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Research paper

Specificity in mediated pathways by anxiety symptoms linking adolescent stress profiles to depressive symptoms: Results of a moderated mediation approach

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ABSTRACT

Background: We investigated the specificity in mediated pathways that separately link specific stress dimensions through anxiety to depressive symptoms and the protective utility of resilience. Thus, this study goes beyond lumping together potential mediating and moderating processes that can explain the relations between stress and (symptoms of) psychopathology and the buffering effect of resilience.

Methods: Ghanaian adolescents between 13 and 17 years (female = 285; male = 244) completed the Adolescent Stress Questionnaire (ASQ), Spielberger State Anxiety Inventory (STAI), Short Mood Feeling Questionnaire (SMFQ) and the Resilience Scale for Adolescents (READ). Independent samples *t*-test, multivariate analysis of covariance with follow-up tests and moderated mediation analyses were performed.

Results: Evidences were found for specificity in the associations between dimensions of adolescent stressors and depressive symptoms independent of transient anxiety. Transient anxiety partly accounted for the indirect effects of eight stress dimensions on depressive symptoms. Except stress of school attendance and school/leisure conflict, resilience moderated the indirect effects of specific stress dimensions on depressive symptoms. Results suggested differences in how Ghanaian adolescents view the various stress dimensions, and mediated pathways associated with anxiety and depressive symptoms.

Limitations: Use of cross-sectional data does not show causal process and temporal changes over time.

Conclusions: Findings support and clarify the specificity in the interrelations and mediated pathways among dimensions of adolescent stress, transient anxiety, and depressive symptoms. Conditional process analyses shows that resilience does not only buffer direct, but also indirect psychological adversities. Interventions for good mental health may focus on low resilience subgroups in specific stress dimensions while minimizing transient anxiety.

1. Introduction

Recent studies are beginning to fill the gap in addressing the potential contingent effects of resilience protective resources to protect against direct and indirect –through other channels – negative effects of exposure to stress associated with anxiety and depression (Anyan et al., 2017). However, significant gaps remain. Studies that address specificity in the dimensions of adolescent stressors and/or mediated relationship with anxiety and depression and the potential contingencies of the effects on resilience as a moderator are lacking. Dimensions of adolescent stressors include thematically meaningful and recognized dimensions of adolescent stressors within existing body of theory and empirical corpus of adolescent stress research (Byrne et al., 2007). The need for specificity in the dimensions of adolescent stressors is pressing, similarly to examining specificity in resilient outcomes across different domains of adversities (Luthar et al., 2000). Addressing the lack of specificity in stress dimensions associated with anxiety and depressive symptoms is important as a first step towards identifying specific, differential and uneven associations that can also inform targeted interventions for dimension-specific stress.

2. Models of specificity

Three major specificity models are provided in the literature on stress research namely, (1) stressor specific, (2) outcome specific, and (3) stressor – outcome specific models (McMahon et al., 2003). The

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stressor specific model includes many stressors but one single outcome that allows for examining specificity in many different stressors independently associated with one particular outcome. The outcome specific model includes many different outcomes, but one single stressor that allows for determining specificity in outcomes. In the final model, the stressor – outcome, a researcher examine different stressors with many different outcomes, allowing for the determination of specificity in each of the stressors with each of the outcomes. There is a paucity of literature that clarifies specificity in interrelations among specific dimensions of stressors and depression, as well as whether the interrelations are mediated by other variables. In this way, researchers can facilitate a move beyond lumping together potential mediating and moderating processes that can explain the relations between stressors and psychopathology across development (Cicchetti and Cohen, 1995; Grant and McMahon, 2005).

3. Role of stressors, mediators and moderators in (symptoms of) psychopathology

It has been suggested that in the absence of stress, negative and dysfunctional cognitions remain latent and inactivated. However, in the presence of stress, endogenous vulnerabilities may be activated, resulting in psychopathology (Ingram and Luxton, 2005). Researchers have provided a general conceptual model in child and adolescent psychopathology that hypothesizes that stressors contribute to psychopathology, moderators influence the relationship between stressors and psychopathology, and mediators explain the relationship between stressors and psychopathology (Grant et al., 2003; Grant and McMahon, 2005). Therefore, moderators (e.g. demographic variables, social factors and fixed cognitive/relational styles) increase or decreases the probability that stressors will predict psychopathology. Mediators (e.g. biological, psychological and social processes) are activated by stressors and markedly increase or decrease in response to the stress. Mediators, like moderators can also be pre-existing characteristics of the child/adolescent or his/her environment.

4. Dimensions of adolescent stressors and (symptoms of) psychopathology

Rudolph and Hammen (1999) examined multiple domains of stressors in preadolescents (n = 46) and adolescents (n = 42) who ranged in age from eight to eighteen years. As predicted, the results showed that, in the adolescent samples, independent stress in the interpersonal domain was strongly associated with depressive symptoms than in the preadolescent samples. Independent stress was defined as life events that an individual has no control over, occurring outside of the individual's control. Dependent stress was defined as life events that an individual at least partially contributes to its occurrence.

Exposure to disruptions in relationships predict depressive characteristics and behaviours which also create new interpersonal stressors that contribute to recurring depression over time among adolescents (Hammen et al., 2003). Stress of home life including negative family relationships, parent-child conflict and parental over control are associated risk factors for depression in adolescents (Hammen et al., 2003). The authors suggested a bidirectional relationship between adolescent depression and problematic family relationships. Stress of peer relationships are found to be both antecedents and consequences of depression among adolescents. Difficulties in interpersonal behaviours within peer relationships such as excessive reassurance seeking and peer victimization are associated with depression (Borelli and Prinstein, 2006; Rudolph et al., 2011). Stress of romantic relationships are thought to be both antecedents and consequences of depression among adolescents (Hammen et al., 2003). Engagement in romantic relationships was positively associated with depressive symptoms over time among adolescents (Davila et al., 2009).

5. The mediating relation of anxiety symptoms and the protective utility of resilience

To our knowledge, the only existing study that examined the mediating relation of generalized anxiety symptoms (GAD) and the protective utility of resilience in the relationship between stressful negative life events and depressive symptoms was conducted with an adult sample. The study examined the mediating role of generalized anxiety symptoms across samples from Australia (n = 206) and Norway (n = 210) (Anyan et al., 2017). The authors found a significant mediating relation of generalized anxiety symptoms between exposure to stressful negative life events and depressive symptoms in both samples. The authors contended that exposure to stressful life events were associated with stressful life circumstances and additional negative life events, which was further associated with increases in anxiety-related cognitions that, may in turn, contribute to depressive symptoms. Interestingly, the authors also found that the pathway through which anxiety symptoms mediate exposure to stressful negative life events on depressive symptoms vary systematically across subgroups of resilience. High subgroup of resilience were less affected by both the direct effects of anxiety symptoms, and the indirect effects of exposure to stressful life events mediated by anxiety symptoms on depressive symptoms than the low subgroup of resilience. The authors concluded that resilience protective resources namely, positive personal dispositions, family cohesion and external social support outside the family protect against both direct and indirect (i.e. through other channels) psychological adversities.

6. The current study

Studies that examine specificity in multiple dimensions of stressors among adolescents have become increasingly important, as subtle variations in youngsters' experience of stress are unable to be accounted for by aggregate indexes of measure of stressful negative life events (Rudolph and Hammen, 1999). According to the general conceptual model of the role of stressors in psychopathology (Grant et al., 2003; Grant and McMahon, 2005), specific stressors have specific relations with psychological outcomes via specific mediators and/or moderators. While a few existing specificity in stress studies have been reviewed, we could not find any study conducted with African samples. Hence, the present study was conducted to expand the literature on specificity in stress studies across diverse populations. The present study extends past work regarding the relationship between profiles of adolescent specific stress dimensions, transient anxiety symptoms and depressive symptoms in ways that these associations can be buffered depending on levels of resilience protective resources. This is achieved by examining the mediating role of transient anxiety symptoms between specific stress dimensions and depressive symptoms, and the protective utility of resilience resources.

The use of a conditional process modelling – *moderated mediation* – in the present study overcomes the shortfalls in mediated or moderated models that result in oversimplification of complex processes involving indirect relations and mechanisms, which is why researchers lump together mediating and moderating relations and mechanisms by ignoring potential contingent effects. Moderated mediation combines mediation and moderation to determine when the strength of an indirect effect is estimated to depend on the level of some variable (Hayes, 2013, 2015; Preacher et al., 2007). In this way, we go beyond explaining mediated pathways through which the relationship between exposure to adolescent specific stress dimensions and depressive symptoms unfold, to specify subgroups of resilience – *high, average versus low resilience* – that is able to overcome psychological adversities that do not only directly, but also indirect affect them.

6.1. Hypotheses

Based on the general conceptual model for the role of stressors in symptoms of psychopathology, it was hypothesized that:

i. Exposure to specific stress dimensions would individually be significantly positively associated with anxiety and depressive symptoms.

In addition to the general conceptual model of the role of stressors, based on the study by Anyan et al. (2017), it was further hypothesized that:

ii. Transient anxiety symptoms would mediate the relations between exposure to specific stress dimensions and depressive symptoms.
iii. Resilience protective resources would moderate the relationship between transient anxiety symptoms and depressive symptoms.
iv. The effect of exposure to specific stress dimensions on depressive symptoms through (i.e. mediated by) transient anxiety symptoms would be a decreasing function of resilience protective resources.

7. Methods

7.1. Participants

Participants were selected from whole classes in six junior and senior high schools in the Greater Accra region of Ghana. The eligibility criterion was adolescents aged 13 – 17 years. A total of 628 adolescents recruited participated, with a response rate of 98%. The study was approved by Regional Committee for Medical Research Ethics (REK) in Norway and the Ghana Health Service Ethical Review Committee (GHS –ERC). Written parental or guardian informed consent was obtained.

7.2. Instruments

English versions of all questionnaires were used because all students in this study could speak, read and understand English.

7.2.1. Resilience Scale for Adolescents (READ)

The READ (Hjemdal et al., 2006a) is a 28-item self-report scale with all items positively phrased and comprises five subscales. The READ is scored on a 5-point Likert type scale with response categories ranging from 1 (*Totally disagree*) to 5 (*Totally agree*). Total score ranges from 28 to 140. Example items include “I know how to reach my goals”, “In my family we like to do things together”, “I am good at organizing my time”. The READ has established reliable construct validity and predictive validity in a prospective study (Hjemdal et al., 2006b). Higher scores indicate higher levels of resilience.

7.2.2. Adolescent Stress Questionnaire (ASQ)

The ASQ (Byrne et al., 2007) consists of 58 items which make up 10 subscales. The ASQ assesses adolescents on subjective stressor load. In this study, the 10 subscales constituted ten dimensions of stress namely, *stress of home life (SHL), stress of school performance (SSP), stress of school attendance (SSA), stress of romantic relationship (SRR), stress of peer pressure (SPP), stress of teacher interaction (STIN), stress of future uncertainty (SFU), stress of school/leisure conflict (SS/LC), stress of financial pressure (SFP)* and *stress of emerging adult responsibilities (SEAR)*. The ASQ is scored on a 5-point Likert type scale with response categories ranging from 1 (*Not at all stressful or is irrelevant to me*) to 5 (*Very stressful*). Total score ranges from 58 to 290. Example items include “Disagreements between you and your father” from SHL, “Not being taken seriously” from SPP, “Compulsory school attendance” from SSA. Higher scores indicate higher stressor load.

7.2.3. Spielberger state-trait anxiety inventory (STAI)

Symptoms of transient anxiety were assessed by using the state anxiety scale of STAI (Barnes et al., 2002; Spielberger, 1983). The state anxiety inventory consists of 20 items measuring respondents’ level of state (current) anxiety, rated on a 4-point Likert type scale with response categories ranging from 1 *(Not at all)* to 4 *(Very much so)*. Example items include “I feel at ease”, and “I feel nervous”. Total score ranges from 20 to 80 (includes reverse scored items). The STAI has been widely used in adolescent samples (Barnes et al., 2002; Byrne et al., 2007; Moksnes et al., 2010a). Higher sum scores indicate more symptoms of current anxiety.

7.2.4. Short Mood and Feeling Questionnaire (SMFQ)

The brief 13-item Short MFQ (Angold et al., 1995) was used for assessing depressive symptoms. All 13 items are negatively phrased and rated on a 3-point Likert type scale with response categories ranging from 0 (*Not true*) to 2 (*True*). Example items include “I felt miserable or unhappy”, “I did everything wrong”. Total score ranges from 0 to 26. High sum scores indicate high severity of levels of depressive symptomatology.

7.2.5. Socioeconomic status

Socioeconomic status was measured by adding together the current employment status of fathers and mothers, or guardians in the case of adolescents who are not living with their biological parents, and the highest education attained by fathers and mothers, or guardians. Detailed information is found in another study (Anyan and Hjemdal, 2017). A composite score was then computed for levels of socioeconomic status. The total score ranged from 2 to 16 with higher scores indicating better socioeconomic circumstances. The results were collapsed into ($\leq$ 6) low, (7 $-$ 12) average and ($\geq$ 13) high socioeconomic status.

7.3. Statistical analyses

Participants with more than 15% missing values in the questionnaire were deleted scale-by-scale from the analyses. The remaining missing data points were replaced by mean imputation. A similar approach has been used elsewhere, such as using the mean value of the total sample on corresponding variables (Olstad et al., 2015), and using the scale mode (Moksnes et al., 2010). Cronbach's alpha was computed to estimate the internal consistency of all measures used. Frequencies and mean scores were analyzed for all measures. Pearson correlations were performed to examine the bivariate associations between all continuous variables in the study. Point-Biserial correlations were conducted to examine the relationship between discrete dichotomous variables (sex and family structure) with the continuous variables. Spearman's rank correlation was computed to examine the relationship between ordered categorical variables (age and socioeconomic status) with the continuous variables.

As sex significantly correlated with stress of future uncertainty and depressive symptoms, two separate independent samples *t*-tests were computed with sex as the grouping variable and stress of future uncertainty and depressive symptoms as test variables. A two-way between groups multivariate analysis of covariance (MANCOVA) was computed with age and socioeconomic status as grouping variables. Five variables that significantly correlated with the grouping variables were used as dependent variables, namely *stress of romantic relationship, financial pressure, school attendance and future uncertainty* and *transient anxiety symptoms*. In the multivariate analysis of covariance, continuous variables that significantly correlated with the outcome variables were controlled for their effects.

The first and second hypotheses were tested in a mediation model. The mediating relation by anxiety symptoms, while controlling for age and sex in the relationship between specific stress dimensions and depressive symptoms, was tested using SEM modelling with maximum likelihood (ML) to estimate the indirect, direct and total effects in ten separate path analysis models for each of the ten specific stress dimensions as focal predictors (see Fig. 1).

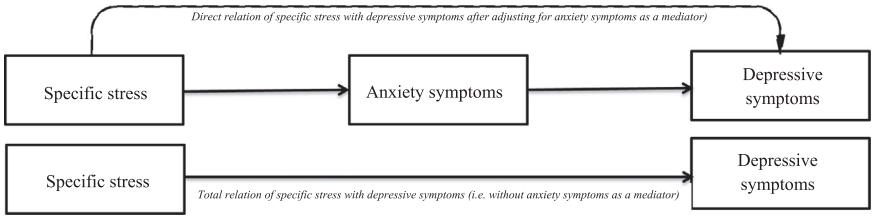

Fig. 1. The conceptual simple mediation model.

As each hypothesized model was recursive, assessing model fit was not considered because recursive path models are identified with no degrees of freedom (Acock, 2013). Therefore, a significant mediating effect was established when the 95% bias-corrected bootstrap confidence interval based on 1000 bootstrap samples did not contain zero. This procedure provides bootstrap confidence interval and standard errors for the mediated effects and has advantages over the traditional approaches in testing mediation (Hayes, 2012, 2015; Preacher et al., 2007), such as the causal steps approach or the test of joint significance approach popularized by Baron and Kenny (1986) and the product of coefficients approach by Sobel (1982, 1986). To determine the effect size, the completely standardized indirect effect size (Hayes, 2013) was used because other effect sizes such as the ratio of the indirect effect to the total or direct effect although popular are unstable and limited to situations where both the indirect and total effects are negative or positive values. The completely standardized effect, an advancement of the partially standardized effect rescales both the direct and indirect effects to the standard deviations of the predictor and outcome variables, therefore is not scale-bound (Hayes, 2013).

To test the third hypothesis, resilience was added to each of the ten mediation models separately as a moderator variable of the indirect relations (See Fig. 2).

In this stage, we combined the mediation and moderation analyses to estimate the conditional indirect relations of specific stress profiles through anxiety symptoms on depressive symptoms as a function of resilience protective resources, using moderated mediation approach (Preacher et al., 2007). Also using 95% bias-corrected bootstrap confidence interval based on 1000 bootstrap samples, moderation of the indirect effects at levels of resilience (i.e., conditional indirect effects) were examined. Evidence of moderated mediation was shown when a 95% bias-corrected bootstrap confidence interval did not contain zero for the conditional indirect effects. When moderated mediation was established, we derived and quantified the conditional indirect relations as a function of resilience subgroups to test the fourth hypothesis. We used a standard deviation above the mean, the mean, and a standard deviation below the mean on READ to represent high, average and low levels of resilience, respectively.

SEM is robust against multicollinearity. However, other researchers offer methods that can be used to detect multicollinearity in SEM. The methods include condition index and variance decomposition proportion, inspection of correlation matrix and variance inflation factors. Inspection of the correlation matrix showed that all correlations were below the cut-off ($r > 0.80$) recommended by Field (2013). The variance inflation factor ranged from 2.73 to 1.05, far below the maximum value of 10.00 recommended by Myers (1990). The tolerance statistics ranged from 0.95 to 0.37 with all values above the cut-off of 0.10 (Field, 2013). Belsley (1991) and Belsley et al. (1980) suggest a condition index greater than 30 as indicating strong dependency. In the present study, the condition index was 22.64. These test statistics indicate that multicollinearity was not a problem

8. Results

8.1. Preliminary results

Table 1 displays the means, standard deviations and Cronbach's alphas of the measures used and their inter-correlations. Age significantly positively correlated with *stress of romantic relationship, stress of financial pressure*, and transient anxiety symptoms. Sex significantly negatively correlated with *stress of future uncertainty* and depressive symptoms. Socioeconomic status significantly negatively correlated with *stress of future uncertainty, stress of school attendance*, and transient anxiety symptoms.

8.1.1. Independent samples t-test of sex effects for stress of future uncertainty and symptoms of depression

Potential sex differences on measures of stress of future uncertainty and symptoms of depression were explored with independent *t*-tests. Levene's tests for equal variances were not significant confirming that the assumption for equality of variance was not violated. Scores on *stress of future uncertainty* were higher for adolescent girls ($M = 9.15$, $SD = 3.65$) than for adolescent boys ($M = 8.18$, $SD = 3.50$), $t(527) = 3.081$, $p < 0.01$, $d = 0.269$ [0.097, 0.440]. Scores on symptoms of depression were higher for adolescent girls ($M = 10.49$, $SD = 5.71$) than for adolescent boys ($M = 9.10$, $SD = 5.74$), $t(527) = 2.784$, $p < 0.01$, $d = 0.243$ [0.071, 0.414].

8.1.2. Multivariate analyses of covariance by age and socioeconomic status

The test of equality of covariance matrices of the dependent variables across the socioeconomic status groups [(Box's M: $F(12, 374883) = 0.81$, $p = 0.644$)] with χ^2 (12) = 9.68, $p = 0.644$, and across age groups [(Box's M: $F(24,142626) = 1.13$, $p = 0.294$)] with χ^2 (24) = 27.23, $p = 0.294$ were non-significant, confirming that the assumptions of equality of covariance matrices were not violated. After controlling for specific stress dimensions that correlated with one or the entire dependent variables, the overall MANCOVA was significant (Wilks' lambda: $\lambda = 0.134$ (F [22, 506] = 11.21, $p < 0.000$)). The multivariate effects on the combined dependent variables was significant for age (Wilks' lambda: $\lambda = 0.918$ (F [4, 506] = 2.17, $p < 0.002$)), but not for socioeconomic status ($\lambda = 0.982$ (F [2, 506] = 0.92, $p = 0.516$)), and their interaction ($\lambda = 0.950$ (F [8, 506] = 0.65, $p = 0.958$)).

Follow-up ANCOVA tests were performed to examine the main effect of age on all five (separate) dependent variables. The results revealed significant effects of age on *stress of romantic relationship, F*(4,

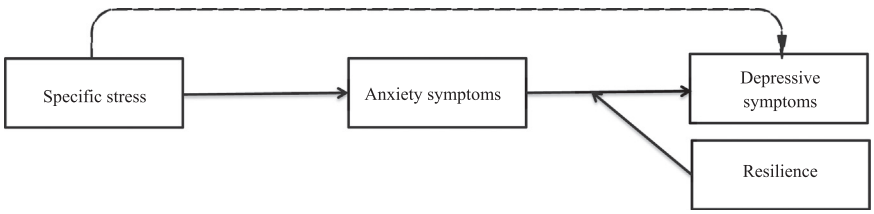

Fig. 2. The conceptual moderated mediation model.

Table 1
Demographic characteristics, Correlations, Means (M), Standard deviations (SD) and Cronbach's alpha estimates (α) for all measures.

			(*N* = 529)		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Age		n	%		0.133†	0.034	−0.328†	−0.025	−0.013	0.060	0.167†	−0.011	0.032	0.040	−0.076	0.097†	0.022	0.114†	0.036	−0.010
		13years	90	17																	
		14years	124	24																	
		15years	37	7																	
		16years	122	23																	
		17years	156	29																	
2	Sex						−0.047	0.025	−0.035	−0.084	−0.027	−0.011	−0.031	−0.001	−0.133†	−0.015	0.030	0.001	−0.003	−0.120†	−0.014
		Female	285	54																	
		Male	244	46																	
3	Family							−0.037	0.014	0.053	−0.043	0.018	−0.013	0.019	0.043	0.011	0.001	0.052	−0.007	−0.014	0.067
		Nuclear	450	85																	
		Extended	79	15																	
4	SES								0.051	−0.013	−0.096†	−0.010	0.059	−0.002	−0.111†	0.026	−0.027	−0.041	−0.087†	−0.067	0.071
		High	166	31																	
		Average	273	52																	
		Low	90	17																	
	Stress																				
5		SHL								0.558†	0.322†	0.445†	0.654†	0.655†	0.335†	0.535†	0.619†	0.472†	0.165†	0.191†	−0.316†
6		SSP									0.559†	0.359†	0.513†	0.461†	0.584†	0.571†	0.537†	0.506†	0.133†	0.166†	−0.313†
7		SSA										0.316†	0.384†	0.366†	0.430†	0.443†	0.395†	0.346†	0.069	0.101†	−0.172†
8		SRR											0.483†	0.534†	0.269†	0.372†	0.387†	0.381†	0.141†	0.144†	−0.146†
9		SPP												0.573†	0.370†	0.449†	0.548†	0.450†	0.202†	0.193†	−0.292†
10		STIN													0.246†	0.512†	0.513†	0.481†	0.121†	0.135†	−0.165†
11		SFU														0.365†	0.407†	0.349†	0.144†	0.149†	−0.251†
12		SS/LC															0.506†	0.419†	0.059	0.098†	−0.174†
13		SFP																0.515†	0.171†	0.203†	−0.248†
14		SEAR																	0.105†	0.091†	−0.152†
15	STAI																			0.554†	−0.325†
16	SMFQ																				−0.204†
17	READ																				—
M					12.25			9.84	26.96	21.09	7.83	11.52	18.22	17.47	8.70	13.77	11.23	7.61	42.37	9.85	3.99
SD					1.51			4.34	8.98	6.77	3.35	5.43	6.40	6.30	3.61	5.07	4.54	3.33	9.40	5.76	0.48
α									0.79	0.77	0.55	0.68	0.72	0.73	0.64	0.67	0.71	0.55	0.83	0.84	0.86

Note: † Correlation is significant at $p < 0.05$ or lower.
SHL: stress of home life; SSP: stress of school performance; SSA: stress of school attendance; SRR: stress of romantic relationship; SPP: stress of peer pressure; STIN: stress of teacher interaction; SFU: stress of future uncertainty; SS/LC: stress of school/leisure conflict; SFP: stress of financial pressure; SEAR: stress of emerging adult responsibilities; STAI: symptoms of state anxiety; SMFQ: symptoms of depression; READ: resilience scale for adolescents.

Table 2
Path Coefficients for Simple Mediation Relations by Transient Anxiety Symptoms in the Relationship between Specific Stress Dimensions and Depressive Symptoms (N = 529).

Specific stress	B (SE)					BC 95% CI for *axb*	ab_{cs}
	a	*b*	*c*	c^1	*axb*		
Home life	0.174*** (0.045)	0.329*** (0.022)	0.121*** (0.128)	0.063** (0.023)	0.057*** (0.016)	[0.026, 0.088]	0.0888
School performance	0.185** (0.059)	0.333*** (0.022)	0.133*** (0.038)	0.072* (0.031)	0.062** (0.022)	[0.167, 0.105]	0.0729
School attendance	0.179 (0.121)	0.338*** (0.022)	0.164* (0.078)	0.103 (0.066)	0.061 (0.043)	[−0.029, 0.139]	–
Romantic relationship	0.224** (0.075)	0.335*** (0.022)	0.147** (0.047)	0.072 (0.037)	0.075** (0.027)	[0.021, 0.128]	0.0707
Peer pressure	0.300*** (0.062)	0.330*** (0.022)	0.171*** (0.038)	0.072* (0.033)	0.099*** (0.023)	[0.058, 0.148]	0.1100
Teacher interaction	0.176** (0.064)	0.335*** (0.022)	0.122*** (0.038)	0.063* (0.033)	0.059** (0.021)	[0.017, 0.104]	0.0645
Future uncertainty	0.363** (0.113)	0.335*** (0.022)	0.212** (0.068)	0.090 (0.057)	0.122** (0.038)	[0.046, 0.194]	0.0765
School/Leisure conflict	0.124 (0.080)	0.337*** (0.022)	0.114* (0.048)	0.073(0.041)	0.042 (0.026)	[−0.010, 0.094]	–
Financial pressure	0.338*** (0.088)	0.328*** (0.022)	0.259*** (0.055)	0.148** (0.048)	0.111*** (0.031)	[0.056, 0.175]	0.0875
Emerging adult responsibilities	0.293* (0.121)	0.338*** (0.022)	0.156* (0.076)	0.057 (0.059)	0.099* (0.046)	[0.014, 0.194]	0.0573

Notes: B = Unstandardized path coefficients; SE = Standard Error; CI= confidence interval; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.
a = path coefficient from specific dimensions of stressors to anxiety symptoms.
b = path coefficient from anxiety symptoms to depressive symptoms after adjusting for specific dimensions of stressors.
c = path coefficient for specific dimension of stressors to depressive symptoms without anxiety symptoms as a mediator in the model.
c^1 = path coefficient for specific dimensions of stressors to depressive symptoms adjusting for anxiety symptoms as a mediator in the model.
axb = path coefficient for mediating relations by anxiety symptoms in the relationship between specific dimensions of stressors and depressive symptom.
ab_{cs} = mediation effect size (i.e. completely standardized indirect effect).

516) = 5.38, $p < 0.001$, partial $\eta^2 = 0.040$ [0.009, 0.072], and *stress of financial pressure,* $F(4, 516) = 3.53$, $p = 0.007$, partial $\eta^2 = 0.027$ [0.002, 0.053], but not on transient anxiety symptoms, *stress of school attendance and stress of future uncertainty*. Post hoc pairwise comparisons with Scheffé test were conducted to identify which between-groups difference(s) contributed to overall statistical significance. Significant group differences were found between participants aged 13 years and 17 years (difference: $D = 1.84$, C.I: 0.054, 3.631), and between participants aged 14 years and 17 years ($D = 2.10$, C.I: 0.459, 3.744) for *stress of romantic relationship*. Significant group differences were only found between participants aged 13 years and 17 years ($D = 1.47$, C.I: 0.158, 2.789) for *stress of financial pressure*.

8.2. Main results

Hypothesis i. *Exposure to specific stress dimensions would individually contribute to the explained variance in transient anxiety and depressive symptoms*

All ten specific stress dimensions significantly positively predicted depressive symptoms, but with varying strengths of associations as can be seen in Table 2. All, but two specific stress dimensions namely *stress of school attendance* and *stress of school/leisure conflict* significantly positively predicted anxiety symptoms also showing varying strengths of associations displayed in Table 2. Therefore, Hypothesis i was partially supported.

Hypothesis ii. *Transient anxiety symptoms would mediate the relations between exposure to specific stress dimensions and depressive symptoms.*

Table 2 also displays the estimates of 95% bias-corrected bootstrap CI and results summary for the relations between specific stress dimensions and depressive symptoms mediated by transient anxiety symptoms. From the simple mediation analyses, each specific stress dimension (except *stress of school attendance* and *stress of school/leisure conflict*) indirectly related to depressive symptoms through their effects on transient anxiety symptoms. Bias-corrected bootstrap confidence interval for the separate indirect effects were entirely above zero with varying effect sizes as shown in Table 2. The effect sizes show that transient anxiety symptoms mediated specific stress dimensions in the following (decreasing) order (*stress of peer pressure* $ab_{cs} = 0.11$, *home life* $ab_{cs} = 0.09$, *financial pressure* $ab_{cs} = 0.09$, *future uncertainty* $ab_{cs} = 0.08$, *school performance* $ab_{cs} = 0.07$, *romantic relationship* $ab_{cs} = 0.07$, *teacher interaction* $ab_{cs} = 0.06$ and *emerging adult responsibilities* $ab_{cs} = 0.06$) on depressive symptoms. Further, there was no evidence that the following specific stress dimensions namely *stress of school attendance, romantic relationship, future uncertainty, school/leisure conflict* and *emerging adult responsibilities* related to depressive symptoms independent of their effects through transient anxiety symptoms. These results partially support Hypothesis ii. Graphical presentation of the results are shown in the Supplementary material (page 1–10, Figure 1s–10s).

Hypothesis iii. *Resilience protective resources would moderate the relationship between transient anxiety symptoms and depressive symptoms.*

Hypothesis iii was not supported as the interaction between transient anxiety symptoms and resilience was not statistically significant for all the models. However, as a statistically significant interaction between the mediator – symptoms of transient anxiety and the moderator – resilience does not imply evidence of moderated mediation, but the index of moderated mediation (see Supplementary material page 11, Fig. 11s). Further analyses were conducted to derive and quantify the conditional indirect effects for all specific stress dimensions through transient anxiety on depressive symptoms across high, average and low subgroups of resilience. Table 3 displays the results for the conditional indirect effects of specific stress dimensions. Separate model coefficients for the moderated mediation analyses can be found in the Supplementary material (page 12–21, Table 1s–10s).

Hypothesis iv. *The effect of exposure to individual specific stress dimensions on depressive symptoms through (i.e. mediated by) transient anxiety symptoms would be a decreasing function of resilience protective resources.*

In support of Hypothesis iv, the results showed that the indirect effect of exposure to stress through transient anxiety symptoms on depressive symptoms was a decreasing function of resilience protective resources. High resilience subgroup were slightly less affected while lows resilience subgroup were slightly more affected. Except *stress of school attendance*, and *school/leisure conflict*, the results showed statistical significance in differentiating the resilience subgroups in the conditional effects of specific stress dimensions on depressive symptoms. With different mediation and moderated mediation results and varying conditional effects, the results lend support to specificity in adolescent stress dimensions and resilient outcomes across different dimensions of adversities.

9. Discussion

In the present study, we were able to demonstrate specificity in the associations between adolescent specific stress dimensions and

Table 3
Derivation and Quantification of, and Inference about the Conditional Indirect Relations as a Function of Resilience.

Stress dimension	a_1	a_1b_3	Resilience	$a_1\Theta_{(resilience \rightarrow depressive\ symptoms)} = a_1(b_1 + b_3{*}Resilience)$	SE	Bias-corrected bootstrap 95% CI
Home life	0.174	−0.0015	High	0.056	0.015	[0.029, 0.091]
	0.174	−0.0015	Average	0.057	0.016	[0.027, 0.092]
	0.174	−0.0015	Low	0.058	0.017	[0.027, 0.094]
School performance	0.185	−0.0020	High	0.060	0.021	[0.019, 0.105]
	0.185	−0.0020	Average	0.061	0.022	[0.019, 0.107]
	0.185	−0.0020	Low	0.062	0.023	[0.019, 0.108]
School attendance	0.179	−0.0019	High	0.059	0.042	[−0.023, 0.145]
	0.179	−0.0019	Average	0.060	0.043	[−0.026, 0.148]
	0.179	−0.0019	Low	0.061	0.044	[−0.025, 0.154]
Romantic relationship	0.224	−0.0034	High	0.072	0.027	[0.017, 0.128]
	0.224	−0.0034	Average	0.074	0.028	[0.018, 0.129]
	0.224	−0.0034	Low	0.076	0.029	[0.017, 0.134]
Peer pressure	0.300	−0.0045	High	0.097	0.022	[0.060, 0.145]
	0.300	−0.0045	Average	0.098	0.021	[0.059, 0.142]
	0.300	−0.0045	Low	0.100	0.022	[0.061, 0.147]
Teacher interaction	0.176	−0.0023	High	0.057	0.021	[0.014, 0.097]
	0.176	−0.0023	Average	0.058	0.021	[0.014, 0.100]
	0.176	−0.0023	Low	0.059	0.022	[0.015, 0.104]
Future uncertainty	0.363	−0.0054	High	0.118	0.038	[0.044, 0.198]
	0.363	−0.0054	Average	0.120	0.039	[0.046, 0.197]
	0.363	−0.0054	Low	0.123	0.041	[0.045, 0.211]
School/leisure conflict	0.124	−0.0014	High	0.041	0.026	[−0.008, 0.091]
	0.124	−0.0014	Average	0.041	0.026	[−0.007, 0.093]
	0.124	−0.0014	Low	0.042	0.027	[−0.007, 0.098]
Financial pressure	0.338	−0.0047	High	0.108	0.029	[0.054, 0.166]
	0.338	−0.0047	Average	0.110	0.030	[0.056, 0.171]
	0.338	−0.0047	Low	0.113	0.031	[0.055, 0.175]
Emerging adult responsibilities	0.293	−0.0026	High	0.096	0.045	[0.007, 0.186]
	0.293	−0.0026	Average	0.097	0.046	[0.006, 0.188]
	0.293	−0.0026	Low	0.099	0.047	[0.008, 0.196]

Note: SE = Standard Error; CI = Confidence interval; a_1 = effect of specific stress dimensions on transient anxiety symptoms; a_1b_3 = Index of moderated mediation; $a_1(b_1 + b_3{*}Resilience)$ = conditional indirect effects at levels of resilience.

perceived feelings of tension and apprehension measured by the state or transient anxiety inventory of STAI, and depressive symptoms indicating negative emotionality and mood problems measured by SMFQ. Specificity in mediated pathways that separately link different specific stress dimensions to depressive symptoms were also demonstrated and further clarified which indirect pathways showed significant or non-significant relations. This also extended to the specificity in the outcomes of resilience protective resources across conditional effect of different specific stress dimensions on depressive symptoms. Our analytic approach enabled us to explain and to go beyond specificity in interrelations among specific stress dimensions and symptoms of anxiety and depression, and the mediated pathways through which associations between specific stress dimensions and depressive symptoms unfolded. By piecing together mediated and moderated models into a single analytical model, moderated mediation analyses showed that resilience protective resources namely, positive personal dispositions, family cohesion and external social support outside the family do not only protect against or buffer direct psychological adversities, but also indirect psychological adversities associated with exposure to stress.

Independent samples *t*-test revealed that adolescent girls reported more stress than boys regarding future uncertainty that reflects concerns about personal pressure to succeed in the future. As adolescence is a challenging transitioning period, it may create heightened concerns about future events. Moreover, as girls are more sensitive to apprehensive expectations (Leikanger et al., 2012), it shows that uncertain of expectations in the future, girls more than boys concern themselves with the personal pressure to succeed. Similarly, girls reported more depressive symptoms indicating negative emotionality and mood problems, which is consistent with result by past studies (see Angold et al., 1999; Anyan and Hjemdal, 2016; Bouma et al., 2008; Hankin and Abramson, 2001). Results regarding observed sex differences in the literature are mixed. Angold et al. (1999) attributed girls' report of higher symptoms of low mood and negative affect to accompanying hormonal changes. Hankin and Abramson (2001) attributed it to how girls encode interpersonal negative experiences in associative cognitive networks that are connected to affective nodes. More recently from a sociocultural perspective, Anyan and Hjemdal (2017) attributed the observed gender differences in scores of depressive symptoms in Ghana to gender role socializations in which a failure to fulfil socially prescribed gender norms in home life was associated with loss, hopelessness negative emotionality and low mood that measured depressive symptoms.

Our findings also showed that adolescence is also a period that is associated with experiences of romantic relationship in which higher age categories showed more stress of establishing and maintaining romantic relationship. Investment and commitment in romantic relationships introduces variety of stressors namely breakups, rejection, passion and sexual behaviours that require adequate psychological resources to cope with, but which are lacking in adolescent years (Davila, 2008; Hammen et al., 2003), only becoming available as one matures in age. In addition, we found that stress from the recognition that financial resources do not match material needs and a real concern for financial survival was higher among older adolescents. As with emerging demands while growing, consumerism increases with age hence the need for adequate financial resources as one ages. This may explain why older adolescents report more concern for financial survival than younger adolescents.

9.1. Direct relations of specific stress dimensions and indirect relations through transient anxiety symptoms and depressive symptoms

As indicated in previous studies (Grant et al., 2003; Grant and McMahon, 2005), which showed that specific stress have specific relations with psychological outcomes via specific mediators. We found evidence that five specific stress dimensions, namely *stress of home life, school performance, peer pressure, teacher interaction,* and *financial*

pressure independent of transient anxiety symptoms were individually significantly positively associated with symptoms of negative emotionality and mood problems that measured depressive symptoms. However, the other five, namely *stress of school attendance, romantic relationship, future uncertainty, school/leisure conflict* and *emerging adult responsibilities* were not. Among the five specific stress dimensions that were directly not related to depressive symptoms, three of them, namely *stress of romantic relationship, future uncertainty* and *emerging adult responsibilities* were individually associated with higher levels of transient anxiety symptoms, which in turn was positively associated with depressive symptoms. This was the same for *stress of home life, school performance, peer pressure, teacher interaction, and financial pressure*. Consequently, it can be argued that the negative effects of the associations between these eight specific stress dimensions and depressive symptoms is in part accounted for by scores on transient anxiety. As for *stress of school attendance* and *school/leisure conflict*, they neither directly related to depressive symptoms nor through transient anxiety symptoms.

This shows that while the present findings implicate some individual stress dimensions as directly contributing to the explained variance in negative emotionality and mood problems. It is also clear that an underlying psychological state – being transiently anxious – may foster the associations of specific stress dimensions with depressive symptoms even if a specific stress dimension is not directly associated with depressive symptoms. Alternatively, psychological states such as transitory anxious related cognitions may be activated by specific stress dimensions, which in turn fosters an association with depressive symptoms. This means that for those specific stress dimensions whose relationship with depressive symptoms are only fostered by transitory anxious related cognitions, when they are absent transient anxiety will be inactivated and therefore remain latent consistent with the proposition by Ingram and Luxton (2005). Nonetheless, some specific stress dimensions will go on to be directly associated with depressive symptoms, and not only when some psychological state is activated. These findings lend support to the specificity model (Grant et al., 2003) and the hypothesis that specific stress dimensions have specific relations with psychological outcomes via specific mediators.

Specifically, the mediating effect size was highest for *stress of peer pressure* on symptoms of negative emotionality and mood problems that measures depressive symptoms. During adolescence, interpersonal relationships and connectedness evolve dramatically including affiliative needs, social evaluative concerns and reassurance seeking among peers. Therefore, we can argue that for Ghanaian adolescents in a society that is highly collectivistic, disruptions in peer relationships may create heightened focus on interpersonal problems such as aversive interpersonal relationships, rejection, social withdrawal and personal disappointment associated with stress of peer pressure. Consistent with Grant et al. (2003), Grant and McMahon (2005) and Ingram and Luxton (2005) stress of peer pressure may activate transitory anxious related cognitions, which in turn may account for the associations with depressive symptoms. It can also be argued that the uneven mediation effect sizes across the different specific stress dimensions, but the same mediator variable indicate that Ghanaian adolescents unequally view the transitional challenges of adolescence stress in general, for example from dependence to autonomy, financial survival, home life and peer relationships.

9.2. Protective utility of resilience against indirect effect of specific stress dimensions through transient anxiety symptoms on depressive symptoms

Consistent with findings from a previous study (Anyan et al., 2017), the findings in the present study showed that resilience protective resources buffered the indirect relations of specific stress dimensions whose effects were mediated by transient anxiety symptoms on depressive symptoms. However, inconsistent with the study by Anyan and Hjemdal (2017), the present study found no evidence that resilience protective resources buffered the direct effect of transient anxiety symptoms on depressive symptoms. The study by Anyan and Hjemdal (2017) was conducted with adult samples from Australia and Norway and used a generalized anxiety disorder measure different from the transient anxiety measure that was used in the present study with an adolescent sample from Ghana. The study by Anyan and Hjemdal (2017) also used a global and an aggregate index measure of stress and did not examine specificity in stress dimensions.

In the present study, it was found that the derivation and quantification of the conditional indirect effects of specific stress dimensions on depressive symptoms through transient anxiety symptoms showed that high resilience subgroup was associated with less effect of stress through transient anxiety symptoms on depressive symptoms than the low resilience subgroup. This was true for all specific stress dimensions except *stress of school attendance* and *school/leisure conflict* whose effect were also not mediated by transient anxiety symptoms at all. By extending the literature on resilience, the present study shows that, resilience protective resources do not only buffer direct psychological adversities, but also indirect psychological adversities through other channels in adolescents. Similarly to the conclusion by Anyan and Hjemdal (2017), the present study concludes that more access to resilience or people who have available high resilience resources can protect against direct negative life circumstances as well as those that may confront them indirectly through other channels of adversities. Therefore, targeted interventions may focus on the low resilience subgroups in specific stress dimensions while minimizing transient anxiety.

10. Limitations

Cronbach's alpha for SSA and SEAR of the ASQ were both 0.55 and somewhat lower than the cut-off of 0.60 (Loewenthal, 2001), but still appeared useful for research purposes to detect expected effects at conventional significance levels with large samples (John and Soto, 2007). The use of cross-sectional survey fails to show causal process and temporal changes over time. While we have provided strong evidence of pathways by use of the bootstrap (bias-corrected) method in a conditional process modelling to explain the associations among exposure to stress, transient anxiety and depressive symptoms as well as the association with protective factors. We acknowledge that the use of a cross-sectional survey is limited in answering questions about protective processes that lead to successful adaption over time from a lifespan developmental perspective. In addition, social desirability might be a problem for a study that relied on self-reported, retrospective behaviours and thoughts. However, participants were assured of anonymity, therefore, this could increase the possibility to answer questionnaires truthfully and honestly.

Finally, as shown in Table 1, there were significant correlations between stress dimensions. This was expected as the ASQ assesses broad domains of adolescent stress from their experiences with a wide span of subjective stressors. Nonetheless, the ASQ is described as comprising 10 recognized dimensions of adolescent stressors from theoretical perspectives and in relation to existing empirical literature on adolescent stress. That are qualitatively consistent with contemporary literature and transformations into scales provide quantitative indices, rather than aggregated scores that conceal subtle variations in stressor experience.

11. Conclusions

The present study, although a partial specificity in stress research, extends past work regarding the relationship between dimensions of adolescent specific stress, transient anxiety and depressive symptoms in ways that these associations can be buffered depending on levels of resilience protective resources. Evidence was found to support the stressor specific model and the hypothesis in the general conceptual model that specific stressors have specific relations with psychological

outcomes via specific mediators and/or moderators and the specificity in resilient outcomes across different dimensions of psychological adversities. These specificity findings expand the field in a way that conceptualizes the role of specific stress dimensions in symptoms of psychopathology that does not lump together the potential mediating and moderating processes.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.jad.2017.12.011.

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