an average academic proficiency/medium-sized town school. Future studies could focus on disentangling the separate effect of academic proficiency as well as urbanicity on stress levels and stress-related psychiatric symptoms in adolescents.

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