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Associations between teacher emotional support and depressive symptoms in
Australian adolescents: A 5-year longitudinal study

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Abstract

Approximately one-fifth of adolescents develop depressive symptoms. Given that youth spend a good deal of their lives at school, it seems plausible that supportive relationships with teachers could benefit their emotional well-being. Thus, the purpose of this study is to examine the association between emotionally supportive teacher relationships and depression in adolescence. The so-called *principle-effect* and *stress-buffer models* could explain relationships between teacher emotional support and depressive symptoms, yet no study has used both models to test bidirectional relationships between teacher support and depressive symptoms in students separately by sex. Four thousand three hundred forty-one students (boys: $n = 2063$; girls: $n = 2278$) from grades 8 to 12 completed the Center for Epidemiological Studies Depression Scale (CES-D), List of Threatening Experiences Questionnaire (LTEQ), and an instrument developed for the study to measure teacher support annually for 5 years. Results support neither of the two proposed models. Instead they indicate that in the first years of high school students of both sexes with average and high numbers of stressful events benefit from teacher support, while teacher support might have iatrogenic effects on students experiencing low numbers of stressful events. Possible explanations for the findings and future research are discussed.

Keywords: teacher support, supportive relationships, depression, high school students

Previous research has shown that approximately 20% of girls and 7% of boys develop depressive symptoms before the end of their adolescent years (Angold, Erkanli, Silberg, Eaves & Costello, 2002; Twenge & Nolen-Hoeksema, 2002), and the consequences of developing such symptoms may persist years later (Dunn & Goodyer, 2006). Given the prevalence and consequences of depression, it is important to identify potential opportunities for prevention and early intervention.

A large body of work pointing to the positive impact of supportive relationships on depression in adolescents (for a review see Rudolph, Flynn, & Abaied, 2008) has resulted in the development of interventions designed to reduce depressive symptoms by improving supportive relationships in schools (Sawyer et al., 2010) and student social skills (Pössel, Seemann, & Hautzinger, 2008; Pössel, Adelson, & Hautzinger, 2011). However, not all studies' findings clearly support the notion that supportive relationships ameliorate depression. For example, with middle school students, combined social support by classmates, friends, parents, and teachers mediated the associations between some cognitive risk factors (e.g., rumination; Abela, Vanderbilt, & Rochon, 2004) and depression, but not others (dysfunctional attitudes; Abela & Sullivan, 2003). Those findings raise the question of how it is possible that some studies' results show a clear positive impact of supportive relationships on depression in adolescents while others show only limited evidence of such positive impact. As Rueger, Malecki, and Demaray (2008) suggest, possible explanations include different sources (i.e., classmates, friends, parents, teachers) and different types of social support (i.e., academic, appraisal, emotional, instrumental, informational; Malecki, & Demaray, 2002). For example, social support is a multidimensional concept, and different conceptualizations might impact

depression in different ways. This hypothesis is supported by research demonstrating that perceptions of support from one source, but not another, may affect depressive symptoms (e.g., Rueger et al., 2008). Indeed, accumulated research suggests that social support is important for the development of depressive symptoms, particularly in adolescence. At the same time, social support comes in varied forms, some of which seem to be more important than others in preventing depressive symptoms. Thus, it is helpful to identify the extent to which one source of social support (i.e., teachers) and one form of social support (i.e., emotional) are connected to depression.

Burgeoning evidence indicates that supportive relationships with parents and peers are protective against depression (e.g., Desjardins & Leadbeater, 2011; Kerr, Preuss, & King, 2006; Murberg & Bru, 2004; Rueger, Malecki, & Demaray, 2010; Stice, Ragan, & Randall, 2004; Yang et al., 2010; Young, Berenson, Cohen, & Garcia, 2005; Ystgaard, Tambs, & Dalgard, 1999). However, there is limited research on associations between adolescents' supportive relationships with teachers and depression. This is surprising given that young people spend a good deal of their lives at school. It seems plausible that supportive relationships with teachers could benefit students' emotional well-being. Thus, the purpose of this study is to examine the association between emotionally supportive teacher relationships and depression in adolescence.

Models of the Associations between Supportive Relationships and Depression

Two theoretical models have been used to investigate the relationship between depressive symptoms and social support (Dumont & Provost, 1999). The *principle-effect model* (Dumont & Provost, 1999), also known as the main- or direct-effect model (Cohen & Wills, 1985), proposes that supportive relationships provide individuals with regular

positive experiences and stable, socially rewarding roles which promote positive outcomes (Cohen & Wills, 1985). In other words, supportive relationships can prevent depression because they give an individual the feeling of being accepted and valued by others, and this feeling, in turn, bolsters self-esteem, confidence, and efficacy, all of which are known protective factors for depression (Stice et al., 2004). There is some support for the main effect of supportive relationships on depressive symptoms in adolescents. For example, Kerr et al. (2006) found that family support was negatively associated with depressive symptoms in suicidal female adolescents during psychiatric hospitalization. Further, a two-year longitudinal study demonstrated that deficits in parental support predict an increase in depressive symptoms (Stice et al., 2004). Thus, one might expect that the principle-effect model explains the association between supportive relationships with teachers and depressive symptoms best. If this is the case, support by teachers has the potential to benefit students regardless of the extent to which they experience stressful life events. In other words, supportive relationships with teachers could be effective mechanisms to prevent depression in universal prevention programs.

The *stress-buffer model* proposes that (a) stressful events increase the likelihood that an individual will develop depressive symptoms and (b) supportive relationships moderate the impact of stressful events on depressive symptoms. Contrary to the principle-effect model that predicts social support has a positive effect on individuals independent of their life situations, the stress-buffer model proposes that supportive relationships only have a positive impact when an individual faces stressful events. Indeed, there is some support for this model. For example, Murberg and Bru (2004)

found parental support moderated the association between stress in form of negative life-events and depressive symptoms in adolescent girls. Further, a study by Desjardins and Leadbeater (2011) revealed that emotional support from fathers reduced the association between adolescents' relational victimization and depressive symptoms. Finally, an 18-month longitudinal study demonstrated that the harmful effects of negative life-events were reduced by parental support (Ystgaard et al., 1999). Hammen (2005) points out that multiple models explaining the development and maintenance of depression, such as the cognitive stress-vulnerability model of depression (Beck, 1976) and the self-esteem vulnerability model (Brown & Harris, O. T., 1978), are conceptualized similarly to the stress-buffer model. Thus, these models provide further contexts to test the stress-buffer model. Findings from tests of either of the two models have generally showed support for the predicted stress-buffer effect (e.g., Harris, O. T. et al. 2000; Lewinsohn, Joiner, & Rohde, 2001).

In general, supportive relationships can play a role at two different points in the chain linking stress to depression. First, supportive relationships may interrupt associations between stressful events and stress reactions by changing individuals' perceptions of the level of stress posed by perceived challenging situations. These changed perceptions may facilitate the use of adaptive coping strategies (Cohen & McKay, 1984; Cutrona & Troutman, 1986). In other words, an individual's perception that others can and will provide necessary resources may help an individual to redefine the potential for harm posed by a stressful event and/or bolster the individual's ability to manage challenging situations. Second, supportive relationships may reduce or eliminate stress reactions, potentially by reducing the impact of stress appraisal by providing a

solution for a problem and/or by reducing the perceived importance of the problem (Cohen & Wills, 1985). If the stress-buffer model explains the association between supportive relationships with teachers and depressive symptoms best, support from teachers will particularly benefit students experiencing stressful life events.

Problematic social functioning is one of the core symptoms of depression (APA, 2000). For example, individuals with depression often withdraw from social interactions (Lewinsohn, Hoberman, Teri, & Hautzinger, 1985). When they do not withdraw, depressed individuals continuously demand reassurance from others to substantiate their sense of self-worth and verify that others care about them (Joiner & Metalsky, 2001). This continuous demand may cause others to avoid interacting with them. Thus, it becomes clear that not only do supportive relationships affect depressive symptoms, but depression is capable of affecting supportive relationships, and bidirectional associations between both constructs should be examined.

As outlined above, several explanations for the buffering effect of supportive relationships have been proposed (Cohen & McKay, 1984; Cohen & Wills, 1985; Cutrona & Troutman, 1986). These models are supported by empirical studies showing that (a) a lack of supportive relationships with parents and peers predicts an increase of depressive symptoms in adolescents (e.g., Young et al., 2005), and (b) depressive symptoms predict weaker quality and less stable peer relationships, especially in adolescent girls (Prinstein, Borelli, Cheah, Simon, & Aikins, 2005; Stice et al., 2004). In other words, results from previous studies identify *reversed* and *bidirectional relationships* between supportive relationships with parents and peers and depressive symptoms. Thus, the lack of supportive relationships and depression may fuel each

other, forming a vicious cycle for affected adolescents. If patterns between supportive relationships with teachers and depressive symptoms in students exist as well, a lack of supportive relationships with teachers could magnify the risk for depression.

Associations between Supportive Relationships with Teachers and Depression in Adolescents

Student sex is an important variable to consider when studying associations between supportive relationships with teachers and depressive symptoms in students. However, whether girls or boys benefit more from supportive relationships with teachers is an open question. For example, girls benefit more from parental support in middle adolescence (Kerr et al., 2006; Murberg & Bru, 2004) while boys benefit more in late adolescence (Ystgaard et al., 1999). Research also shows that pubertal girls report more stressful events (Rudolph, 2002; Sawyer, Pfeiffer, & Spence, 2009) and are more likely to develop depression than boys (Angold et al., 2002; Twenge & Nolen-Hoeksema, 2002). Contrary to this, girls perceive higher levels of emotional support in their relationships than do boys (Johnson, 2004) and might be more vulnerable to depression if they lack or face problems with such relationships. Thus, one could just as well expect girls to benefit more than boys from support by teachers. This hypothesis is supported by multiple studies demonstrating that girls report more supportive relationships with teachers than boys (Furrer & Skinner, 2003; Niehaus, Rudasill, & Rakes, 2012; Rueger et al., 2010; Shochet et al., 2011; Wentzel, Battle, Russel, & Looney, 2010). Finally, in stressful situations, girls seek more emotional support from peers while boys are more likely to seek instrumental support (Frey & Röthlisberger, 1996). Thus, it is possible that the form of the associations between supportive relationships and depression in

adolescents (main effect vs. interaction effect) differs depending on the type of support and the sex of the adolescent. Despite the open questions regarding sex as a possible moderator in the associations between supportive relationships with teachers and depressive symptoms in students, only four studies of teacher support and depression included sex in their analyses to date (Murberg & Bru, 2004; Reddy et al., 2003; Rueger et al., 2010; Shochet et al., 2011).

Previous studies regarding the associations between supportive relationships with teachers and depression in adolescents, the principle-effect model was supported by two studies (including a cross-sectional study) for academic and emotional support (Murberg & Bru, 2004) and emotional support (Reddy, Rhodes, & Mulhall, 2003), respectively, in high school students of both sexes. In a study of middle school students measuring a mix of different types of support by teachers, however, this model was supported only for boys (Rueger et al., 2010). In another study with students in grades 7 and 8, teacher emotional support predicted concurrent depression in both sexes, but not depression one year later (Shochet, Smith, Furlong, & Homel, 2011). In the only study testing the principle-effect model in students from grades 5 to 12 (Barber & Olsen, 2004), the model was supported for both boys and girls during transitions from elementary to middle school (grades 5 to 6) and from middle to high school (grades 8 to 9) when measuring perceptions of academic support. Further, the reversed principle-effect model is supported for middle school students of both sexes measuring appraisal, emotional, informational, and instrumental support (Reddy et al., 2003).

The purpose of the current study is to provide answers to remaining questions regarding teacher support and adolescent depression. First, is the relationship between

teacher emotional support and depression in high school students bidirectional or unidirectional? If the latter is true, does teacher emotional support predict depression in high school students (principle-effect or stress-buffer model) or vice versa (reversed model)? Second, is teacher emotional support directly related to depression (principle-effect model) or is this association moderated by perceived stress, such that teacher emotional support is linked to depression only when perceived stress is high (stress-buffer model)? Third, does the same model provide the best explanation of the associations between supportive relationships with teachers and depression in high school students for boys and girls? Our hypotheses follow.

Hypothesis 1 – Direction of the Associations: While empirical literature on supportive relationships with peers and depressive symptoms, especially in female middle school students, provides some evidence for bidirectional associations between both constructs (Prinstein et al., 2005; Stice et al., 2004), the only study examining bidirectional associations between teacher emotional support and adolescent depression found evidence for teacher support influencing depressive symptoms but not for reversed associations (Reddy et al., 2003). Thus, consistent with Reddy et al., we expect unidirectional associations such that higher teacher emotional support will predict lower adolescent depressive symptoms, but adolescent depression will not predict lower teacher support in high school students of both sexes.

Hypothesis 2 – Social Support as Moderator and Sex Effects: Previous studies testing for both the principle-effect model (direct associations between teacher emotional support and depressive symptoms in high school students) and the stress-buffer model (associations between stressful life events and depressive symptoms in high school

students moderated by teachers' emotional support; Murberg & Bru, 2004; 2009) found support for both models. However, they did not compare the models, so it remains unclear whether one of these models describes the relationship between teacher emotional support and adolescent depression better than the other. In addition, while some studies' findings support the principle-effect model for both sexes (Murberg & Bru, 2009; Reddy et al., 2003), Rueger et al. (2010) found support for this model in boys only, and Shochet et al. (2011) found support for this model for both sexes in the cross-sectional part of their study, but no support for this model longitudinally. The only study testing the stress-buffer model for boys and girls separately (Murberg & Bru, 2004) found evidence for this model only in girls but not in boys (Murberg & Bru, 2004). This is consistent with Frey and Röthlisberger's (1996) finding that girls, but not boys, try to increase the emotional support they receive from their family in stressful situations. Thus, it is possible that different models describe the associations between teacher support and depressive symptoms for boys and girls. Based on this and hypothesis 1, we predict that the stress-buffer model will fit the data best for girls, while the principle-effect model will describe the nature of the associations best for boys.

Methods

Participants

Participants were drawn from the *beyondblue* prevention study, a large scale depression prevention study conducted in Australia with students from 50 secondary schools. The prevention program comprised four elements, including (a) a classroom intervention aimed at improving problem-solving and social skills, resilient thinking style, and coping strategies; (b) an element to build supportive environments (including

decision-making, conflict resolution, classroom discipline, staff relations, and anti-bullying); (c) an element to enhance partnerships between families, school staff, education support/welfare personnel, and community-based health professionals to facilitate students' access to professional services at school and in the wider community; and (d) community forums to provide students, their families, and school personnel with information to assist them with identifying problems, to seek help for themselves, and to help peers. Analyses revealed no significant differences in depressive symptoms and risk and protective factors experienced by students between intervention and control groups over a 3 year period (Sawyer et al. 2010). However, no separate analyses considering stressful situations in students were calculated.

Students in the study were followed from grades 8 to 12 and completed a baseline assessment in the second term of grade 8 (May and June, 2003). At the baseline assessment, participants ($N = 5,633$) were an average age of 13.1 ($SD = .5$) years old and 47% were male. Demographic data indicated that 92% of the students were born in Australia, and 4.7% identified themselves as Aboriginal or Torres Straight Islander. Eighty-one percent of participants had at least one parent in full-time employment while 70% of participants' parents lived together, consistent with national Australian population estimates (Australian Bureau of Statistics, 2003).

The academic year in Australia extends from February to early December, with grade 8 typically being the first year of high school. Follow-up assessments took place in all schools in the last term of the school year (October through December) when the students were in grades 9 to 12. Of the baseline responders, 90.17% completed follow-up assessments in 2004, 79.87% did so in 2005, 59.10% in 2006, and 53.36% in 2007. This

retention rate is comparable with other Australian longitudinal studies with adolescents and reflects the high mobility of the Australian society (e.g., Caldwell, Rudolph, Troop-Gordon, & Kim, 2004; Heaven & Ciarrochi, 2008). Informed consent was obtained from all participants and their parents prior to the baseline assessment.

Based on data of the Departments of Education of the participating states, 1,152 students left the school they attended at baseline sometime during the study. Thus, 4,481 students remained in the participating schools and formed the sample used in this study. The students left these schools for a variety of reasons (e.g., family relocation, changing to a vocational school¹, school dropout) and were excluded from the data analysis. No differences were found between students that left the school they attended at baseline and the remaining students with regard to sex [$\chi^2(1) = 2.06, p = .358$, age, $t(5473) = 0.94, p = .350$] and whether they were born in Australia or not [$\chi^2(2) = 1.01, p = .604$]. However, students who left their baseline school were significantly more often of Aboriginal and/or Torres Strait Islander background [$\chi^2(1) = 8.91, p = .012$], reported less supportive relationships with teachers at baseline [$t(1650.64) = 4.03, p < .001$], reported more negative life-events [$t(1550.15) = 7.28, p < .001$], and reported a higher frequency of depressive symptoms [$t(1549.85) = -7.20, p < .001$].

Measures

Depressive symptoms. The Center for Epidemiological Studies Depression Scale (CES-D) was used to assess depressive symptoms at each time point. The CES-D consists of 20 items describing a wide range of depressive symptomatology (Radloff, 1991). To complete the measure, respondents rate their experience of each symptom in

¹ Students in Australia that are interested in a vocational career leave the general high school after grade 10 and transition to specialized vocational high schools.

the past week on a four-point scale from *Rarely or none of the time (less than 1 day)* to *Most or all of the time (5–7 days)*. Summed scores can range from 0 to 60, with higher scores indicating more depressive symptoms in the past week. Scores from the CES-D have strong reliability and construct validity in adolescents (Garrison, Schluchter, Schoenbach, & Kaplan, 1989; Radloff, 1991). Cronbach's alpha in the *beyondblue* sample was between .92 and .94 in girls and between .88 and .91 in boys (Table 1).

Life-events. An adaptation of the List of Threatening Experiences Questionnaire (LTEQ) was used to measure 13 possible events with considerable long-term contextual threat (e.g., illness or death; pregnancy; problems with friends, law, or school; Brugha, Bebbington, Tennant, & Hurry, 1985). Equivalent items were modified in their focus to be more appropriate for an adolescent group (e.g., split-up with boyfriend/girlfriend rather than marital separation or divorce). Students answer *yes* or *no* regarding whether or not the event has happened in their lives within the past 6 months. Endorsed items are summed; total scores can range from 0 to 13, with higher scores representing more life events. The original LTEQ demonstrated inter-rater agreements of kappa = 0.66 to 0.84 between psychiatric patients and their relatives, sensitivity of 0.89 to 1.00, and specificity of 0.74 to 0.88 based on the criterion of independently rated adversity derived from a semi-structured life events interview (Brugha & Cragg, 1990). Further, a previous publication demonstrated that the adapted version of the LTEQ predicts concurrent depressive symptoms and depressive symptoms one year later in high school students of both sexes (Sawyer et al., 2009). Mean number and standard deviation of endorsed stressful events separated by sex and grade level are reported in Table 1.

Supportive relationships with teachers. An instrument to measure supportive relationships with teachers (emotional support) was developed for this study. Items were selected from existing scales (Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002; Bond et al., 2004; Epstein & McPartland, 1976; Goodenow, 1993; Roeser, Midgley, & Urdan, 1996). Students used a 4-point scale (1-4) to rate the degree to which they agreed with each of the statements (sample item: “I feel I can go to my teacher with the things that are on my mind”), producing scores ranging from 9 to 36. Cronbach’s alpha in the total *beyondblue* sample was between .89 and .90 in girls and between .89 and .90 in boys (Table 1).²

Design and Procedure

Letters describing the study were sent to parents of all 8,873 students in grade 8 of the participating schools (For a detailed description of the eligibility criteria, the selection protocol, and the demographics of the participating schools, see Saywer et al., 2009, 2010). Parental consent was received for 5,633 (63%) who were invited to participate. Students were assessed in classrooms or assembly halls during school time and it took approximately 30 minutes to complete the measures. Students absent during the scheduled assessments were followed to minimize missing data. Students, parents, and teachers were not paid for their participation. The researchers administered the questionnaires and teachers helped with maintaining control during instrument administration. Ethics approvals were obtained from the appropriate bodies in each state.

Data Analysis

Students who dropped out of the study were significantly more often of

² To determine the factor structure of this instrument, an exploratory factor analysis (EFA) and a confirmatory factor analysis (CFA) was employed. These results are presented in online supplement A.

Aboriginal and/or Torres Strait Islander background, reported less supportive relationships with teachers at baseline, reported more negative life-events, and reported a higher frequency of depressive symptoms compared with the retained students (see Participants). Thus, the data of the dropped out students were deleted before computing multilevel models (Enders, 2001). Because students were nested in schools, HLM version 6.03 (Raudenbush, Bryk, Cheong, Congdon, & du Toit, 2004) was employed to examine effects of between-school differences. An unconditional means model revealed that variation in supportive teacher relationships between schools as measured by the ICC is .0575. Thus, only 5.75% of the total variability in supportive teacher relationships can be attributed to the schools. Similarly, the ICC of the unconditional means model with depressive symptoms is .0136, or only 1.36% of the variability in depressive symptoms is between schools. As the variance in both variables explained by schools is less than 10%, multi-level analyses accounting for nesting at the school level was deemed unnecessary (Lee, 2000).

Full information maximum likelihood (FIML) estimation was used to calculate path analyses (Arbuckle, 1999) with AMOS 18.0 because it is robust to missing data (Enders, 2001). Models' goodness of fit was tested with χ^2 , the RMSEA, and the CFI. Furthermore, to determine the best fitting model, nested models were compared using χ^2 difference tests. In the χ^2 difference test, the χ^2 values as well as the *dfs* of the models are subtracted from each other. When $\Delta\chi^2$ is significant for Δdf the models are seen as significantly different from each other and the model with fewer *dfs* fits the data better than the model with more *dfs*. When the $\Delta\chi^2$ is not significant, both models fit equally well statistically and the more parsimonious model (the model with more *dfs*) can be

retained.

The different versions of the principle-effect model and the stress-buffer model were first calculated separately by sex. These models include the principle-effect model (unidirectional associations from teacher support at wave X to depressive symptoms at wave X+1; Online Supplement B1), the reversed principle-effect model (unidirectional associations from depressive symptoms at wave X to teacher support at wave X+1; Online Supplement B2), the bidirectional principle-effect model (teacher support at wave X is associated with depressive symptoms at wave X+1 and depressive symptoms at wave X are associated with teacher support at wave X+1; Online Supplement B3), the stress-buffer model (unidirectional associations from teacher support and teacher support by stressful events interactions at wave X to depressive symptoms at wave X+1; Online Supplement B4), the reversed stress-buffer model (unidirectional associations from depressive symptoms and depressive symptoms by stressful events interactions at wave X to teacher support at wave X+1; Online Supplement B5), and the bidirectional stress-buffer model (teacher support and teacher support by stressful events interactions at wave X are associated with depressive symptoms at wave X+1 and depressive symptoms and depressive symptoms by stressful events interactions at wave X are associated with teacher support at wave X+1; Online Supplement B6). Next, the models were compared with each other separately by sex using the χ^2 difference test to determine which model fit the data best for boys and which model fit the data best for girls.

The interaction terms included in the models were analyzed by calculating z-scores for each of the variables contributing to the interaction, followed by multiplying the z-scores. In all models, latent random intercepts were modeled as predictors of each

variable (depressive symptoms, stressful events, teacher support, depressive symptoms x teacher support, stressful events x teacher support) at every time point. The latent random intercepts assign each student a *baseline* for each variable across time. This allows for the measurement of the unexplained variance in relation to the individual rather than the sample as a whole. In other words, deviations from the latent intercept capture students' non-observed differences while discriminating variability due to relationships of the observed variables. Thus, the use of a latent random intercept allows us to control for non-observed confounding variables (Fergusson, Borden, & Horwood, 2009; Hamerle & Ronning, 1995), decreasing threats to validity. In addition, since being Aboriginal and/or Torres Strait Islander was associated with increased likelihood of dropping out of the study, Aboriginal and/or Torres Strait Islander status (yes/no) was added as an auxiliary variable in all analyses. Finally, all variables and the error terms of variables measured at one time point, respectively, were allowed to covary in all models.

Results

Preliminary Analyses

Descriptive statistics and correlations are shown in Table 1 and Online Supplement D. As expected, girls reported more stressful events, teacher emotional support, and depressive symptoms compared to boys. Also as expected, while most constructs correlated moderately with each other, age at grade 8 did not correlate significantly with most other constructs.

Hypothesis Testing

To identify the model that fit the data best, six different models were tested separately by sex and compared with each other (Online Supplement E). First, the

principle-effect model was compared with the stress-buffer model (boys: $\Delta\chi^2 [4, N = 2063] = 24.92, p < .001$; girls: $\Delta\chi^2 [4, N = 2278] = 15.00, p < .001$), the reversed principle-effect model was compared with the reversed stress buffer model (boys: $\Delta\chi^2 [4, N = 2063] = 4.07, p = .397$; girls: $\Delta\chi^2 [4, N = 2278] = 7.45, p = .114$), and the bidirectional principle-effect model was compared with the bidirectional stress-buffer model (boys: $\Delta\chi^2 [8, N = 2063] = 30.63, p < .001$; girls: $\Delta\chi^2 [8, N = 2278] = 22.02, p < .001$). The χ^2 difference tests supported the stress-buffer model, the reversed principle-effect model, and the bidirectional stress-buffer models for both sexes. Next, the stress-buffer models (boys: $\Delta\chi^2 [8, N = 2063] = 11.31, p = .185$; girls: $\Delta\chi^2 [8, N = 2278] = 11.02, p = .201$), and the reversed principle-effect models (boys: $\Delta\chi^2 [12, N = 2063] = 33.56, p < .001$; girls: $\Delta\chi^2 [12, N = 2278] = 28.09, p = .005$) were compared with the bidirectional stress-buffer model. The χ^2 difference tests supported the stress-buffer models for both sexes, clearly demonstrating the superiority of the stress-buffer model.

With the stress-buffer model fitting best for both sexes, it was important to test for potential differences in this model between the sexes. Thus, a multiple group analysis comparing the fit of the stress-buffer model without any between-group constraints to the same model with increasing numbers of constraints was conducted. To test for statistical invariance, $\Delta\chi^2$ -tests were used. However, as χ^2 is known to increase with sample size (Joreskog & Sorbom, 1993), Δ CFI and Δ RMSEA were used to estimate practical invariance. Following Chen (2007) and Sass (2011) Δ CFI of < 0.01 and Δ RMSEA of < 0.015 demonstrate practical invariance. Multiple group analyses comparing girls ($n = 2278$) and boys ($n = 2063$) indicated statistical and partially practical variance of the stress-buffer model across both sexes ($\chi^2_{\text{unconstrained}} (464) = 1506.40, p < .001$, CFI

(0.980), RMSEA (0.023); $\chi^2_{\text{fully constrained}}(609) = 3749.12, p < .001$, CFI (0.941), RMSEA (0.034); $\Delta\chi^2(145) = 2242.72, p < .001$, ΔCFI (0.039), ΔRMSEA (0.011)).

The individual paths between waves of the stress-buffer model for girls and boys are presented in Figure 1 and Figure 2, respectively, and the correlations between the constructs within the waves are presented in Online Supplement F. A close inspection of the cross-wave paths relevant to the study's hypotheses revealed that none of the four paths from emotionally supportive relationships with teachers to depressive symptoms in high school students were significant for boys or girls. However, two of the four predicted paths from teacher support x stressful events to depression scores were significant for boys; for girls, this association was significant from grade 8 to 9. Nevertheless, it needs to be mentioned that the effect sizes of the paths from teacher support x stressful events to depression scores were significant but relatively modest.

Model-implied graphs were constructed to examine the nature of the association between teacher support by stressful events interaction and depressive symptoms (Figures 3 & 4). The graphs demonstrate that student perceptions of teacher emotional support was inversely associated with depressive symptoms one year later, even when the students faced average and high numbers of stressful events. This general trend was true for boys and girls. However, when the students experienced a low number of stressful life events, sex differences emerged. In girls experiencing a low number of stressful life events, an average level of teacher emotional support was associated with elevated depressive symptoms compared to low and high levels of teacher emotional support. In boys experiencing a low number of stressful life events, an almost linear negative association between teacher emotional support and depressive symptoms one year later

emerged.³

Discussion

Extending the previous empirical literature on associations between teacher support and depressive symptoms in students (Barber & Olsen, 2004; Murberg & Bru, 2004, 2009; Reddy, Rhodes, & Mulhall, 2003; Rueger et al., 2010; Shochet et al., 2011), the current 5-year longitudinal study with high school students is an investigation of the nature and direction of associations between teacher emotional support and adolescent depression for boys and girls. Based on findings from a longitudinal study of teacher emotional support and depressive symptoms in middle school students (Reddy et al., 2003), we proposed unidirectional associations for both boys and girls such that greater teacher emotional support would be associated with lower levels of depressive symptoms in high school students, but that adolescent depression would not predict teacher support (hypothesis 1). In addition, we proposed that more teacher emotional support would mitigate the effects of stressful life-events on depressive symptoms (unidirectional stress-buffer model) best for high school girls, while the unidirectional principle-effect model would fit the data best for boys (hypothesis 2).

Consistent with hypothesis 1, the model where greater teacher emotional support predicted lower levels of adolescent depression across time fit the data best for both girls and boys. However, the teacher support by stressful events interaction significantly predicted depressive symptoms from grade 8 to 9 for students of both sexes and from grade 9 to 10 for boys. More specifically, for boys and girls, increasing teacher support at one time point was associated with decreased depressive symptoms one year later. This

³ Results of additional analyses with imputed data, with only mixed gender schools, multi-group analyses with prevention and control group schools, and to test if paths vary across time are presented in online supplement C.

association held up only in students with average and high numbers of stressful life events. For students reporting a low number of stressful life events, somewhat contrary findings emerged. For girls reporting low numbers of stressful events, average teacher emotional support was actually linked to more depressive symptoms than high or low teachers' emotional support. For boys reporting low numbers of stressful events, more teacher support was associated with more depressive symptoms one year later. In other words, while the results suggest that the interaction of teacher support and life events impacted depressive symptoms in boys and girls, the interaction effect did not represent the expected stress-buffer effect of teacher support. In addition, it should be pointed out that the effect sizes of the interaction effects are relatively modest. A possible explanation for the unexpected finding regarding students with low numbers of stressful life events is that teacher emotional support has iatrogenic effects for those students. It would not be the first time that well intended actions show negative consequences. For example, negative effects of group interventions are well documented in adolescents with conduct problems (e.g., Gifford-Smith, Dodge, Dishion, & McCord, 2005; Mager, Milich, Harris, M. J., & Howard, 2005). Cross-age peer mentoring programs (Karcher, Davidson, Rhodes, & Herrera, 2010) and programs to prevent adolescent depression (Pössel, Horn, Groen, & Hautzinger, 2004; Pössel, Martin, Garber, & Hautzinger, 2012) also have the potential to produce iatrogenic effects. Especially important for the present findings is that students reporting fewer problems at study begin demonstrated an increase in problems while students with more problems at study begin did not demonstrate such an increase (Karcher et al., 2010; Mager et al., 2005). In addition, research demonstrates that the level of friend-reported depressive symptoms among

members of adolescents' peer cliques is associated longitudinally with changes in adolescents' own self-reported depressive symptoms (Prinstein, 2007). These patterns can be explained by the so-called *deviancy training hypothesis*, which states that students are role models for each other, learning to attend to or describe depressive symptoms. Regarding our finding in the present study, this could mean that teacher emotional support provides the space for such learning as it allows students to express their problems in a public forum. This interpretation is consistent with a study that found short-term iatrogenic effects of an emotional supportive prevention program of depression in adolescents (Pössel et al., 2012). Nevertheless, the finding that emotional teacher support might have iatrogenic effects on depressive symptoms in students with low numbers of stressful life events needs to be interpreted cautiously until explored further.

Our finding that the same model describes the associations best for both girls and boys is not consistent with our hypothesis. However, it should be pointed out that previous findings on sex differences in the relationships between students and adults (parents, teachers) are mixed (Kerr et al., 2006; Murberg & Bru, 2004; Shochet et al., 2011; Ystgaard et al., 1999). This raises questions about potential causes of this inconsistent pattern. Inspecting the literature, it seems that girls benefit more in middle adolescence from adult support (Kerr et al., 2006; Murberg & Bru, 2004) while boys benefit more from adult support in late adolescence (Ystgaard et al., 1999). This observation seems consistent with the fact that girls develop one to two years earlier than boys (Patton & Viner, 2007), suggesting that this earlier development is connected with earlier independence from adult support. This difference in development could also

explain why the interaction of teacher emotional support and stressful events only predicts depressive symptoms in grade 9 in girls while it predicts depressive symptoms up to grade 10 in boys. However, empirical research does not support the expectation that girls become independent from adult support earlier than boys without reservation. For example, a study with 12 to 18 year olds showed a positive association between age and supportive peer relationships but not age and supportive parental relationships (Kerr et al., 2006). Thus, further research studying possible sex effects on the associations between teacher support by stressful events and depressive symptoms is needed.

Of further interest, girls reported more stressful events and depressive symptoms than boys across all grades of high school. This is not entirely unexpected, as several studies have demonstrated similar findings (e.g., Angold et al., 2002; Rudolph, 2002; Sawyer et al., 2009; Twenge & Nolen-Hoeksema, 2002). Further, the finding that girls in grades 9 to 12 reported more emotionally supportive relationships with teachers than boys expands on other work (e.g., Furrer & Skinner, 2003; Rueger et al., 2010; Shochet et al., 2011; Wentzel, Battle, Russel, & Looney, 2010) where girls have reported more supportive relationships with teachers than boys. Thus, results reported herein, together with results from other work, suggest that, although girls report more teacher emotional support than boys throughout high school, this does not seem to completely protect them from developing depressive symptoms. There appear to be other factors that contribute to girls' increased likelihood of depression in adolescence, such as the fact that girls have lower global self-worth and domain-specific self-perceptions during adolescence (Harter, 2006) and are more vulnerable to negative self-appraisals regarding body-image (Ruble, Martin, & Berenbaum, 2006).

Strengths of the present study include a large sample size and a 5-wave longitudinal design that allowed us to follow students during their entire high school career. These strengths allowed us to draw conclusions about the directionality of relationships between teacher support and adolescent depressive symptoms across high school. In addition, the use of a community sample allows our results to be less vulnerable to a selection bias. In other words, because individuals with depressive disorders are systematically different from the general population, findings in a community sample are more generalizable because they can be applied to a larger number of individuals (Cohen & Cohen, 1984).

Several limitations of this study should be noted. First, and as already mentioned, the sole usage of student-reports might cause an overestimation of the associations between teacher support, stressful events, and depressive symptoms. Second, more evidence on the validity of the instrument to measure teacher support is needed. However, some construct validity evidence by two different factor analyses, and practical metric invariance across sex (girls vs. boys), condition (prevention vs. control condition), and time (grade 8 vs. grade 12) exists. However, this evidence is especially limited because all reported analyses used the *beyondblue* sample, and validity evidence using other samples is clearly needed. Third, as depressive symptoms were assessed using a checklist rather than a diagnostic interview, it is unclear whether findings can be generalized to adolescents with clinical levels of depression. Nevertheless, most research suggests that adolescent depression can be seen best as dimensional (e.g., Hankin, Fraley, Lahey, & Waldman, 2005), making it likely that our results could be replicated in a sample with depressive disorders.

Another important limitation is the high, nonrandom drop-out rate of 46.63%. More students of Aboriginal and/or Torres Strait Islander background and more students who reported less supportive relationships with teachers at baseline, more negative life-events, and/or a higher frequency of depressive symptoms left their baseline school. However, it needs to be considered that students in Australia interested in a vocational career leave the general high school after grade 10 and transition to specialized vocational high schools. This explains the 20% drop in participation rate from grade 10 grade 11. In addition, in Australia, students of Aboriginal background transfer more often into vocational schools or drop out of schools entirely (Gray, Huber, & Schwab, 2000). Similarly, adolescents who report less teacher support (Davis & Dupper, 2004), experience more negative life-events (Dyregrov, 2004), or suffer from depressive symptoms (Fortin, Marcotte, Potvin, Royer, & Joly, 2006; Lewinsohn & Clarke, 1999) change schools and drop out of school more often than other students. Nevertheless, such patterns limit the generalizability of the findings to these groups. Thus, future research concerning teacher support and depressive symptoms with such students is essential.

The results are not only important from an academic point of view but also for clinical purposes. Combined with previous studies on the association between teacher support and depressive symptoms in students (Barber & Olsen, 2004; Murberg & Bru, 2004, 2009; Reddy, Rhodes, & Mulhall, 2003; Rueger et al., 2010; Shochet et al., 2011), our findings that the negative impact of average and high numbers of stressful events on students is reduced by teacher emotional support highlight the importance of teachers' emotional support for students in stressful situations. However, if replicated, the finding that teacher emotional support can have iatrogenic effects on students with low numbers

of stressful life events is important as well. It seems worth considering how teacher emotional support can be used in depression prevention programs for high school students without harming some students.

First, based on the present findings, a prevention program using emotional support by teachers should be implemented in the first year of high school to benefit both girls and boys. Second, it is important to include a way to identify students in stressful situations that will allow teachers to focus especially on these students. Third, it is necessary to identify ways to provide emotional teacher support to those identified students without harming students with low numbers of stressful life events. Thus, research studying the mechanisms by which emotional teacher support might have iatrogenic effects on students experiencing low numbers of stressful life events is needed. Fourth, the sex of the teachers and the match between student and teacher sex might be relevant for the effect of teacher support on depressive symptoms in students. However, the instrument used to measure the emotional support from teachers did not include an item querying teacher sex. It is up to future research to study the relevance of teacher's sex and match between student-teacher sex for the effects of teacher support on depressive symptoms in students.

In summary, while the effect sizes of the associations between the interactions of teacher support and life events with depressive symptoms were relatively modest, data from this study support the importance of the interplay between teacher emotional support and life events for male and female high school students' depressive symptomatology, but only in the early grades of high school. Further, while students with average and high numbers of stressful life events seem to benefit from emotional

teacher support, supportive relationships with teachers seem to bear a risk for negative effects on depressive symptoms in students experiencing a low number of stressful life events. Thus, future studies designed to identify the underlying mechanisms by which emotional teacher support impacts students depressive symptoms in a positive and a negative way using multiple student- and teacher-report instruments is needed. In these studies, possible sex differences in the associations between teacher support and students' depressive symptoms should be studied carefully. Further, the associations between other types of support (i.e., academic, appraisal, instrumental, and informational) and depression in students should be explored. Finally, recent advances in analyzing longitudinal models like latent change score models (e.g., Ferrer & McArdle, 2010) should be used in future studies.

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Table 1

Descriptive Statistics (Age, Life-Events, Supportive Relationships with Teachers, & Depressive Symptoms) by Grade and Sex as well as t-Tests Comparing Girls and Boys

	Girls (n = 1356)			Boys (n = 960)			t-tests	
	Mean	SD	α	Mean	SD	α	df	t-value
Aget1	13.15	3.16		13.21	2.73		4339.00	-0.57
Stresst1	1.70	1.62		1.60	1.63		4279.00	1.96+
Stresst2	1.70	1.62		1.52	1.71		3964.00	3.35**
Stresst3	1.68	1.63		1.56	1.81		3338.62	2.21*
Stresst4	1.49	1.49		1.35	1.64		2565.00	-2.31*
Stresst5	1.39	1.49		1.23	1.59		2324.00	2.51*
Supportt1	25.91	5.51	.89	24.90	5.72	.89	4325.00	5.93***
Supportt2	24.17	5.56	.89	23.42	5.80	.90	3910.94	4.18***
Supportt3	24.27	5.21	.89	23.87	5.78	.90	3372.57	2.18*
Supportt4	25.85	5.21	.90	25.23	5.28	.90	2585.00	3.012**
Supportt5	26.62	4.82	.89	25.88	5.25	.90	1985.20	3.45**
Depressiont1	14.94	11.64	.92	12.59	9.62	.88	4273.67	7.26***
Depressiont2	16.29	12.45	.93	12.23	9.95	.89	3950.64	11.45***
Depressiont3	16.51	12.70	.94	12.38	10.49	.91	3579.52	10.66***
Depressiont4	15.00	11.36	.93	12.22	10.10	.91	2538.91	6.58***
Depressiont5	14.29	11.40	.93	12.17	9.94	.91	2241.31	4.76***

Note. Cronbach's α cannot be calculated for age or LTEQ. Support = supportive relationships with teachers score; Stress = List of Threatening Experiences Questionnaire; Depression = Center for Epidemiological Studies Depression Scale; t1 = grade 8; t2 = grade 9; t3 = grade 10; t4 = grade 11; t5 = grade 12. + $p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

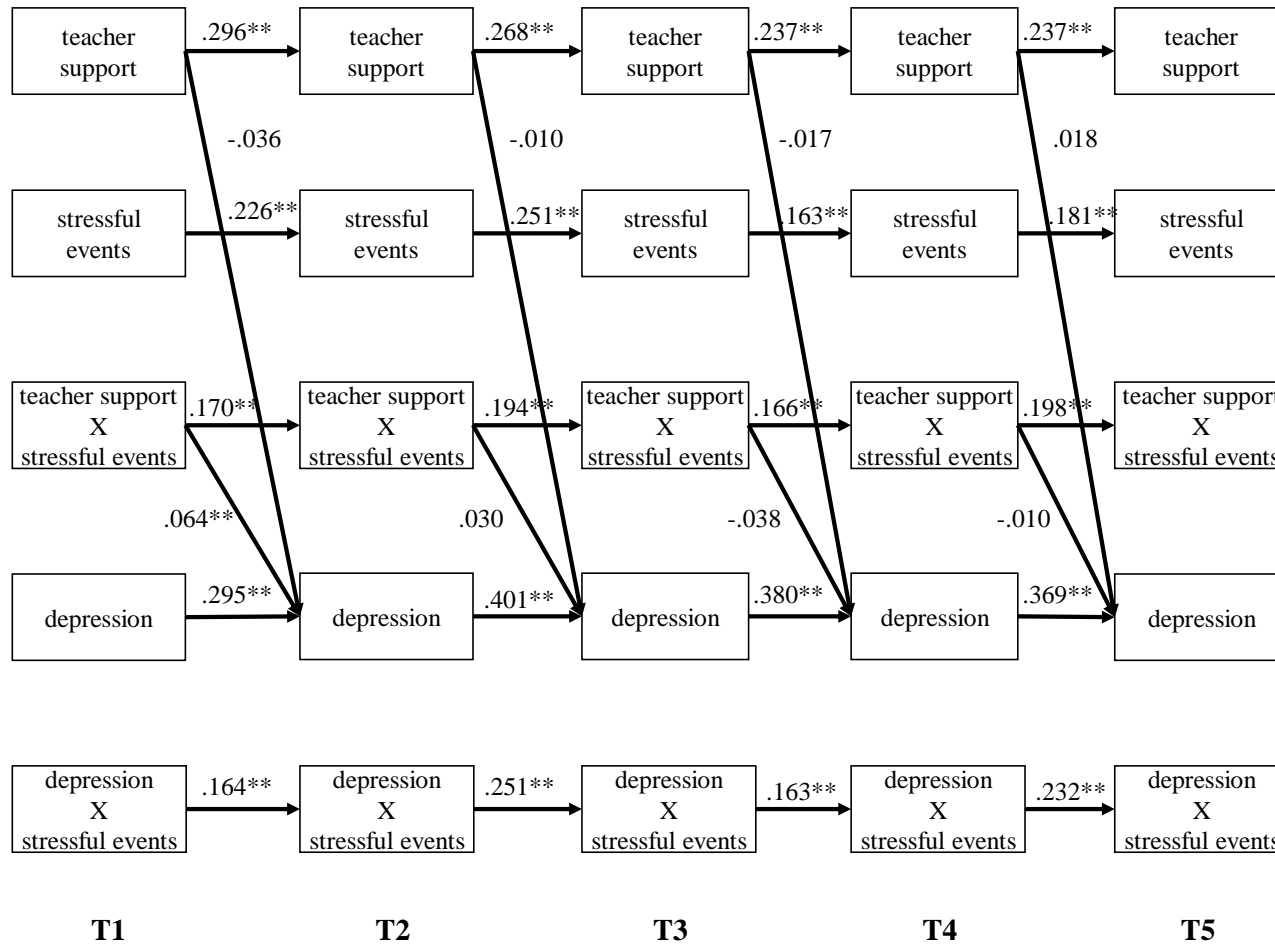


Figure 1. Stress-buffer model for girls. All constructs and error terms of the constructs, respectively, measured at one time point are correlated. These correlations, latent intercepts, and the auxiliary variable are not pictured for reasons of clarity. However, the correlations can be found in Table 4. * $p < .01$; ** $p < .001$.

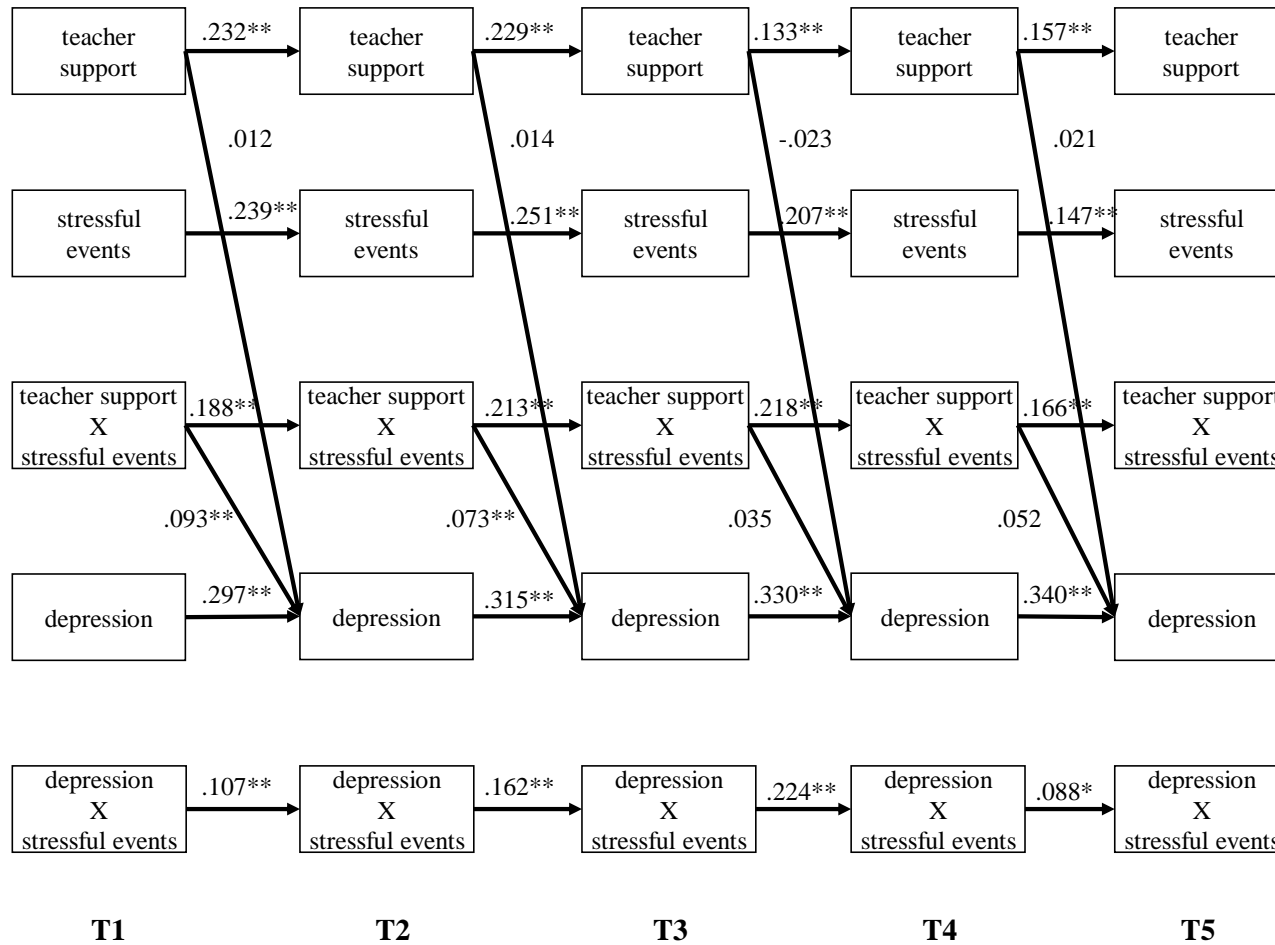


Figure 2. Stress-buffer model for boys. All constructs and error terms of the constructs, respectively, measured at one time point are correlated. These correlations, latent intercepts, and the auxiliary variable are not pictured for reasons of clarity. However, the correlations can be found in Table 4. * $p < .01$; ** $p < .001$.

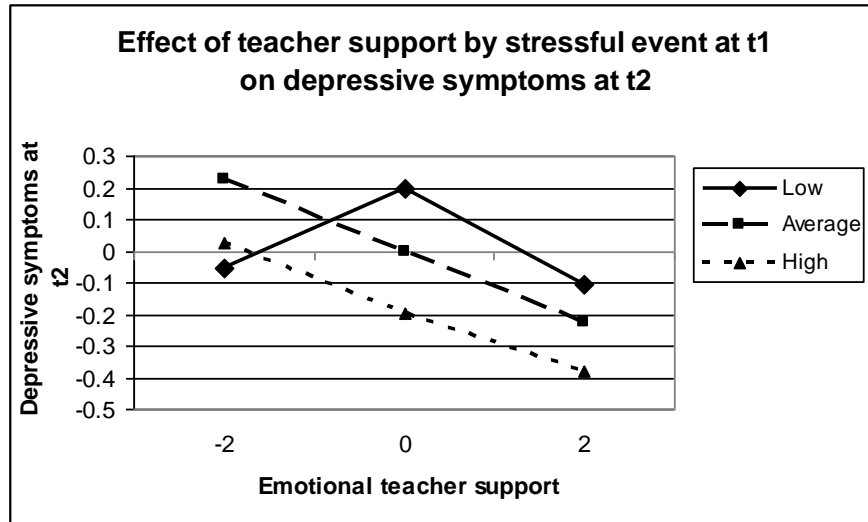


Figure 3. Model implied graph of the standardized interaction effect in girls. For the sake of comprehension and simplicity, the graphs were calculated with standard deviations of -2, 0, and 2 on both standardized teacher emotional support and standardized stressful events.

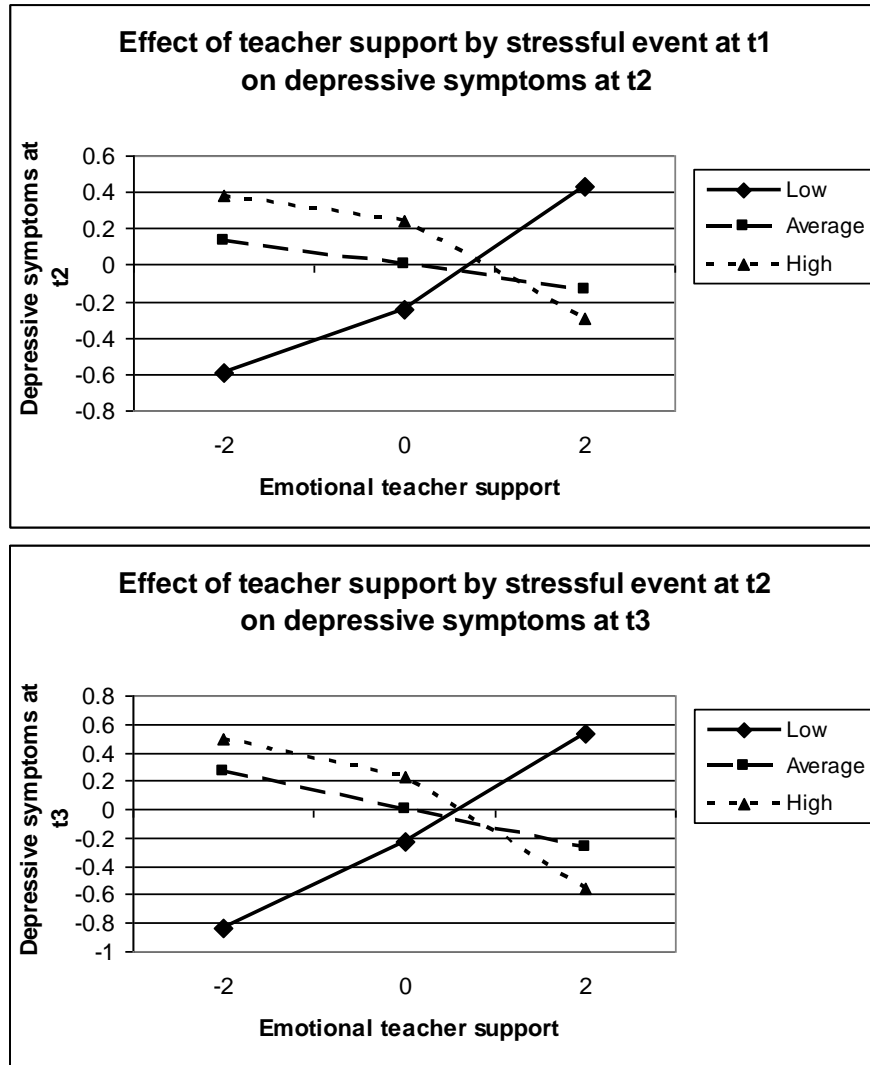


Figure 4. Model implied graphs of the standardized interaction effect in boys. For the sake of comprehension and simplicity, the graphs were calculated with standard deviations of -2, 0, and 2 on both standardized teacher emotional support and standardized stressful events.