Temporal associations between social anxiety and depressive symptoms and the role of interpersonal stress in adolescents

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Abstract

Background: Adolescence is characterized by an increased vulnerability for internalizing psychopathology such as depression and anxiety. A positive association between anxiety and depression has consistently been found in research. However, the specific direction of this association is less clear. In this study, we investigated the temporal associations between (social) anxiety and depressive symptoms. Furthermore, the role of dependent interpersonal stress as a potentially mediating factor in these temporal associations was examined.

Methods: Data were part of a larger longitudinal study on the emotional development of adolescents, which was initiated in February 2013. The total sample consisted of 2011 adolescents between the ages of 11 and 19. Data were analyzed using cross-lagged models.

Results: Bidirectional positive associations were found between social anxiety symptoms and depressive symptoms. However, dependent interpersonal stress was not a mediator in the link between social anxiety and depression. Our results indicate that dependent interpersonal stress seems to be particularly related to depressive symptoms and not to social anxiety symptoms.

Conclusions: Findings suggest that bidirectional associations between social anxiety and depressive symptoms exist. This implies that clinicians should be specifically vigilant for the development of depressive symptoms in socially anxious adolescents and the development of social anxiety symptoms in depressed adolescents. Our findings further highlight the importance of targeting dependent interpersonal stress in the context of depression.

Key words: Adolescence, Depressive symptoms, Social anxiety symptoms, Interpersonal Stress, Prospective Study

Adolescence is characterized by an increased vulnerability of internalizing psychopathology, such as depression and anxiety (McLaughlin & King, 2015). Depression has a prevalence of

2.8% under the age of 13. Prevalence increases to 5.6% between the age of 13 and 18 (Costello, Erkanli, & Angold, 2006). In addition, anxiety disorders often begin in adolescence (Clark, Smith, Neighbors, Skerlec, & Randall, 1994). Not only internalizing disorders cause a burden in life, subclinical symptoms too can be responsible for significant impairment in several life domains and for a decrease in academic and social functioning (Steinert, Hofmann, Lechsenring, & Kruse, 2013). Furthermore, subclinical symptoms form a risk for future onset of associated disorders (Pine, Cohen, Cohen, & Brook, 1999). An additional concern is that internalizing symptoms demonstrate continuity over time and often co-occur (Waszczuk , Zavos, Gregory, & Eley, 2016).

A cross-sectional positive association between anxiety and depression has consistently been found in research (Biggs, Nelson, & Sampilo, 2010; Brady & Kendall, 1992; Waszczuk et al., 2016). However, the prospective direction of this association is less clear (Cummings, Caporino, & Kendall, 2014). Research indicates that transitioning from an anxiety disorder to depression is more likely than vice versa in adolescents and adults (Fichter, Quadflieg, Fischer, & Kohlboack, 2010). Additionally, at symptom level, there is evidence that anxiety symptoms predict subsequent depressive symptoms in adolescence (Cole, Peeke, Martin, Truglio & Seroczynski, 1998; Kouros, Quasem, & Garber, 2013; Starr, Stroud, & Li, 2016). Evidence for depressive symptoms being a precursor of anxiety symptoms is less consistent than the opposite association (i.e., anxiety predicting subsequent depression) (Cole et al., 1998; Kouros et al., 2013; Pine, Cohen, Gurley, Brook, & Ma, 1998). Kouros and colleagues (2013) found a positive association between depressive symptoms and later anxiety symptoms across adolescence. In contrast, some studies failed to find evidence for a prospective association from depressive to anxiety symptoms in adolescents (Cole et al., 1998; Starr et al., 2016).

Potentially important information is missing in the link between depression and anxiety symptoms because these studies used a composite score of anxiety symptoms with questionnaires such as the Child Behavior Checklist (CBCL; Achenbach, 1991) or the Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1985). More specifically, the link between depression and anxiety symptoms may differ for different types of anxiety symptoms (Cummings et al., 2014). Research should thus further explore the link between symptoms of specific anxiety disorders and depressive symptoms to unravel this association at a more fine-grained level (Keenan, Feng, Hipwell, & Klosterman, 2009).

Social anxiety is particularly interesting to examine in relation to depression given that both have a strong interpersonal component (Eberhart & Hammen, 2006; Starr & Davila, 2008). Furthermore, social anxiety is one of the most common types of anxiety in adolescence, with 27% to 47% of adolescents reporting at least one social fear (APA, 2013; Clark et al., 1994; Essau, Conradt, & Petermann, 1999). Moreover, social anxiety symptoms often co-occur with depressive symptoms and this co-occurence is related to more severe future symptoms and worse treatment outcome (Ledley et al., 2005; Perugi et al., 2001). Therefore, it is important to specifically examine the temporal associations between social anxiety and depressive symptoms. Some studies have already investigated the reciprocal associations between social anxiety symptoms (in particular) and depressive symptoms (Hamilton et al., 2016; Van Zalk & Tillfors, 2017). Van Zalk and Tillfors (2017) observed an association between social anxiety symptoms and prospective depressive symptoms in adolescents aged between 13 and 15 years old but did not find evidence for an association in the reverse direction. In contrast, the opposite was observed in a study by Hamilton et al. (2016), in which depressive symptoms were shown to be a precursor of social anxiety symptoms but social anxiety symptoms were not predictive of subsequent depressive symptoms following stress in a sample of adolescents between the ages of 12 and 13 years. the current study aims to further investigate the reciprocal associations between social anxiety symptoms and depressive symptoms throughout the entire period of adolescence.

The role of stress

Stress has been shown to be important in the context of internalizing symptoms (Flynn & Rudolph, 2011; Grant et al., 2003). Kendler, Thornton, and Prescott (2011) distinguish between various types of stress. A first distinction is made between dependent and independent stress. Dependent stress is stress generated by a person's own behavior (e.g., arrest for theft), whereas independent stress is generated by events beyond the person's control (e.g., illness of a good friend) (Hankin, Stone, & Wright, 2010). Another common distinction is between interpersonal stress, which refers to stress within relationships (e.g., a conflict with friends) and non-interpersonal stress, referring to stress that is unrelated to relationships (e.g., failing an exam) (Rudolph, Hammen, Burge, Lindberg, Herzberg, & Daley, 2000). Especially, dependent interpersonal stress has been shown to be related to internalizing symptoms in general (Conway, Hammen, & Brennan, 2012) and depressive

symptoms in particular (Bastin, Mezulis, Ahles, Raes, & Bijttebier, 2015; Flynn & Rudolph, 2011). These findings may be understood in terms of the stress generation model, which stipulates that depressive symptoms generate stressful events, particularly in the interpersonal domain, which in turn increase depressive symptoms. However, Hammen (2006) suggested that this model may not be unique to depression. Social anxiety may increase interpersonal stress as well. For example, several models of social anxiety highlight risk factors that are known to be related to stress generation, such as social skill deficits and social apprehension (Hofmann, 2007). Yet, as rightly noted by Siegel et al. (2018), research on stress generation in the context of social anxiety is surprisingly scarce. Nonetheless, there is some evidence that chronic life stress in adolescents (Uliaszek et al., 2010) and dependent stress in undergraduates (Siegel et al., 2018) is cross-sectionally related to social anxiety. Finally, a study by Uliaszek and colleagues (2012) also provided longitudinal support for (episodic) stress generation for anxiety disorders in adolescents.

Even though there is evidence that stress is related to symptoms of both depressive and anxiety disorders and that a stress generation model applies to both of these disorders and their associated symptomatology, research examining the role of stress in the link between depressive and (social anxiety) symptoms is limited. Results of a study by Biggs, Nelson, and Sampilo (2010) pointed to a mediating role for stress, indicating that difficulties in peer relations mediated the association between anxiety and subsequent depressive symptoms (Biggs et al., 2010). To date, the only study that has examined interpersonal stress as an intervening factor in the temporal association between social anxiety and depressive symptoms did not find evidence for a mediational role of stress in such a temporal association (Hamilton et al., 2016). However, it is important to note that this study did not distinguish between dependent and independent interpersonal stress. Hence, given that the stress generation model is specifically related to dependent stress and that both social anxiety and depressive symptoms are characterized by a strong interpersonal component, we will specifically examine the role of dependent interpersonal stress as a mediator between social anxiety and depressive symptoms.

The present study

The main goal of this study is to further investigate temporal associations between social anxiety and depression in adolescence by examining (1) the bidirectionality of such associations and (2) the potentially mediating role of dependent interpersonal stress. First, we will evaluate temporal associations between social anxiety and depressive symptoms in a sample of adolescents. Given previous findings, we expect a reciprocal association between social anxiety and depressive symptoms (Cole et al., 1998; Kouros et al., 2013). Additionally, we expect that the association between social anxiety and prospective depressive symptoms will be stronger than vice versa. Second, we will investigate the mediating role of dependent interpersonal stress in the association between social anxiety and subsequent depressive symptoms (as well as in the reverse association, i.e. between depressive and subsequent social anxiety symptoms).

Materials and Method

Participants

Data were part of the [omitted for publication] project, a larger longitudinal study on the emotional development of adolescents, which was initiated in February 2013 (for details see [omitted for publication]). Data of the last three waves were used, which will further be referred to as T1-T3. The average time between assessment times is one year. Several schools were contacted, of which seven agreed to participate in the study. Parents were given information about the purpose of the study and gave consent. Pupils who gave additional assent collectively filled out the questionnaires on paper. Adolescents present at T1 (*N* = 2011) were followed -up each academic year for three subsequent years (1062 [53%] girls and 947 [47%] boys; gender unknown for two respondents) and adolescents were between 11 and 19 years old at T1 (*M* = 13.73; *SD* = 1.44). Our population sample is predominantly Caucasian (93%) and can be considered representative of the Flemish population. At the end of the study 678 participants dropped-out. Individuals who dropped-out did not differ significantly from individuals who did not drop-out by Gender ($\chi^2(1) = 0.23$, *p* =.63), Age (*t*(1259.4) = 1.75, *p* =.08), social anxiety symptoms at T1 (*t*(1221.6) =0.88, *p* = .38) and T2 (*t*(466.04) = 1.75, *p* = .08). However individuals who did drop-out differed by depressive symptoms at T1 (*t*(1143.4) = -7.32, *p* <.001) and T2 (*t*(466.04) = -5.12, *p* = .08) and dependent interpersonal stress at T1 (*t*(1137.5) = -5.99, *p* <.001) and T2 (*t*(449.03) = -3.69, *p*< .001).

Measures

The Social Anxiety Scale for Adolescents

The Social Anxiety Scale for Adolescents (SAS-A) is a self-report questionnaire that measures social anxiety symptoms in adolescents (La Greca, 1999). It consists of 22 items and has three subscales: Fear of Negative Evaluation (FNE), Social Avoidance and Distress in new social situations or with unfamiliar peers (SAD-New) and Social Avoidance and Distress that is more general (SAD-General). Participants answer the items on a likert-scale from 1 (*definitely not*) to 5 (*always*). In this study, a shorter version consisting of 12 items is used (Benner & Graham, 2009; Nelemans et al., 2017).

Children's Depression Inventory

The Children's Depression Inventory (CDI) is a self-report questionnaire that assesses depressive symptoms in children and adolescents between the ages of 7 and 18 (Kovacs, 2003; Timbremont, Braet, & Roelofs, 2008). The questionnaire has 27 items, of which each item consists of three sentences. Respondents choose the sentence which is most closely related to how they have felt over the last two weeks.

The Adolescent Life Events Questionnaire

The Adolescent Life Events Questionnaire (ALEQ; Hankin & Abramson, 2002) is a self-report questionnaire that assesses the occurrence of negative life events in adolescents. The ALEQ consists of two parts: major life events and daily hassles. All items were categorized into interpersonal versus noninterpersonal and dependent versus independent stressors. For our study we focused on dependent interpersonal events, which were assessed using 18 items (e.g. "You had an argument with a close friend") (Bastin, Mezulis, Ahles, Raes, & Bijttebier, 2015; Hankin et al. 2010; personal communication). For every item, participants had to indicate the frequency of such events in the last three months.

Analyses

First, descriptive analyses were performed. More specifically, we examined internal consistencies, means and standard deviations for each scale. We examined gender differences and associations with age. Correlations across stress and symptom variables within and between timepoints were examined as well. In order to study the temporal associations between social anxiety and depressive symptoms, cross-lagged models were used. In cross-lagged models, stability paths, cross-lagged paths and within-time correlations were included. Further, we tested whether dependent interpersonal stress was a mediator between social anxiety and prospective depressive symptoms and/or a mediator between depressive and prospective social anxiety symptoms. Age, gender and school were included as control variables. Model fit was assessed by investigating several fit indices: Chi-square goodness-of-fit test, which should be as small as possible, the standardized mean square residual (SRMR), which should have a value smaller than .08, the root mean squared error of approximation (RMSEA), which should be lower than .06 and the comparative fit index (CFI) and the Tucker-Lewis index (TLI), both of which should exceed .95 (Hu & Bentler, 1999). Missing data were handled with the full-information maximum likelihood method (FIML), which is considered an adequate method to handle missing data patterns (Jelicic, Phelps, & Lerner, 2009).

Results

Descriptive Statistics

Internal consistencies, means and standard deviations of social anxiety symptoms, depressive symptoms and dependent interpersonal stress at all three time points (T1, T2, T3) are shown in Table 1. Correlations between all variables at the three different time points are shown in Table 2. There were significantly positive correlations between social anxiety symptoms and depressive symptoms, both cross-sectionally and prospectively. Furthermore, within-time and between-time correlations between dependent interpersonal stress and depressive symptoms were significantly stronger than correlations between dependent interpersonal stress and social anxiety symptoms, using the Steiger's equations (1980) to test the equality of correlations. All *p-values* were less than .05.

Temporal associations between social anxiety and depressive symptoms

In the crossed-lagged model, stability paths of depressive and social anxiety symptoms were included as well as direct paths from symptoms at T1 to T3. Moreover, we included all cross-lagged paths. Within-time associations were included in the model as well as paths for gender, age, and school to all variables at T1 in order to control for their effects. The model in which all paths were freely estimated fitted the data well: χ^2 (32) = 106.39, p <.001, *SRMR* = .03, *RMSEA* = .03, *CFI* = 0.99, *TLI* = .97. Second, we tested a model in which all stability paths and all cross-lagged paths were assumed to be equal over time. Using the chi-squared difference test, we found that this constrained model was a significantly worse fit to, χ^2 (36) = 125.99, p < .001, *SRMR* = .03, *RMSEA* = .04, *CFI* = .98, *TLI* = .97, compared to the unconstrained model, $\Delta \chi^2(4)$ = 19.60, p < .001. Therefore, we further examined a model in which certain equality constraints can be imposed on certain paths. The best fitting model was the model in which the cross-lagged paths were constrained to be equal over time but in which the stability paths were freely estimated. This model was not a significantly worse fit compared to the one in which all parameters were freely estimated, χ^2 (34) = 107.51, p <.001, $\Delta \chi^2$ (2) = 1.12, p > .05. Moreover, other fit indices indicated that the latter model fitted the data well, *SRMR* = .03, *RMSEA* = .03, *CFI* = .99, *TLI* = .97. The standardized coefficients of this model are shown in Figure 1.

The paths from social anxiety symptoms to subsequent depressive symptoms were positive and significant. This means that increases in social anxiety symptoms were related to relative increases in prospective depressive symptoms. Furthermore, the association between depressive symptoms and subsequent social anxiety symptoms was also positive and significant meaning that increases in depressive symptoms also predicted increases in prospective social anxiety symptoms. The paths from social anxiety symptoms at T1 to depressive symptoms at T3 and vice versa were not significant, with p > .05.

Examination of dependent interpersonal stress as a mediator

In this model, we included, within-time associations, stability paths between different time points, and all cross-lagged paths. Moreover, the direct path from social anxiety symptoms at T1 to depressive symptoms at T3 as well as the path from depressive symptoms at T1 to social anxiety symptoms at T3 were included. First, all paths were freely estimated. The model fitted

the data well, χ^2 (56) = 186.83, $p < .001$, *SRMR* = .03, *RMSEA* = .03, *CFI* = .99, *TLI* = .97. Next, we tested a more parsimonious model. The most parsimonious model that still showed a good fit to the data was the one in which cross-lagged paths were assumed to be equal over time but stability paths were allowed to vary: χ^2 (60) = 189.92, $p < .001$, $\Delta\chi^2(4) = 3.09$, $p > .05$. Standardized coefficients are shown in Figure 2. First, we examined if there was an indirect path of dependent interpersonal stress in the association between social anxiety and depressive symptoms. The indirect effect between social anxiety and subsequent depressive symptoms was not significant, with $p > .05$. Thus, we did not find any evidence that dependent interpersonal stress plays a role in the association between social anxiety and depressive symptoms. However, the path from dependent interpersonal stress to subsequent depressive symptoms was significant. Second, we examined whether there was an indirect path of dependent interpersonal stress in the association between depressive and later social anxiety symptoms. This path was not significant, *p > .05 (1).*

Discussion

The aim of the current study was to further investigate the link between (social) anxiety and depressive symptoms by considering bidirectional associations between both. A second goal of our study was to examine the role of stress in these temporal associations. Based on previous research, we hypothesized that the association between anxiety and depressive symptoms would be bidirectional (Cole et al., 1998; Kouros et al., 2013; Pine et al., 1998). Nevertheless, we expected the association between social anxiety symptoms and future depressive symptoms to be stronger than the opposite association (Cole et al., 1998; Kouros et al., 2013). We here built on previous research by specifically focusing on *social* anxiety and studying dependent interpersonal stress as a possible mediator of the association between social anxiety and depressive symptoms.

First, and as hypothesized, social anxiety symptoms were found to be predictive of depressive symptoms one year later. It is possible that socially anxious adolescents avoid social interactions as they fear, for example, negative evaluations. This increasing withdrawal from others possibly results in rejection, which may then induce feelings of sadness (Gazelle & Ladd, 2003). There was also a significant, positive association between depressive symptoms and subsequent social anxiety symptoms. Both associations appeared equally strong.Social anxious and depressed individuals tend to avoid social interactions; this

avoidance behaviour prevents them from experiencing potentially pleasurable interactions which may explain the bidirectional relation (Eberhart & Hammen, 2006; Starr & Davila, 2008).

Second, and contrary to our expectations, we did not find that dependent interpersonal stress mediated the temporal associations between social anxiety and depressive symptoms. Specifically, the path between social anxiety symptoms and dependent interpersonal stress was not significant. There are several possible explanations for these findings. First, most studies examining the role of stress in social anxiety that did find a significant path between social anxiety symptoms and dependent interpersonal stress did not take into account depressive symptoms, which may act as a likely third variable, related to both stress and anxiety symptoms (Brady & Kendall, 1992). Second, this finding could be due to the measurement of dependent interpersonal stress. The measurement tool used in this study contains several items about stress in relation to friends as well as several items about stress related to parents. The association between dependent interpersonal stress and social anxiety may be different for different types of relationships (e.g., friends vs. parents). Third, the measure of dependent interpersonal stress used in this study was a sum score including several dependent interpersonal stressors. The drawback of this approach is that this index thus sums across different types of stressors (e.g., poor relationship qualities or peer victimization) which may very well each be differently related to social anxiety and/or depressive symptoms (Hammen, 2006). The paths between dependent interpersonal stress and depressive symptoms were significant in both directions. This is consistent with previous research in which an association between interpersonal stress and later depressive symptoms was found(Bastin et al., 2015; Carter & Garber, 2011;). Furthermore, our finding correlates with the stress exposure model, in which stress is a vulnerability factor of future depressive symptoms (Liu & Alloy, 2010). These findings are also consistent with previous research of the stress generation model in depression, which suggests that individuals with higher levels of depressive symptoms actively display behavior that generates stressful events (Flynn & Rudolph, 2011; Hammen, 1991). Our findings suggest that dependent interpersonal stress is uniquely related to depressive symptoms.

There are a number of limitations to this study. First, our results cannot be generalized to samples of adolescents with clinical levels of anxiety and depressive symptomatology. Therefore, it would be interesting to replicate these findings in a clinical sample. Second, this study used a sample with a broad age range. Even though we controlled for age in the

analyses, associations between variables may still differ in early versus late adolescence. Therefore, it could be interesting to examine if the same findings can be established in different age ranges. Third, we only focused on social anxiety. Future research could further explore temporal associations between anxiety symptoms of other anxiety disorders and depressive symptoms as well as the role of stress in such associations. Fourth, it may not just be dependent interpersonal stress that is the key variable in the relation between social anxiety and depressive symptoms. The way individuals respond to such social challenges could also be another important factor to take into account in future research (Flynn & Rudolph, 2011). Fifth, data were gathered using only self-report questionnaires, which could have inflated the results due to shared method variance. Therefore, it would be interesting to include interview-based assessment and multiple informants in future research.

Conclusion

Findings suggest that there are bidirectional associations between social anxiety and depressive symptoms. However, the association between social anxiety and future depressive symptoms was stronger than the association in the other direction. This suggests that clinicians should be specifically vigilant for the development of depressive symptoms in socially anxious adolescents. Dependent interpersonal stress does not seem to mediate the association between social anxiety and depressive symptoms. Results suggest that dependent interpersonal stress is uniquely related to depressive symptoms. This highlights the importance of targeting dependent interpersonal stress in the context of depressive symptoms.

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Tables

Table 1 Internal consistencies, means and standard deviations of all variables at all measurement points

	α	M	SD	t	df
Social anxiety T1	0.91	2.56	0.85	-8.02**	1995
Male		2.41	0.77		
Female		2.70	0.81		
Social anxiety T2	0.91	2.56	0.78	-5.60**	1562
Male		2.45	0.75		
Female		2.67	0.79		
Social anxiety T3	0.91	2.58	0.74	-4.32**	1324
Male		2.48	0.70		
Female		2.66	0.77		
Depressive symptoms T1	0.87	8.89	6.70	-7.35**	2004[a]
Male		7.74	5.83		
Female		9.91	7.23		
Depressive symptoms T2	0.87	8.46	6.39	-5.76**	1534[a]
Male		7.46	5.78		
Female		9.32	6.76		
Depressive symptoms T3	0.87	8.30	6.39	-5.65**	1330[a]
Male		7.24	5.71		
Female		9.20	6.78		
Dependent interpersonal stress T1		15.47	8.40	-2.85*	2006[a]
Male		14.92	8.05		
Female		15.97	8.66		
Dependent interpersonal stress T2		10.46	9.36	-1.02	2006
Male		10.25	9.40		
Female		10.68	9.33		
Dependent interpersonal stress T3		9.15	9.44	-1.88	2006
Male		8.75	9.12		
Female		9.54	9.71		

*Note t-test for differences between gender. A is t-test with unequal variance; *p<0.05, **p<0.001*

Table 2 Correlations between all variables at all measurements

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1 Social anxiety T1	-								
2 Social anxiety T2	.66*	-							
3 Social anxiety T3	.56*	.70*	-						
4 Depressive symptoms T1	.47*	.38*	.35*	-					
5 Depressive symptoms T2	.39*	.48*	.44*	.70*	-				
6 Depressive symptoms T3	.34*	.40*	.50*	.62*	.73*	-			
7 Dependent interpersonal stress T1	.34*	.25*	.22*	.66*	.47*	.41*	-		
8 Dependent interpersonal stress T2	.17*	.32*	.22*	.20*	.61*	.38*	.33*	-	
9 Dependent interpersonal stress T3	.15*	.21*	.37*	.11*	.25*	.64*	.20*	.46*	-
10 Age T1	.18*	.14	.12*	.16*	.15*	.15	.06*	.02	0.04

*Note *p < 0.05 **p<0.001*

List of Figures

Figure 1. Temporal associations between social anxiety and depressive symptoms

Legend:

*Standardized coefficients. * p<.05, ** <.001*

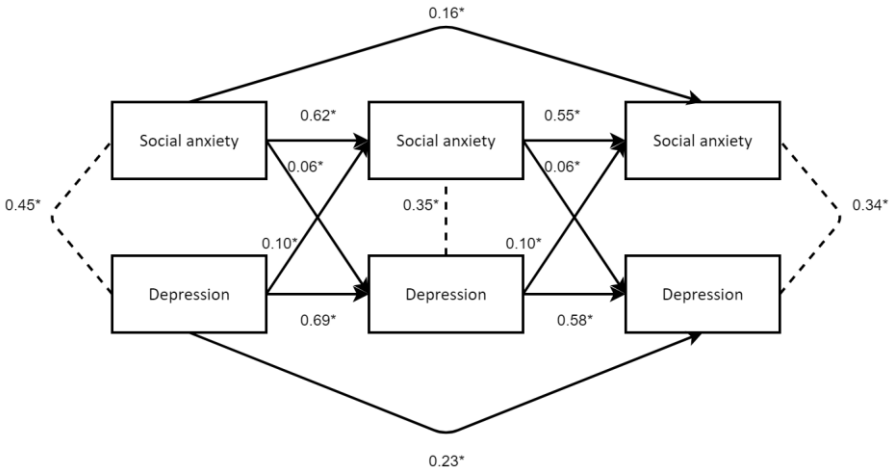


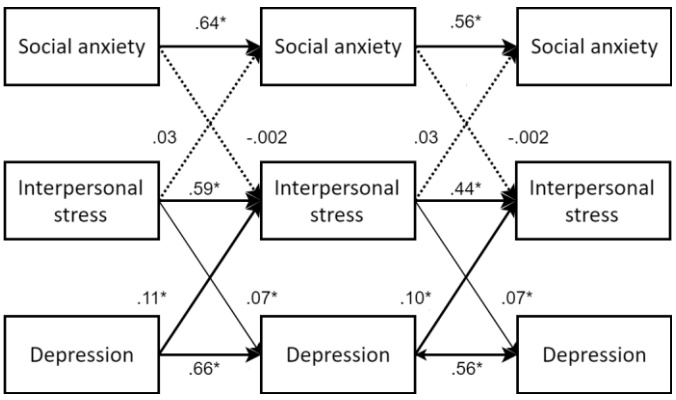
Figure 2. Dependent interpersonal stress as a mediator

Legend:

*Standardized coefficients. * p<.05, ** <.001*

Note:

Within-time correlations were included in the model, but are not presented for reasons of clarity.



Footnotes

1) Results generally remained the same when interpersonal stress scale items were removed from the CDI questionnaire. Further, we used a multilevel approach in order to examine the stability of our results when controlling for the nested structure within schools. For most paths the significance levels remained the same. However, for the path from dependent interpersonal stress to subsequent social anxiety was significant in this analysis, meaning that increases in dependent interpersonal stress were related to relative increases in prospective social anxiety symptoms. However, these multilevel results should be examined with caution because of the limited capacity of statistical software (Muthen & Muthen, 2019, personal communication).