

COGNITION, EMOTION AND STRESS MEDIATION

**Negative Automatic Thoughts - not Dysfunctional Attitudes, Emotion Regulation Difficulties or  
Negative Cognitive Distortions - Explain the Association between Change in Life Stress and  
Emotional and Behavioural Problems in Adolescence**

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**Abstract**

**Background:** To test whether maladaptive cognitions or difficulties in emotion regulation mediate the association between change in number of adverse life events (i.e., change in life stress) and emotional and behavioural problems in adolescence. **Method:** Our sample was 557 10-19 year olds from a state secondary school in London. We fitted a multiple mediator model to contrast five mediators: three maladaptive cognitions (negative cognitive errors, negative automatic thoughts, and dysfunctional attitudes) and the two emotion regulatory processes of cognitive reappraisal and expressive suppression. We adjusted for sex, age, ethnicity, special educational needs, and family poverty. **Results:** Taken as a set, our mediators explained the effect of change in life stress on adolescent emotional and behavioural problems. However, cognitive reappraisal, expressive suppression, dysfunctional attitudes and negative cognitive errors did not contribute to the indirect effect above and beyond negative automatic thoughts. **Conclusions:** Only negative automatic thoughts mediated the association between change in life stress and emotional and behavioural problems.

**Keywords:** adolescence, adverse life events, emotion regulation, emotional and behavioural problems, maladaptive cognitions

### **Introduction**

The link between stressful or adverse life events and emotional and behavioural problems in childhood and adolescence is well-established (Carter et al., 2006; Carter, Garber, Ciesla & Cole, 2006; Chapman, Whitfield, & Felitti, 2004; McMahon et al., 2003; McMahon, Grant, Compas, Thurm & Ey, 2003; Tiet et al., 1998). There are several explanations why life stress leads to emotional and behavioural problems. For example, stressful experiences result in greater reactivity to emotional information, and, therefore, general difficulties in emotion regulation (Lupien et al., 2009; Lupien, McEwen, Gunnar & Heim, 2009). Emotion regulation refers to the regulatory strategies, such as cognitive reappraisal and expressive suppression, individuals deploy to modify the magnitude and/or type of their emotional experience or the stressful event. In general, reappraisal is negatively and suppression is positively associated with emotional and behavioural problems (Aldao, Nolen-Hoeksema, & Schweizer, 2010).

Diathesis-stress theories of psychopathology (Abramson, Metalsky, & Alloy, 1989; Beck, 1967), on the other hand, argue that stressful experiences activate diatheses, which, in turn, predict psychopathology. For example, according to cognitive theory of depression (Beck, 1967), three cognitive constructs, once activated, play an important role in the etiology and phenomenology of depression: dysfunctional attitudes (belief systems that are unrealistic and perfectionistic in nature), negative cognitive errors (involved in the process of interpreting information in an overly negative or pessimistic manner) and negative automatic thoughts (the more immediate negative evaluations individuals make about themselves, their situation, and their future). Tests of diathesis-stress theories of depression are carried out by fitting moderation models. According to these theories, a diathesis alone cannot trigger a depressive response. Rather, it is the combination of stress with a diathesis [i.e., the (stable) tendency to think in a negative or maladaptive way] that leads to such a response.

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Thus, variables measuring the tendency to endorse a negative attributional style, make negative cognitive errors or have hopelessness thoughts are treated as moderator variables. However, the applicability of such moderation models in childhood depression has been questioned. Cognitions in children do not seem to constitute a stable feature as they do in adults, and may develop as a result of adverse life events (Gibb & Alloy, 2006). That is why, in general, cognitions in stress/depression models have been treated as moderators in adults and mediators in children (Jacobs, Reinecke, Gollan, & Kane, 2008).

Beck et al. (1990) extended Beck's (1967) cognitive theory beyond depression, and recent studies have shown that both emotional and behavioural problems in young people are associated with cognitive constructs such as dysfunctional attitudes and negative cognitive errors (Leung & Poon, 2001). Despite the evidence for the role of cognitive constructs (and emotion regulation styles) in explaining the association of life stress with emotional and behavioural problems in adolescents, no study has, to our knowledge, tested their specific indirect effects. We carried out this cross-sectional study on an adolescent community sample to address this issue. We assessed and contrasted five potential mediators (negative automatic thoughts, dysfunctional attitudes, negative cognitive errors, cognitive reappraisal, and expressive emotion) of the relationship between life stress and adolescent emotional/behavioural problems. Although we did not have repeated measures of emotional and behavioural problems or of cognitive and emotion regulation styles, we had data on recalled recent (last 12 months) and earlier (before last 12 months) adverse life events. We were, therefore, able to model the effect of life stress *change* (i.e., number of adverse life events experienced in the last year controlling for number of adverse life events experienced before the last year), which increased our confidence in drawing conclusions.

## Methods

### Participants

Our study, carried out in 2010, used self-report questionnaire data from students attending a high-performing state secondary school in London. Most students came from the relatively affluent local community, and more than half had an Indian heritage, with Pakistani, White British, and African Caribbean students making up significant ethnic groups. Data were obtained from 557 young people (of whom 51% boys), aged 10-19 ( $M = 13.50$ ,  $SD = 1.51$ ) years. Of those with valid data, 4% were on the school's Special Educational Needs register and 14% were eligible for free school meals. The sample contained some ethnic diversity, and the largest ethnic group was Indian. In particular, 43% reported they were Indian, 7% Pakistani, 7% white British, 7% African Caribbean, 6% white Other, 3% black Other, 3% black African, 2% Chinese, 12% answered that they did not fit any of the above categories, 7% reported they were of mixed parentage, and 3% reported they did not want to answer.

Ethical approval was given by our Department's Ethics Committee. All students were informed about the study, ensured that their participation was voluntary and their responses anonymous, and offered the opportunity to withdraw from the study at any time. Parental consent was obtained for all participants. Questionnaires were completed during planned school lessons with the research team present.

### Measures

Both number of adverse life events experienced in the last year (*proximal life stress*) and number of adverse life events experienced before the last year (*total previous life stress*) were measured with the 25-item Adverse Life Events Scale (ALES; Tiet et al., 1998). The ALES is a

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modified version of the Life Events Checklist (Coddington, 1972), a widely used and psychometrically sound (Gray, Litz, Hsu, & Lombardo, 2004) measure of potentially stressful life events. In this study, adolescents were asked to report which events happened to them in two time periods, during the last year (proximal life stress) and before the last year (total previous life stress). These events mostly concerned parents, family or friends (e.g., “family had drug/alcohol problem”, “close friends was seriously sick or injured”), or individual exposure to possibly risky situations (e.g., “saw a crime or an accident”). Over most of these, youths had little or no control (e.g., “someone in the family died”, “someone in the family was arrested”, “mother/father figure lost job”).

*Dysfunctional attitudes* were assessed with the 20-item version of the Children’s Dysfunctional Attitudes Scale (Abela & Sullivan, 2003;  $\alpha = .85$ ), which includes items such as “I should be good at everything I try”. *Negative cognitive errors* were measured with Leitenberg, Yost, and Carroll-Wilson’s (1986) Children’s Negative Cognitive Error Questionnaire ( $\alpha = .91$ ). This 24-item questionnaire measures four cognitive errors in assessments about events/situations: *catastrophising*, *overgeneralising*, *personalising*, and *selective abstraction*. *Negative automatic thoughts* were measured with the 40-item Children’s Automatic Thoughts Scale (Schniering & Rapee, 2002;  $\alpha = .92$ ). Items load onto four cognitive factors: physical threat (e.g., “I’m going to get hurt”), social threat (e.g., “People are thinking bad things about me”), personal failure (e.g., “I am a failure”), and hostility (e.g., “Most people are against me”). *Cognitive reappraisal* and *expressive suppression* were measured with the 10-item Emotion Regulation Questionnaire (Gross & John, 2003). Items include “I control my emotions by changing the way I think about the situation I’m in” (cognitive reappraisal;  $\alpha = .73$ ) and “I control my emotions by not expressing them” (expressive suppression;  $\alpha = .56$ ).

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*Emotional and behavioural problems* were assessed with the Strengths and Difficulties Questionnaire (Goodman, 1997), a 25-item scale measuring four difficulties (hyperactivity, emotional, conduct, and peer problems) and prosocial behaviour. A total difficulties scale ( $\alpha = .75$ ) is calculated by summing the scores for the four difficulties.

*Control factors* (related to life stress and emotional/behavioural problems) were age, sex, ethnicity, poverty (eligibility for free school meals), and special educational needs. Table 1 shows the zero-order correlations between the study measures.

(Insert Table 1 about here)

### ***Analytic strategy***

In all, around 8% of values were missing, and between 1% and 24% were missing at variable-level. Little's (1988) chi-square statistic showed that the data were missing completely at random. Missing data were imputed using multiple imputation in SPSS 18. We produced five imputed datasets.

To estimate indirect effects, we followed the bootstrap method of Preacher and Hayes (2008a). This method facilitates the testing of mediation involving multiple simultaneous mediators, and has been recommended as superior to the Sobel test because it does not require a normal sampling distribution of the indirect effect. Also, it allows conclusions about the extent to which mediators mediate the effect of the “ ‘independent’ ” on the “ ‘dependent’ ” variable as well as about the relative magnitudes of the specific indirect effects associated with each of the mediators. Our estimates were based on 5,000 bootstrap samples. We ran Preacher and Hayes's (2008a) SPSS macro in each of the five imputed datasets, and pooled regression coefficients and standard errors using Rubin's (1987) method for multiple imputation inference.

### Results

Even after controlling for total previous life stress, proximal life stress was positively although weakly ( $r$ s between .10 and .19) associated with emotional and behavioural problems, negative automatic thoughts, negative cognitive errors, and dysfunctional attitudes. Our regression model showed that, even after full adjustment, proximal life stress was positively related to negative automatic thoughts and dysfunctional attitudes ( $b = 1.63$ , 95% CI .66, 2.96, and  $b = .43$ , 95% CI .10, .73, respectively). Its association with negative cognitive errors, reappraisal and suppression was not different from zero ( $b = .47$ , 95% CI -.15, 1.09,  $b = .01$ , 95% CI -.22, .23, and  $b = .02$ , 95% CI -.15, .18, respectively). As shown in Table 2, which presents the total and specific indirect effects, although the total indirect effect was different from zero, only the specific indirect effect through negative automatic thoughts was different from zero.

(Insert Table 2 about here)

Examination of all possible pairwise contrasts of the indirect effects (presented at the bottom of Table 2) showed that the specific indirect effect through negative automatic thoughts was larger than the specific indirect effect through suppression or through dysfunctional attitudes. However, the indirect effects through reappraisal and negative cognitive errors could not be distinguished in terms of magnitude from the indirect effect through negative automatic thoughts, despite the fact that both reappraisal and negative cognitive errors had nonsignificant effects. Such apparent paradoxes can occur when one of the specific indirect effects involved in the contrast is not sufficiently *far* from zero.



### Discussion

We carried out this study to investigate the mechanisms through which maladaptive cognitions and difficulties in emotion regulation may explain the association between change in life stress and adolescents' emotional and behavioural problems. On the whole, an increase in life stress was associated with negative cognitive errors, dysfunctional attitudes, expressive suppression and cognitive reappraisal, which were, in turn, associated with emotional and behavioural problems. An examination of the specific indirect effects indicated that only negative automatic thoughts was a mediator. No other variable contributed to the indirect effect above and beyond negative automatic thoughts. Examination of all possible pairwise contrasts of the indirect effects showed that the specific indirect effect through negative automatic thoughts was larger than the specific indirect effects through suppression and through dysfunctional attitudes.

The finding that the indirect effect through negative automatic thoughts was larger than that through dysfunctional attitudes broadly reflects the hierarchy of cognitive constructs in the cognitive model of depression. In this model, negative automatic thoughts are reflective of underlying dysfunctional attitudes, and so they are the "in the moment" manifestation of dysfunctional attitudes and the less distal negative cognitive errors. As such, negative automatic thoughts can be expected to be the first cognitive construct to change in response to change in life stress levels. Relatedly, the finding that the indirect effect through negative automatic thoughts was larger than that through suppression likely reflects the temporal ordering of these two responses to distress. Whereas the former is an indication of whether or not a response is triggered, the latter concerns how the response is modulated once it has been triggered (Gross & John, 2003).

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Together, these findings have important implications for researchers, policy makers and clinicians working towards identifying youth at risk of emotional and behavioural problems. Our findings, if replicated with experimental data, suggest that an increase in life stress is associated with both emotional and behavioural problems in young people. In addition, our findings suggest that considering specificity at mediator level (McMahon et al., 2003) can improve our understanding of putative psychosocial risk factors, such as life stress, that have associations with a range of common child and adolescent psychiatric symptomatology. Studies, such as ours, testing multiple mediator models can distinguish potential foci for prevention and treatment programmes. If replicated with experimental data, our findings suggest that negative automatic thoughts - rather than maladaptive emotion regulation strategies, dysfunctional attitudes or negative cognitive errors – is the pathway through which an increase in life stress leads to emotional and behavioural problems in adolescents. Therefore, our findings can inform the design and methodology of future targeted prevention efforts.

These conclusions should be evaluated in light of several study limitations. First, our life stress measures, calculated at the sum of adverse life events over a specified period, weighted chronic factors as heavily as one-off adversities. Second, this study, like the well-known Adverse Childhood Experiences Study (Chapman et al., 2004), measured life stress retrospectively. Reporting of adverse events, however, may be related to current state of emotional and behavioural problems due only to colouring of recall by current state (Beck, 2008). Therefore, it is possible that the relation between life stress and behavioural/emotional problems is stronger when both measures are reported at the same moment in time. Third, although we modelled the effect of maladaptive cognitions in line with theory and evidence (Beck, 2008), we assumed a causal path of associations with cross-sectional data. Prospective longitudinal data are needed to

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exclude other possibilities, such that an increase in life stress predicts an increase in emotional and behavioural problems which then predicts maladaptive cognitions, or - in line with findings supporting stress generation models of adolescent psychopathology (Carter et al., 2006; Rudolph & Klein, 2009) - that an increase in life stress is not the contextual risk factor but the contextual outcome of an increase in psychiatric symptomatology, maladaptive cognitions or both. Fourth, our findings may not be generalised to the UK adolescent population at large. Our data were collected from one state secondary school in Greater London which was assessed by the Office for Standards in Education (OFSTED) as “outstanding.” According to the OFSTED report, 78% of the student achieved five or more good GCSE grades, which is above the national average. Most students came from the relatively affluent local community, and more than half had an Indian heritage, with Pakistani, white British and African Caribbean students making up significant minority groups. Our study sample broadly reflected the school’s student population. Thus, our findings may not be relevant to adolescents from other backgrounds, such as those from less prosperous communities. Future research on a more representative UK adolescent sample will be able to determine to what extent our findings can be generalised to the UK adolescent population. Fifth, we acknowledge that our sample size, even after multiple imputation of missing data, was small. However, the bootstrapping method which we used to test for mediation does not impose the assumption of normality of the sampling distribution (Preacher and Hayes, 2008b). Finally, we acknowledge that our findings may benefit from comparison with those from studies on older samples. For example, as the association between emotion regulation and mental health is weaker in children than in adults (Aldao et al., 2010), the nonsignificant mediational path from change in life stress to emotional and behavioural problems via difficulties in emotion regulation may not be replicated in adults. Further, as there is evidence that

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maladaptive cognitions moderate rather than mediate the association between life stress and psychiatric symptomatology in adults, we may find no evidence for mediation by negative automatic thoughts in adults.

*What's known:* The strong relationship between adverse life events and emotional and behavioural problems in childhood and adolescence is well-documented. There is also evidence for the role of maladaptive cognitive and emotion regulation styles in explaining this association.

*What's new:* We assessed and compared five mediators (the three cognitive styles of dysfunctional attitudes, negative automatic thoughts, and negative cognitive errors, and the two emotion regulation processes of cognitive reappraisal and expressive suppression) of this association. We found that only negative automatic thoughts explained the relationship between change in life stress and emotional and behavioural problems in adolescence.

*What's clinically relevant:* Programmes that aim to prevent adolescents' emotional and behavioural problems could consider targeting and challenging young people's negative automatic thoughts.

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**Table 1. Descriptives and pairwise correlations (Ns = 427 - 521).**

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
<b>Variables (range)</b>																		
1. Proximal life stress (0 - 17)																		
2. Total previous life stress (0 - 17)	.51**																	
3. Emotional symptoms (0 - 10)	.16**	.14**																
4. Peer problems (0 - 7)	.12*	.10*	.32**															
5. Conduct problems (0 - 9)	.22**	.19**	.23**	.23**														
6. Hyperactivity (0 - 10)	.20**	.14**	.27**	.09*	.48**													
7. Prosocial behaviour (1 - 10)	.08	.02	.03	-.13**	-.29**	-.24**												
8. Negative automatic thoughts (0 - 155)	.26**	.21**	.48**	.31**	.42**	.26**	-.05											
9. Dysfunctional attitudes (0 - 47)	.16**	.10*	.28**	.26**	.16**	.12**	.08	.49**										
10. Negative cognitive errors (24 - 102)	.15**	.12**	.39**	.24**	.21**	.21**	-.05	.52**	.59**									
11. Cognitive reappraisal (8 - 42)	-.00	-.04	-.07	-.04	-.13**	-.16**	.22**	.09	-.02	-.05								
12. Expressive suppression (4 - 28)	-.06	-.11*	.10*	.22**	-.00	.01	.01	.13**	.15**	.13**	.15**							
13. Special educational needs (0 = no, 1 = yes)	.13**	-.03	-.00	.16**	.10*	.06	-.04	.09	.11*	.09*	.02	.12*						
14. Indian (0 = no, 1 = yes)	-.17**	-.22**	.01	-.02	-.11*	-.09*	.10*	-.04	.00	-.02	.05	.11*	-.03					

15. Free school meals (0 = no, 1 = yes)	.14**	.15**	-.04	.08	.04	.07	-.04	.05	-.04	.05	.04	-.07	.13**	-.21**				
16. Age (10 - 19)	.00	.16**	.04	-.09*	.08	.03	-.02	.08	-.02	-.10*	.00	-.02	-.10*	-.01	-.04			
17. Girl (1 = boy; 2 = girl)	.03	.00	.33**	-.04	-.14**	-.04	.31**	.08	-.05	-.03	.04	-.05	-.02	.03	-.03	-.01		
18. Total emotional and behavioural difficulties (1 - 29)	.27**	.23**	.70**	.53**	.73**	.72**	-.23**	.55**	.30**	.38**	-.17**	.12*	.11*	-.08	.06	.04	.06	
N	506	493	551	548	550	537	547	427	491	502	492	481	514	519	507	519	522	521
M	3.47	3.82	2.62	1.67	2.17	3.60	7.39	25.44	15.59	51.01	28.14	15.52	.04	.43	.14	13.50	1.49	10.0
SD	2.88	3.08	2.12	1.40	1.83	2.05	1.80	21.98	8.71	16.52	6.04	4.54	.20	.49	.35	1.51	.50	5.07

**\*\*p < .01; \*p < .05**

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**Table 2. Mediation of the effect of life stress change on total emotional and behavioural difficulties through the five mediators.**

	Point Estimate	S.E.	Lower 95% CI	Upper 95% CI
<b>TOTAL</b>	<b>0.18</b>	<b>0.06</b>	<b>0.02</b>	<b>0.35</b>
Cognitive reappraisal	-0.00	0.02	-0.05	0.05
Expressive suppression	0.00	0.01	-0.02	0.03
Dysfunctional attitudes	-0.01	0.01	-0.05	0.03
<b>Negative automatic thoughts</b>	<b>0.17</b>	<b>0.06</b>	<b>0.01</b>	<b>0.34</b>
Negative cognitive errors	0.02	0.01	-0.02	0.05
Cognitive reappraisal vs. Expressive suppression	-0.00	0.02	-0.06	0.06
Cognitive reappraisal vs. Dysfunctional attitudes	0.01	0.02	-0.06	0.07
Cognitive reappraisal vs. Negative automatic thoughts	-0.18	0.07	-0.36	0.01
Cognitive reappraisal vs. Negative cognitive errors	-0.02	0.02	-0.08	0.05
Expressive suppression vs. Dysfunctional attitudes	0.01	0.02	-0.04	0.06
<b>Expressive suppression vs. Negative automatic thoughts</b>	<b>-0.17</b>	<b>0.06</b>	<b>-0.33</b>	<b>-0.01</b>
Expressive suppression vs. Negative cognitive errors	-0.01	0.02	-0.06	0.03
<b>Dysfunctional attitudes vs. Negative automatic thoughts</b>	<b>-0.18</b>	<b>0.06</b>	<b>-0.35</b>	<b>-0.01</b>
Dysfunctional attitudes vs. Negative cognitive errors	-0.02	0.02	-0.08	0.05
Negative automatic thoughts vs. Negative cognitive errors	0.16	0.06	-0.01	0.32

**Note: effects different from zero (Lower and Upper 95% CIs do not contain zero) are in bold**