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# The interplay of perceived stress, self-determination and school engagement in adolescence

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## Abstract

Currently, many societies are placing a greater onus on academic achievement—resulting in higher levels of stress being observed among adolescent students. Stress can have detrimental repercussions on adolescents' health and is also associated with anxiety and depression. However, since less is known about how high stress levels affect school engagement, this study examined the interplay of perceived stress and school engagement in a large sample of seventh and eighth grade students ( $N = 1088$ ;  $M_{Age} = 13.7$ ) in secondary schools in Brandenburg, Germany. Based on self-determination theory (SDT), this study also examined if perceived autonomy, relatedness, and competence mediated the association between stress and school engagement in order to identify

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possible strategies for intervention and prevention. Latent structural equation modeling (SEM) was used to test for the associations between stress, self-determination, and school engagement. Results showed that self-determination acted as a full mediator in the negative association between stress and school engagement. These results suggest that supporting students' basic psychological needs for autonomy, relatedness, and competence could be an effective starting point for prevention and intervention of stress and its negative association with school engagement. Consequently, SDT has strong implications for both school psychologists as well as teachers.

### **Keywords**

Adolescence, Germany, mediation, school engagement, self-determination, stress, structural equation modeling

The 21st century and the growing dominance of knowledge-based societies in the Western world have coincided with increased stress levels for many individuals. For example, the majority of Americans currently suffer from moderate or high levels of stress (American Psychological Association, 2010). High levels of stress can result in higher levels of physiological impairments such as sleeping disorders, increased prevalence of back pain, and gastric disorders. In Germany, for example, people who reported high levels of stress were twice as likely to have suffered from cardiovascular diseases in contrast to those who reported low levels of stress (FAZ-Institut & Techniker Krankenkasse, 2009). In addition, stress—and more precisely—work stress is considered to be a risk factor for developing disorders such as depression and anxiety (Wang, Lesage, Schmitz, & Drapeau, 2008). With such high levels of perceived stress in our society, it is not surprising that children and adolescents also report high levels of stress, particularly in regards to their schoolwork (Murberg & Bru, 2007). In fact, one-third of German elementary school students reported high levels of stress associated with school (Deutscher Kinderschutzbund, 2011). Regarding stress triggers for students, the number of hours spent on homework has been found to be positively correlated with the amount of perceived stress (Brown, Nobiling, Teufel, & Birch, 2011). In addition, in adolescence this stress often increases, as does the pressure to perform and to achieve good grades, which at this age is now associated with securing future job opportunities and careers (de Anda et al., 2000). Furthermore, interpersonal problems and strained relations with parents are other sources of school-related psychosocial stress in adolescence (Murberg & Bru, 2007; Suldo, Shaunessy, Thalji, Michalowski, & Shaifer, 2009).

Despite this, most research on stress has either examined its influence on somatic syndromes (e.g. Torsheim & Wold, 2001) or on manifestations of psychopathology, such as anxiety, depression, and aggression (e.g. Sontag & Graber, 2010). According to Alfvena, Östergb, and Hjercn (2008), a high level of perceived stress is related to weekly headache and abdominal pain. Keeping in mind that

many students lack motivation and withdraw from school engagement nowadays (Babcock & Marks, 2011), it is important to examine how stress may play a role in this, beyond any possible pathological variables. Likewise, it would be helpful for school psychologists to understand how students' levels of perceived stress affects their school engagement on an emotional and behavioral level. To our knowledge, there are currently no studies that address the influence of stress on school engagement.

Recently, the concept of school engagement has been of special interest in terms of predicting academic achievement and protecting students from school dropout (Fredricks, Blumenfeld, & Paris, 2004). Although school engagement and motivation are closely related (Jimerson, Campos, & Greif, 2003), as of yet no theory-driven framework, which subsumes both motivation and school engagement, has been developed. In the literature, school engagement has often been subclassified into behavioral, emotional, and cognitive school engagement (Fredricks et al., 2004). Constructs within cognitive engagement are quite similar to those within the field of motivation, whereas behavioral school engagement refers to involvement in school activities and participation in the classroom, and emotional school engagement describes the student's feelings towards teachers, classmates, and the institution (Fredricks et al., 2004).

Self-determination theory (SDT) currently dominates the research body on scholastic motivation (Deci & Ryan, 1985); SDT implies a broad framework to understand motivation, emphasizing basic psychological needs and the satisfaction of these needs. These needs include: The need for autonomy (i.e. the feeling of being self-determining in one's actions); the need for relatedness (i.e. the feeling of having supportive social relationships); and the need for competence (i.e. the feeling of dealing with one's environment in a competent way). Relatedness in particular seems to be closely connected with school engagement and achievement (Furrer & Skinner, 2003; Martin & Dowson, 2009), whereas the satisfaction of both autonomy and competence needs is essential in maintaining intrinsic motivation (Niemiec & Ryan, 2009; Ryan & Deci, 2009).

In terms of the relationship between stress and self-determination, Weinstein and Ryan (2012) proposed that a high level of self-determination reduces the harmful effects of stressors. Furthermore, the relationship between stress and academic achievement is mediated by intra-individual coping mechanisms (cf. Leung & He, 2010). Whether this is also true for school engagement—which is closely related to school achievement—has not yet been studied.

### *Current study*

Based on self-determination theory and the above-mentioned empirical background, the current study examined the relationship between perceived stress, self-determination, and school engagement. In detail, we hypothesized that (a) perceived stress, self-determination, and school engagement would be

associated, such that the relations between perceived stress and school engagement and between stress and self-determination would be negatively correlated whereas self-determination and school engagement would be positively correlated. In addition, we hypothesized that (b) the relation between perceived stress and (behavioral and emotional) school engagement would be mediated by self-determination (autonomy, competence, relatedness).

## Method

The current study is part of the SELF-project (SELF = Socio-Emotional Learning-Factors), a larger research analysis on the impact of socio-emotional factors on learning and motivation processes in students attending secondary schools in Germany.

### Participants

The sample consisted of 1088 boys and girls in the age range of 12- to 15-years-old ( $M_{age} = 13.7$ ;  $SD = 0.53$ ). All participants were seventh and eighth grade students from secondary schools in Brandenburg, Germany. Students were asked to complete questionnaires that assessed, among other variables, their perceived stress, self-determination, and school engagement. The age of the students was considered suitable for this study because former research has shown that students' motivation and school engagement undergoes a rapid decline during the transition to secondary school and the first three years of high school (Eccles, Wigfield, & Schiefele, 1998; Harter, 1996; Watt, 2004; Zusho & Pintrich, 2001). 54% of the students in the sample were girls ( $n = 587$ ) and 46% were boys ( $n = 502$ ). Information about ethnicity was not included in the questionnaires because of a very low rate of ethnic variation in Brandenburg; the percentage of ethnic minorities was 2.6%. It was not possible to collect data about socio-economic status, because in Germany it is legally prohibited to ask participants for information about a second party (i.e. to ask the students about their parents' income). The 23 participating schools were selected randomly from the 124 secondary schools existing in Brandenburg.

### Procedure

Before answering the questionnaires, students were informed that participation was voluntary, that their answers would be treated confidentially, and that they were not obliged to answer any questions. In addition, participating students were thoroughly introduced to the questionnaires and the means for completing the questionnaires. Special attention was given on how to use the four-point and five-point Likert scales. Self-report information was used because we were especially interested in how students perceived stress, self-determination, and school engagement. Nevertheless, we are aware of the problems of self-report data; therefore,

we developed a stable conceptual framework in order to make interpretations with as few concerns as possible (Chan, 2009). The collection of the data was conducted during class time on two consecutive days in fall 2011. Permission for the study was obtained from the governmental Department of Education, Youth and Sport of Brandenburg. In addition, we asked for parental permission for students' participation.

## Measures

**Perceived stress.** In order to assess students' perceived stress, a German version of the measure developed by Cohen, Kamarck, and Mermelstein (1983) was used. The measure consisted of a nine-item scale ( $\alpha = 0.78$ ). Participants were asked to answer questions on a five-point Likert scale (1 = 'never'; 5 = 'very often') about how often they felt and behaved a certain way during the last month (e.g. 'How often during the last month did you feel nervous and stressed').

**School engagement.** Based on the work of Skinner, Kindermann and Furrer (2009), a distinction was made between emotional and behavioral school engagement. Both variables contained a three-item scale ( $\alpha = 0.70$  and  $\alpha = 0.74$  respectively). Items were presented as statements and participants answered how well each statement described their feelings or behavior. Emotional (e.g. 'Class is fun') as well as behavioral school engagement (e.g. 'In class I work as hard as I can') was measured using a five-point Likert scale containing a range from 1 = 'strongly disagree' to 5 = 'strongly agree'.

**Perceived self-determination.** Based on SDT (Deci & Ryan, 1985), self-determination was measured with three subscales developed by Prenzel, Kristen, Dengler, Ettl, and Beer (1996): *Competence* (e.g. 'During class, the teacher tells me what I can improve';  $\alpha = 0.78$ ); *Autonomy* (e.g. 'During class, I can work independently on tasks';  $\alpha = 0.72$ ); and *Relatedness* (e.g. 'During class, the atmosphere is friendly and relaxed';  $\alpha = 0.87$ ). Items were rated on a six-point Likert scale containing a range from 1 = 'strongly disagree' to 6 = 'strongly agree'.

## Statistical analyses

**Correlations.** We conducted bivariate correlations between all of the variables: Perceived stress, the three perceived self-determination subscales, and the two subscales of school engagement, using SPSS (version 21).

**Structural Equation Modeling.** Based on our hypotheses, we conducted a latent structural equation model in order to assess the strength of direct pathways from perceived stress to self-determination as well as from self-determination to emotional and behavioral school engagement. Furthermore, by using bootstrap analyses we tested whether indirect pathways from perceived stress had a significant

impact on emotional and behavioral school engagement. Our analysis focused on the strength of the indirect effects, whereas the observed associations between the predictor, the mediator, and the outcome were considered to be rather secondary (cf., Preacher & Hays, 2008b). We used Mplus (version 7) for estimation of the model fit. More precisely, we considered five primary fit indices as recommended by Hu and Bentler (1999) [i.e. Chi-Square Test of Model Fit ( $\chi^2$ ), Root Mean Square Error of Approximation (RMSEA), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI) and Standardized Root Mean Square Residuals (SRMR)]. To account for missing data models were estimated with full information maximum likelihood (FIML) using mplus version 7.0 (Mplus 7.0; & Muthén 1998–2012).

Subsequently, a second model was conducted which also contained direct effects from stress to emotional and behavioral school engagement. The first model was considered as the (1) baseline model; it was compared to the (2) less restrictive model (partial mediation) by means of the  $\chi^2$ -difference test (Geiser, 2010; Yuan & Bentler, 2004).

## Results

### Correlations

Bivariate correlations between the variables perceived stress, the three perceived self-determination subscales, and the two subscales of school engagement were conducted with SPSS. As presented in Table 1, in agreement with our hypotheses, perceived stress was negatively correlated with all other variables, meaning that a higher amount of perceived stress was associated with lower levels of self-determination as well as school engagement. In contrast, autonomy, relatedness, and competence were all positively correlated with emotional as well as behavioral

**Table 1.** Summary of Means, SD, and intercorrelations for scores on stress, self-determination and school engagement.

Measure	2	3	4	5	6	M	Range	SD
1 ST	–0.278**	–0.306**	–0.245**	–0.280**	–0.350**	2.75	1–5	0.56
2 SDco	–	0.468**	0.521**	0.340**	0.363**	4.01	1–6	0.80
3 SDre		–	0.456**	0.220**	0.399*	4.42	1–6	1.00
4 SDau			–	0.271**	0.301**	4.07	1–6	0.94
5 Beng				–	0.636**	2.77	1–5	0.48
6 Eeng					–	2.75	1–5	0.44

Note: All measures are standardized.

Beng = Behavioral School Engagement; Eeng = Emotional School Engagement; SDau = Self-Determination Autonomy; SDco = Self-Determination Competence; SDre = Self-Determination Relatedness; ST = Stress.  
\* $p < 0.05$ , \*\* $p < 0.001$ .

school engagement. Obviously, autonomy, relatedness, and competence were positively correlated as they emerged from the same questionnaire measuring self-determination.

### Structural Equation Modeling

Before conducting structural equation modeling (SEM), a confirmatory factor analysis (CFA) was run in order to evaluate which combination of items was suitable for the model. In terms of an economic model, the number of items was reduced, such as low-loading items ( $\alpha < 0.50$ ) were excluded from our analysis. Finally, every latent variable consisted of three items respectively.

In order to analyse the above-mentioned results of the correlation matrix in more detail, two structural equation models were constructed: (1) a baseline model (full mediation) consisting of direct and indirect paths from stress to emotional and behavioral school engagement; and (2) a less restrictive model (partial mediation) in which two direct pathways between perceived stress and both types of school engagement were added. The results of the analysis showed a good fit for the baseline model ( $\chi^2 (106) = 246.57$ ,  $p < 0.001$ ; CFI = 0.94, RMSEA = 0.05; SRMR = 0.05) as well as for the less restrictive model ( $\chi^2 (104) = 244.41$ ,  $p < 0.001$ ; CFI = 0.94, RMSEA = 0.05; SRMR = 0.05).

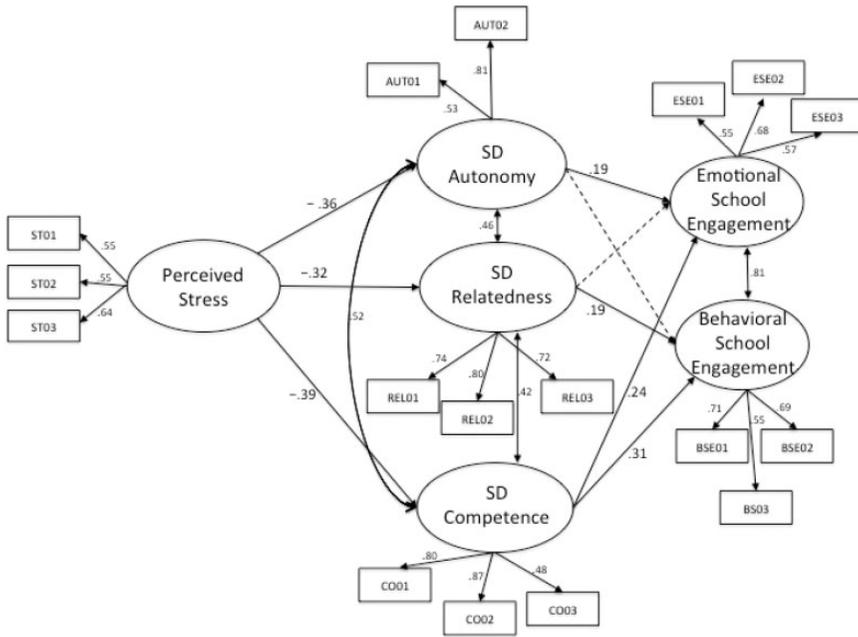
The chi-square difference test between the (1) baseline model and the (2) less restrictive model did not reach level of significance ( $\chi^2 (5) = 8.17$ ,  $p = 0.147$ ), which means that the baseline model was a better fit. Hence, the test revealed that the association between perceived stress and school engagement was fully mediated by competence, relatedness and autonomy (see Table 2), accordingly the additional direct effects between stress and school engagement in the less restrictive model were non-significant.

**Direct effects.** The baseline model of full mediation included direct effects of (a) perceived stress on autonomy, relatedness, and competence (self-determination), and (b) autonomy, relatedness, and competence on both emotional and behavioral

**Table 2.** Model Fit Indices Comparing Baseline Model (Full Mediation) and the Less Restrictive Model (Partial Mediation).

Measure	Baseline model	Less restricted model
$\chi^2$ -Test of Model Fit (df <sup>†</sup> )	246.57 (106)	244.41 (104)
$p(\chi^2)$	<0.001	<0.001
CFI/TLI	0.94/0.92	0.94/0.92
RMSEA (90% CI)	0.05 (0.04, 0.06)	0.05 (0.04, 0.06)
SRMR	0.05	0.05

Note: Baseline Model = Full Mediation; df<sup>†</sup> = degrees of freedom, Less Restricted Model = Partial Mediation.



**Figure 1.** SEM model for stress, self-determination and school engagement. Significant effects shown as standardized coefficients (betas), continuous pathways are significant at  $p < .05$ ; dotted pathways are not significant.

school engagement (see Figure 1). The direct effects between stress and autonomy ( $B = -0.71$ ,  $\beta = -0.36$ ,  $SE = 0.19$ ,  $p < 0.001$ ), as well as stress and relatedness ( $B = -0.85$ ,  $\beta = -0.32$ ,  $SE = 0.21$ ,  $p < 0.001$ ), and stress and competence ( $B = -0.17$ ,  $\beta = -0.39$ ,  $SE = 0.25$ ,  $p < 0.001$ ), were significant. In addition, the direct effects between competence and emotional school engagement ( $B = 0.10$ ,  $\beta = 0.24$ ,  $SE = 0.04$ ,  $p = 0.007$ ), as well as between autonomy and emotional school engagement were found to be significant ( $B = 0.12$ ,  $\beta = 0.19$ ,  $SE = 0.06$ ,  $p = 0.053$ ). In contrast, the direct path between relatedness and emotional school engagement was not significant.

In addition, the direct effects between competence and behavioral school engagement ( $B = 0.17$ ,  $\beta = 0.31$ ,  $SE = 0.04$ ,  $p < 0.001$ ) as well as relatedness and behavioral school engagement ( $B = 0.12$ ,  $\beta = 0.19$ ,  $SE = 0.05$ ,  $p = 0.009$ ) were found to be significant. In contrast, the direct effect of autonomy on behavioral school engagement was not significant.

*Indirect effects.* As recommended by Preacher and Hayes (2008a, 2008b), we conducted bootstrapping (bootstrap = 1000) to assess the effects of mediators by constructing confidence intervals (CI) around the estimates. This procedure reduces bias caused by non-normality in the sampling distribution of indirect effects

(Shrout & Bolger, 2002). Consistent with the hypotheses, we observed significant indirect effects of perceived stress on emotional school engagement mediated by autonomy ( $B = -0.09$ ,  $\beta = -0.07$ ,  $SE = 0.07$ , 95% CI  $[-0.31, -0.003]$ ) and competence ( $B = -0.12$ ,  $\beta = -0.09$ ,  $SE = 0.06$ , 95% CI  $[-0.28, -0.02]$ ). In contrast, relatedness did not mediate the relationship between stress and emotional school engagement. Furthermore, we observed significant indirect effects of perceived stress on behavioral school engagement mediated by relatedness ( $B = -0.10$ ,  $\beta = -0.06$ ,  $SE = 0.07$ , 95% CI  $[-0.27, -0.01]$ ) and competence ( $B = -0.20$ ,  $\beta = -0.12$ ,  $SE = 0.08$ , 95% CI  $[-0.43, -0.09]$ ). In contrast, autonomy did not mediate the relationship between perceived stress and behavioral school engagement. As mentioned above, the chi-square difference test (see Table 2) supports the hypothesis of these indirect effects being full mediations.

The identified final model of full mediation explained 25% of the variance of behavioral school engagement ( $R^2 = 0.247$ ) and 17% of the variance of emotional school engagement ( $R^2 = 0.173$ ).

## Discussion

In general, the results of the current study support the hypothesis that there is an association between stress, self-determination, and school engagement. As hypothesized, stress was negatively correlated with school engagement. This suggests that students with higher levels of stress tend to be more disengaged or disaffected in school, which is characterized by passive behavior (e.g. not making an effort in class, being bored, giving up easily) as well as displaying negative emotions such as anger, blame, and denial (Skinner & Belmont, 1993), which can develop into more chronic emotional states such as boredom, depression, and anxiety. In addition, perceived stress was negatively correlated with self-determination (autonomy, relatedness, and competence). In other words, the more adolescents perceived themselves as being under stress, the weaker was their perceived self-determination. In contrast, there was a positive association between each subscale of self-determination and both emotional and behavioral school engagement, which is in line with current research (Reeve, Jang, Carrell, Jeon, & Barch, 2004; Ryan & Deci, 2009). These results suggest that self-determination may be an effective starting point for prevention and intervention initiatives, which could be used in educational settings and in school psychology practice.

Consistent with our second hypothesis and with regard to our structural equation model, self-determination fully mediated the association between perceived stress and (emotional and behavioral) school engagement. Only two indirect effects from stress to school engagement were found to be non-significant: (1) the path from stress through autonomy to behavioral school engagement and (2) the path from stress through relatedness to emotional school engagement. To our knowledge, there is no existing research that might explain why autonomy did

not act as a mediator in the relationship between stress and behavioral school engagement, nor why relatedness did not act as a mediator in the relationship between stress and emotional school engagement. This deserves further study.

Nevertheless, our results underline the strong implications of self-determination on psychological and educational practice (Niemic & Ryan, 2009). Our findings extend existing evidence by suggesting that teachers' support of the basic psychological needs of students for autonomy, competence, and relatedness not only facilitates their autonomous self-regulation for learning, academic performance, and well-being (Jang, Reeve, Ryan, & Kim, 2009; Niemic & Ryan, 2009; Standage, Duda, & Ntoumanis, 2006; Tsai, Kunter, Lüdtke, Trautwein, & Ryan, 2008), but also their school engagement. As recent research on self-determination theory in educational settings has shown (e.g. Jang et al., 2009; Reeve, Deci, & Ryan, 2004), teachers' interpersonal styles with students can be conceptualized along three dimensions: autonomy support, structure, and interpersonal involvement. These three dimensions should be considered in developing strategies to strengthen students' perceptions of self-determination. In detail, the need for autonomy can be supported through promoting autonomy-supportive or student-centered teaching behaviors by teachers (Chirkov & Ryan, 2001; Radel, Sarrazin, Legrain, & Wild, 2010; Roth, Assor, Kanat-Maymon, & Kaplan, 2007; Soenens & Vansteenkiste, 2005); the need for competence can be supported through teacher feedback and teaching style (Katz & Assor, 2007; Niemic & Ryan, 2009); and finally, the need for relatedness can be supported through strong peer and teacher relationships including interpersonal involvement (Katz & Assor, 2007; Niemic & Ryan, 2009).

Therefore, school psychologists can prevent stress and/or intervene with adolescents who are currently stressed at two levels: (1) the class level and (2) an individual level. At the class level, school psychologists can inform and instruct teachers about need-supportive techniques and tools, which particularly support the need for autonomy and competence, as well as initiating programs to strengthen class climate, teacher-student relationships and student-student relationships, which support the need for relatedness. On the individual level, school psychologists may support autonomy by creating a less constricting environment where evaluative pressures are minimized (Niemic & Ryan, 2009), as well as by maximizing students' perceptions of having a voice and choice in the academic activities in which they are engaged (Niemic & Ryan, 2009). Additionally, adolescents' competencies can be supported by providing students with the appropriate tools and feedback to promote success and feelings of self-efficacy. Finally, school psychologists could enhance students' sense of belonging in the school and class and therefore support their feelings of relatedness, which may facilitate the essential process of internalization academic motivation (Niemic & Ryan, 2009).

These results underline the essential role of self-determination in classroom contexts, which numerous studies have highlighted before; specifically, the satisfaction of all three basic psychological needs was associated with more satisfying learning experiences and greater academic achievement (Jang et al., 2009),

as well as intrinsic motivation (Black & Deci, 2000). In other words, in school contexts that support satisfaction of autonomy, competence, and relatedness needs, students tend to be more intrinsically motivated, more willing to engage in less interesting tasks, and to value academic activities (Niemiec & Ryan, 2009). Finally, with higher need satisfaction, students perceive less stress and demonstrate more school engagement and therefore a greater value for what school has to offer. Furthermore, even when high levels of stress are perceived, increased self-determination can prevent students from disengaging from school.

### *Strengths, limitations and future research*

As with all research, the findings of the present study should be interpreted in light of a number of limitations. First, the correlational nature of the study means that firm conclusions about the causal ordering of variables cannot be definitively established. Future researchers may wish to utilize a prospective design to investigate how the perception of stress changes and how perceived stress affects school engagement over time. In addition, future studies need to investigate younger samples in order to determine the age at which stress and its negative effect on school engagement first appear. Second, the current study was limited to self-report data, which raises the potential problem of mono-method bias. However, accordingly to Chan (2009) the negative attitude towards self-report data has taken unjustified proportions (see also Spector, 2006), which we wish to counteract with this study. We followed his advice and carefully considered the four main problems associated with self-report data, which may also occur with non-self-report data according to Chan (2009). Third, the sample was homogenous in socio economic status (SES). For these reasons, the current findings cannot be generalized to a broader population.

Despite these limitations, the results of the present study are important as they extend previous research on the association between stress and schoolwork/home-work (Brown et al., 2011; Murberg & Bru, 2007) by examining the association between stress and school engagement. Additionally, the essential mediating role of self-determination provides strong implications for both school psychology and classroom practice; support from psychologists, educators, and teachers in satisfying students' three basic needs of autonomy, relatedness, and competence, could increase their school engagement, even if high levels of subjective stress are present (Ryan & Deci, 2009).

So far, stress has been studied extensively in terms of coping and coping styles (Wrzesniewski & Chylinska, 2007). However, coping styles might also be linked to self-determination, especially to autonomy. Therefore, focusing on coping and self-determination simultaneously is imperative in order to analyse how such factors affect students in perceiving and dealing with stress (Skinner & Edge, 2002).

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