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ORIGINAL ARTICLE

Does self-efficacy mediate the association between socioeconomic background and emotional symptoms among schoolchildren?

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Abstract
Objectives Emotional symptoms are widespread among adolescents with the highest prevalence among lower socioeconomic groups. Less is known about why and how to reduce this inequality but personal control, e.g., self-efficacy may be crucial. This study examines whether self-efficacy is a mediator in the association between occupational social class (OSC) and emotional symptoms.
Methods Data stem from the cross-sectional Health Behavior in School-aged Children-Methodology Development Survey 2012 (HBSC-MDS) conducted among 11–15-year old schoolchildren in two Danish municipalities. Participation rate was 76.8 % of 5165 enrolled schoolchildren, $n = 3969$.
Results Low OSC is associated with higher odds of daily emotional symptoms and low selfefficacy. Schoolchildren with low self-efficacy have higher odds for daily emotional symptoms. We find a strong and statistically significant direct effect between low OSC and daily emotional symptoms (OR = 1.55, 95 % CI: 1.33; 1.84) and a borderline statistically significant indirect effect of self-efficacy [OR = 1.17 (0.99; 1.38)].
Conclusions Socioeconomic inequality in emotional symptoms exists. This inequality is partly explained by socioeconomic inequality in self-efficacy. Promotion of personal competences like self-efficacy may reduce emotional symptoms among all socioeconomic groups, thereby reducing socioeconomic inequalities in emotional symptoms.

Keywords Mental health · Adolescents · Socioeconomic inequality · Self-efficacy · Emotional symptoms · Mediation analysis

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Introduction

Emotional symptoms like anxiety or depressive mood are widespread among adolescents and constitute an important public health problem (Patel et al. 2007). Feeling low, irritated or nervous almost every day is a serious strain and can have immediate implications for school attendance, ability to learn, and social relations (Patel et al. 2007; Stansfeld et al. 2008). Emotional symptoms in adolescence may also track into adulthood and have serious consequences for mental health (Jané-Llopis et al. 2011; Stansfeld et al. 2008). A systematic review by Reiss (2013) showed that socio-economically disadvantaged children and adolescents had a two- to -threefold higher risk of developing mental health problems compared to adolescents from more affluent families (Reiss 2013). Further, in a study of 10—12-year-old children, those with low and

medium socio-economic status had increased odds for internalizing and externalizing problems compared to children with high socioeconomic status (Amone-P'Olak et al. 2009). Bøe et al. (2012) found that socioeconomic status was a significant predictor of mental health problems among children. Whilst a social patterning of emotional symptoms is fairly well documented, less is known about the underlying causes and mechanisms or how to reduce inequalities.

According to Marmot (2004) one of the mechanisms behind socioeconomic inequalities in health lies in the feelings of autonomy and perceived control of one's life as well as in a sense of social connectedness rather than in financial resources, access to medical services and social position in itself. Individuals at the lower end of the social hierarchy are more likely to be in jobs with lower levels of autonomy and experience reduced control over their life.

Self-efficacy is an aspect of personal control which may be an important factor in explaining and reducing socioeconomic inequalities in emotional symptoms. The concept of self-efficacy is a central part of Bandura's social cognitive theory (Bandura 1997). Bandura defined self-efficacy as "beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments" (Bandura 1997, p: 3). In Bandura's theory self-efficacy is related to specific situations. It has later been expanded by Schwarzer (1992) who developed the term general self-efficacy as referred to in this study. People with high self-efficacy seem to be more optimistic about life and take up more challenging tasks, set higher goals in life and stick to them (Schwarzer 1992). Many people experience bouts of anxiety, depression and worry at some point in their life. Some cope successfully with these negative feelings while others respond negatively to them triggering further negative feelings (Muris 2002).

Few studies have investigated the relationship between self-efficacy and mild symptoms of anxiety and depression in community-based populations of children. Tahmassian and Moghadam (2011) found that children with high levels of self-efficacy experienced lower levels of symptoms of depression, worry and anxiety. Muris (2002) showed that low self-efficacy was related to high levels of anxiety and depression.

Adolescence is a period of major development. The biological, social, behavioral, and relational changes of this life period may lead to special windows of susceptibility and imprint behavior, in ways which may profoundly influence future health (Due et al. 2011). Transition from childhood to adulthood and how adolescents respond to the social systems they are part of, is important for building self-efficacy. High self-efficacy enables adolescents to perceive and respond positively to unexpected situations (Bandura 2006).

According to Steca et al. (2014) the transition period may induce cognitive vulnerability to depressive symptoms. Certain individual positive characteristics may act as protective factors, counteracting cognitive vulnerability. When faced with challenging tasks, e.g., at school, children with low self-efficacy may feel discouraged giving rise to emotional symptoms. Children with a high sense of self-efficacy are more likely to approach difficult tasks as challenges to be mastered, making them less prone to emotional symptoms (Bandura 1997).

Keyfitz et al. (2013) use self-efficacy as one theme of positive schemas, defined as mental structures that guide interpretation, categorization and evaluation of experiences. They find that positive schemas have a positive influence on depression and symptoms of anxiety among adolescents. Hence, high self-efficacy may be important for developing positive mental health and reducing high levels of emotional symptoms. Only a few studies have investigated socioeconomic inequality in self-efficacy, but a study by Mazur et al. (2014) suggests that self-efficacy is more prevalent in higher than lower socioeconomic groups. Boardman and Robert (2000) suggest relative inequalities: Residents of low SES neighborhoods report lower self-efficacy than residents of higher SES neighborhoods.

It is important to understand the potential mediating effects of self-efficacy on emotional symptoms because self-efficacy is modifiable and thereby a potential mechanism to reduce inequalities in mental health among schoolchildren. Therefore, the aim of this study is to investigate whether the association between socioeconomic position and emotional symptoms is mediated by 11–15-year-old schoolchildren's self-efficacy.

Figure 1 shows the analytical model. The thick grey arrow represents the direct path between occupational social class (OSC) and emotional symptoms. The thinner black arrows represent the indirect path of self-efficacy. The thinnest arrows indicate the potential confounders related to each of these associations. Studying mediators for the main association provides opportunities to identify new potential confounders. In this study the only potential confounder in the association between OSC and emotional symptoms is migration while sex and age (grade) are potential confounders of the association between self-efficacy and emotional symptoms.

Standard methods for investigating mediated proportions and indirect effect, by comparing the crude model with the model adjusted for the mediator, is always conservatively biased when using ratio measures of effect (Kaufman et al. 2004; Jiang and Vanderweele 2015). Hence, we applied a method (Lange et al. 2012) enabling the estimation whether self-efficacy is a mediator in the association between OSC and emotional symptoms.

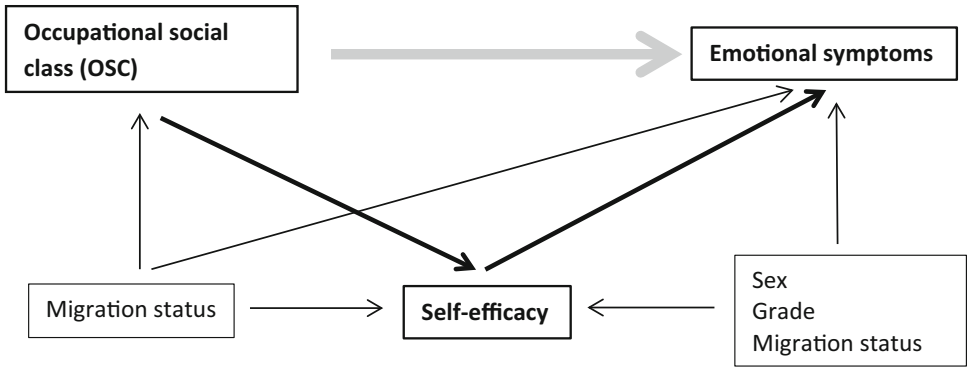

Fig. 1 Analytical model of the studied associations, including possible confounders (Denmark 2012)

Methods

Study design and population

Data stem from the Danish 2012 Health Behavior in School-aged Children Methodology Development Survey (HBSC-MDS 2012). The survey was an interim cross-sectional data collection related to the international Health Behavior in School-aged Children study, which is an international WHO collaborative study conducted every 4 years (Currie et al. 2012). The survey was designed to develop and test new items for use in 2014 and included items measuring self-efficacy. Cross-sectional data were collected from all 23 public schools in the municipalities of Slagelse and Halsnæs in Denmark and included all schoolchildren in grades 5–9 corresponding to ages 11–15. The participation rate was 76.8 % of the 5165 enrolled schoolchildren, $n = 3969$.

Ethics

The study adhered to all Danish ethical and data protection requirements. In Denmark there is no agency for ethical approval of population based surveys. The study was approved by the local governments in Slagelse and Halsnæs. Schoolchildren were informed that participation was voluntary and that the study was anonymous as we did not collect any personal identification information. The study is registered by the Danish Data Protection Agency.

Measurements

Exposure variable: *OSC*. The research group coded the children's information about their parents' occupation into social class according to standards of the Danish National Institute of Social Research (Christensen et al. 2014). This standard is almost identical to the UK Registrar General's classification of occupations. Some participants (17.94 %) gave insufficient information about their parents' occupation for a proper coding, e.g., they mentioned the company in which the parent worked or explained the parents' occupation in vague terms like "mom works in a bank", "dad works with computers". Each child was classified by the highest ranking parent and categorized into social class I (high) to V (low) and two additional categories: parents outside the labor market (VI) and unclassifiable. We dichotomized the children into two broad groups, high OSC (including social classes I–IV) and low OSC (including social classes V, VI and unclassifiable).

The few children with missing information were included in the unclassifiable category. Sensitivity analyses where students with missing information were excluded from the analyses showed almost similar results. Sensitivity analyses with four OSC categories: high, medium, low and unclassifiable, showed similar estimated values for high and medium OSC. This led us to merge these two groups in the final analyses. Because the unclassifiable group consists of almost 18 % of the schoolchildren, exclusion would result in lower statistical power. To estimate whether keeping schoolchildren with missing data on OSC in the analyses would be appropriate, we carefully studied this group. Children with missing data on OSC resembled children from low OSC in relation to migration status, emotional symptoms and self-efficacy. As a result we therefore included children with unclassifiable data into the low OSC.

Outcome variable: *Emotional symptoms* were measured by the health behavior in school-aged children symptom check list (HBSC-SCL) (Haugland and Wold 2001) measuring self-reported psychosomatic symptoms. The HBSC-SCL has been evaluated by colleagues within the HBSC network as valid and reliable (Haugland and Wold 2001; Ravens-Sieberer et al. 2008). Further validation of HBSC-SCL in our Danish study has not been conducted. Schoolchildren were asked how often they had experienced the following symptoms in the past 6 months: Feeling low, irritable or bad tempered and feeling nervous. Response options were: About every day, more than once a week, about every week, about every month and rarely or never. The measure is categorical by nature and we dichotomized

the answers into those experiencing one or more emotional symptoms daily versus all other schoolchildren. The 317 schoolchildren with missing data on emotional symptoms were excluded and the final dataset included 3652 schoolchildren. Sensitivity analyses were we kept children with missing data in the category without emotional symptoms did not change the results significantly.

Mediator: *Self-efficacy*. This paper focuses on the concept of general self-efficacy. According to Schwarzer, once established enhanced self-efficacy tends to generalize to other situations. As a result improvements in behavioral functioning transfer not only to similar situations but also to activities that are substantially different (Schwarzer 1992).

In a large school-based survey like the HBSC which aims at monitoring many aspects of schoolchildren's health and wellbeing, we need to use short measures. Therefore, we developed two new items to measure an indicator of general self-efficacy: "How often can you find a solution to problems if you try hard enough?" and "How often can you manage the things you set your mind to?" with response options: "Always", "Often", "Sometimes", "Rarely" and "Never".

Responses were combined into an index and categorized into high, medium and low self-efficacy. A high self-efficacy score was obtained by answering always or often to both questions, medium self-efficacy by answering always or often to one of the two questions, and low self-efficacy by answering all other possibilities. The items are an indicator of general self-efficacy and were based on a ten item version of general self-efficacy developed by Schwarzer and Jerusalem (1995).

Validation of the self-efficacy measure

We tested the face validity of the items among students in three age groups 11-, 13- and 15-year-olds by means of nine focus group discussions with 5–6 schoolchildren in each group (girls only, boys only, combination of both sexes). The discussions showed that it was easy for schoolchildren in all age groups to understand and answer the two items. The children's understanding of the items corresponded to the researchers' intentions with them. Statistical validation of the measures was performed by analyses of correlation. The Spearman correlation coefficient between the two items was 0.52. Self-efficacy was correlated to other measures in the expected directions: good self-rated health: 0.19, emotional symptoms: −0.14, loneliness: −0.16 and life satisfaction: 0.23.

We also conducted analysis of differential item functioning (DIF) by means of logistic regression in relation to four sociodemographic variables: sex, age, migration status and OSC. Odds ratios within the interval 0.53–1.89 were interpreted as a moderate to large DIF as recommended by Petersen et al. (2003). The analyses revealed a mild degree of DIF on age for both items, but there was no DIF on sex, migration status and OSC. The odds ratio estimates were within the interval suggested by Petersen et al. (2003) and were deemed not to be important for the overall function of the measures.

Potential confounders: *Migration status* is based on information about children's and parents' country of birth and categorized into two groups: (1) native Danes, i.e., a child born in Denmark by parents of whom one or both were born in Denmark and (2) immigrants. Missing information was included in native Danes because our analyses showed resemblance between the group with missing data and the native Danes. Sensitivity analysis where we excluded children with missing information ($n = 158$), showed similar associations. To support this finding Nordahl et al. (2011) observed that many schoolchildren who stated they spoke Danish at home skipped the questions about country of birth, probably thinking that these items were irrelevant for them.

Grade is included as a proxy for age and includes schoolchildren in grades 5–9. Information about *Sex* (boy/girl) is also included.

Initially we wanted to include family type as a possible confounder. Because family type may not only be a confounder but also a mediator of the association between OSC and emotional symptoms, we chose to perform sensitivity analysis where we ran the mediation analysis only for schoolchildren in traditional families, i.e., intact families consisting of biological mother, father and one or more children.

Statistical analyses

The OSC and emotional symptoms variables are binary. We wanted to quantify how much of the effect of OSC on emotional symptoms was mediated through self-efficacy. It has been shown that estimation of the indirect effect by comparing a model without the mediator, with the model adjusted for the mediator, is biased when using non-linear models, e.g., logistic regression models (Kaufman et al. 2004; Jiang and Vanderweele 2015). The mediation analysis was therefore based on the counterfactual framework (Pearl 2009) with a method by Lange et al. (2012) estimating the natural direct and indirect effects, which is estimable for non-linear models. The total effect of OSC on emotional symptoms can be separated into a natural indirect effect mediated by self-efficacy and a natural direct effect not mediated through the proposed mediator.

The interpretation of the natural indirect effect through self-efficacy is that this is the effect that would be observed if OSC was changed, but only the causal pathway through

self-efficacy was active (Petersen et al. 2006). The natural direct effect is the effect that would be observed if OSC was changed, but self-efficacy had the distribution that would have been observed if OSC was at the reference level (inactive state). The method works by fitting a model for the mediator (multinomial logistic regression) conditional on migration status and OSC (Lange et al. 2012). This model is used to construct weights such that the natural direct and indirect effect can be estimated using a logistic regression model of emotional symptoms adjusted for migration status, sex and grade. The outcome was analyzed with a weighted logistic regression model. The confidence interval of the estimates was obtained by bootstrapping sampling the population 1000 times and using the 2.5th and 97.5th percentiles of the estimates as the 95 % confidence interval. Different confounders were necessary to adjust for each of the three associations studied (Fig. 1) (Cole and Hérnan 2002). We used the statistical software system SAS 9.3.

Results

Table 1 shows that 10.35 % of all the schoolchildren experience daily emotional symptoms. Significantly more (13.46 %) of children from low OSC experience daily emotional symptoms compared to children from high OSC (8.20 %) ($p < 0.001$). Our study sample has a majority of native Danes and there is an even distribution between boys and girls and between the different school grades. Many schoolchildren have high self-efficacy, more among children from high OSC (68.13 %) compared to children from low OSC (54.73 %) ($p < 0.001$).

Our initial analyses of associations between exposure, outcome and mediator showed there was socioeconomic inequality in daily emotional symptoms. Schoolchildren from low OSC had 1.74 (CI: 1.40; 2.16) higher odds for daily emotional symptoms compared to children from high OSC, adjusted for migration status. Further, the analyses revealed socioeconomic differences in self-efficacy. Still adjusting for migration status, we found that schoolchildren from low OSC had 1.86 (CI: 1.62; 2.13) higher odds for low self-efficacy than children from high OSC. We also found that self-efficacy was associated with daily emotional symptoms. Schoolchildren with low and medium self-efficacy had increased odds of 3.32 (CI: 2.56; 4.31) and 1.48 (CI: 1.12; 1.95), respectively, for emotional symptoms compared to children with high self-efficacy. This last analysis was adjusted for OSC, sex, age and migration.

Table 2 shows the results from the mediation analysis. Schoolchildren from low OSC have a statistically significant higher risk of emotional symptoms, compared to schoolchildren from high OSC. A mediating effect of self-

Table 1 Prevalence (%) of daily emotional symptoms and distribution of covariates, by occupational social class. Danish health behavior in school-aged children methodology development study 2012 (Denmark 2012)

OSC	Low	High	Total
$N_{schoolchildren}$	1493	2159	3652
Daily emotional symptoms			
Yes	13.46	8.20	10.35
No	86.54	91.80	89.65
Migration status			
Native Danish	79.57	93.28	87.68
Immigrants	20.43	6.72	12.32
Sex			
Boy	52.24	47.06	49.18
Girl	47.76	52.94	50.82
Self-efficacy			
High	54.73	68.13	62.65
Medium	23.64	20.29	21.66
Low	21.63	11.58	15.69
Self-efficacy each item separately			
How often can you find a solution to problems if you try hard enough? (missing = 63)			
Always/often	68.78	77.67	74.12
Sometimes	24.46	18.52	20.90
Rarely/never	6.76	3.80	4.99
How often can you manage things you set your mind to? (missing = 79)			
Always/often	70.27	79.39	75.76
Sometimes	23.68	17.95	20.24
Rarely/never	6.05	2.65	4.00
Grade			
5th	21.03	17.88	19.17
6th	23.78	19.41	21.19
7th	21.90	23.25	22.70
8th	16.08	20.66	18.78
9th	17.21	18.81	18.15

Table 2 OR (95 % CI) for daily emotional symptoms by direct and indirect effects (Denmark 2012)

Direct effect of the association between occupational social class and emotional symptoms[a]
1.55 (1.33; 1.84)
Indirect effect of self-efficacy[b]
1.17 (0.99; 1.38)

[a] The direct effect is controlled for migration status

[b] The indirect effect is controlled for migration status, sex and grade

efficacy was found, but this association was only borderline significant. Sensitivity analyses, where we changed the cut point for high self-efficacy showed the same mediating effects. Sensitivity analysis, where the mediation analysis was conducted only for schoolchildren in traditional families, showed that the estimates were fairly similar in the entire study population and in the sub-population living in traditional families with father and mother (data not shown).

Discussion

Our study shows that children from low OSC have approximately 55 % higher odds for emotional symptoms compared to children from high OSC. General self-efficacy partly mediates the association between OSC and emotional symptoms among schoolchildren although the association is only borderline statistically significant.

The finding of a socioeconomic gradient in emotional symptoms is consistent with several other studies showing that children from low socioeconomic groups perform worse than children from high socioeconomic groups, in a range of both physical and mental health outcomes (Due et al. 2011; Damsgaard et al. 2014; Moor et al. 2015; Reiss 2013).

To our knowledge very little research has investigated the influence of general self-efficacy on emotional symptoms in general populations of children and adolescents. Most studies of self-efficacy among children concentrate on specific self-efficacy and focus on, e.g., chronic illnesses, stress management, smoking or physical activity. We have not been able to detect any studies that explore the mediating effects of general self-efficacy in the relation between socioeconomic status and emotional symptoms. According to Schwarzer (1992), general self-efficacy can be transferred from one situation to another and is a profound general characteristic. It is a skill that makes the individual more robust and able to overcome challenges in different situations. General self-efficacy is important to maintain positive mental health (Barry 2009).

As this study uses cross-sectional data no conclusions can be drawn about causality. In mediation analyses it is a crucial assumption that the associations follow the hypothesized pathways. As we use parent's OSC to categorize schoolchildren into social classes it is not likely that the children's emotional symptoms or self-efficacy could impact on parent's occupation. According to the salutogenic approach we think it is plausible that self-efficacy impacts the development of emotional symptoms rather than the opposite (Schwarzer 1992).

This study includes a large proportion of adolescents from the lower socioeconomic strata as the two municipalities Slagelse and Halsnæs are characterized by a large share of lower socioeconomic groups. The participation rate was high (76.8 %). It is still possible that schoolchildren not present on the day of data collection are absent because they have emotional symptoms. If this is the case we might have underestimated the prevalence of emotional symptoms.

The measure of general self-efficacy used in this study consists of two items. The HBSC-MDS-2012 allowed us to develop and test this new measure among schoolchildren in the included age groups. We did not intend to develop an exhaustive measure but rather a short indicator of a complex concept. The face validity of the two items was high, according to the focus-group discussions. With only two items the precision of the measurement is low, but for analytical purposes the index is appropriate to separate groups of schoolchildren with high and low self-efficacy. We suggest that this short measure is applicable to large population based studies as the HBSC study.

We use information from schoolchildren about their parents' occupation to measure social class. Validation studies showed that children from the age of 11 can provide reliable and valid information about their parents' occupation (Lien et al. 2001; Vereecken and Vandegehuchte 2003). Often there is a large proportion of missing and unclassifiable data, which is also the case in our study. Children in the unclassifiable OSC group did provide information about their parent's job but lacked the exact title which is needed for a correct classification. The children were willing to answer and did it in the best way possible. Before categorizing them into an OSC group we inspected the unclassifiable group's distribution on a range of variables including emotional symptoms. They resembled children from low social class the most and were included in this group.

Parents' occupational social class is only one indicator of socioeconomic status. To get a more nuanced picture, measures of educational level and income could have been investigated. Unfortunately, the HBSC-MDS study did not include such indicators.

To study the influence of *family type*, we performed sensitivity analysis and ran the mediation analysis only for schoolchildren in traditional families. This analysis showed similar results as in the entire group which suggests that our results are robust across different family types.

In our analyses we introduce two new confounders, *sex and grade*, in the relation between self-efficacy and emotional symptoms. We suspect that sex and grade can influence self-efficacy as it increases with age and is higher among boys than girls. Further, emotional symptoms decrease with increasing age and show a higher prevalence among girls than boys. These variables are not considered as confounders in the main association between OSC and emotional symptoms but the analysis of mediation introduces new possible confounding.

Implications for research and practice

There is growing evidence that whole-school based programmes, focusing on promoting schoolchildren's mental health and preventing mental health problems, have positive effects (Wells et al. 2003; Weare and Nind 2011; Jané-Llopis et al. 2011). A systematic review by Barry et al. (2013) focusing on low and middle income countries, finds that school-based initiatives to promote positive mental health among schoolchildren such as building self-esteem, motivation and self-efficacy has positive effects. Jerusalem and Hessling (2009) also show that schoolchildren's self-efficacy can be promoted through school-based interventions.

Therefore, such school-based programs may have the double function of promoting mental health and reducing social inequality in mental health among schoolchildren, as proposed by Nielsen et al. (2015). We need more insight into effective ways to enhance children and adolescents' self-efficacy, thereby promoting the mental health of all children and in particular the schoolchildren who lack these competences. More curriculum time to provide sufficient dose and quality of self-efficacy teaching and learning especially in schools with more vulnerable children might be important. The mediating effect of self-efficacy in this study is only borderline statistically significant and we suggest future studies which include more sensitive measures of self-efficacy. Furthermore, it would be interesting to explore other types of competences that may mediate the direct effect of social background on emotional symptoms, e.g., social competence or self-esteem.

Conclusion

The prevalence of emotional symptoms is higher among schoolchildren from lower than higher social classes. Part of this social inequality can be explained by socioeconomic inequality in self-efficacy. Promotion of self-efficacy, e.g., through school-based initiatives may be a way to reduce emotional symptoms among all socioeconomic groups and thereby also reduce social inequalities in emotional symptoms.

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