

SHORT TITLE: Life experience, emotion regulation, rumination, and psychological distress

Adverse life experience and psychological distress in adolescence: Moderating and mediating effects of emotion regulation and rumination

Mark E Boyes<sup>1</sup>, Penelope A Hasking<sup>1, 2</sup>, & Graham Martin<sup>3</sup>

1: Health Psychology and Behavioural Medicine Research Group, Faculty of Health Sciences, School of Psychology and Speech Pathology, Curtin University, Australia

2: Department of Psychiatry, Monash University, Australia

3: Centre for Clinical Psychiatry and Neuroscience, University of Queensland, Australia

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Abstract

The current study tested whether emotion regulation and rumination moderated and/or mediated the relationship between accumulated adverse life experience and psychological distress in adolescence. In class, Australian high school students ( $n = 2637$ , 12 – 18 years, 68% female) from 41 schools completed well validated measures of adverse life experience, emotion regulation, rumination, and psychological distress and were followed up one year later ( $n = 1973$ , 75% retention rate). Adjusting for age, gender, and baseline psychological distress, adverse life experience predicted psychological distress one year later. Expressive suppression and rumination were positively associated with psychological distress. Cognitive reappraisal was negatively associated with psychological distress and moderated the relationship between adverse life experience and psychological distress. This relationship was also partially mediated by cognitive reappraisal, expressive suppression, and rumination. Promoting cognitive reappraisal and minimising expressive suppression and rumination may be useful strategies to improve mental health for adolescents who have experienced adverse life events. Future research should examine whether adolescents who have experienced adverse life events can be trained in effective emotion regulation strategies, and whether this training can prevent development of psychological maladjustment.

*Keywords:* adverse life experience, mental health, emotion regulation, rumination, adolescence

Adverse life experiences in childhood and adolescence (such as abuse, parental divorce, and sickness or death in the family), have been linked with poor psychological outcomes (Low et al., 2012; Rutter, 1979; Sameroff, Bartko, Baldwin, Baldwin, & Seifer, 1998; Sandberg, Rutter, Pickles, McGuinness, & Angold, 2001; Tiet et al., 2001), which can persist into adulthood (Chapman et al., 2004; Edwards, Holden, Anda, & Felitti, 2003). There is also evidence that life stressors do not occur in isolation but are often inter-related (Dong et al., 2004) and that *accumulation* of adverse life experience is an important risk factor for later psychosocial maladjustment (Appleyard, Egeland, & van Dulmen, 2005). Given that many life stressors are uncontrollable, identifying and understanding mechanisms that explain or mitigate risk the relationship between adverse life experience and mental health is important. The current study focused on emotion regulation and rumination as potential variables that might mediate or moderate the relationship between adverse life experience and adolescent mental health.

Emotion regulation is the process through which we attempt to modulate (either consciously or non-consciously) emotions, in order to respond appropriately to the environment (Gross, 1998). Gross and John (2003) suggest that individuals employ antecedent-focused emotion regulation strategies (e.g., cognitive reappraisal, the reassessing of stressful situation) in an attempt to minimise the salience of a given situation, or they employ strategies focusing on the emotional response (e.g., expressive suppression, the suppression of emotional responses or feelings), which aim to modulate the emotional response to a given situation. A number of studies have established that, in general, cognitive reappraisal is negatively associated with both emotional and behavioural problems, and that expressive suppression of emotional responses is a risk factor for emotional and behavioural problems (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Flouri & Mavroveli, 2013; Gross & John, 2003). A meta-analysis of 114 studies of relationships between emotion regulation and psychopathology (Aldao et al., 2010) reported a medium overall effect for suppression ( $r = .34$ ) and a small overall effect for cognitive reappraisal ( $r = -.14$ ).

In contrast, rumination is a response to distress that involves repetitively and passively focusing on symptoms of distress and the possible causes and consequences of these symptoms (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Rumination is generally maladaptive and associated with higher levels of psychological distress (Nolen-Hoeksema, 2000). The emotional cascade model of Selby and Joiner (2009) posits that ruminating on negative affect is cyclical and that emotional responses may be amplified over time, particularly when the cycle of rumination lasts for extended periods. Relatedly, Brosschot, Gerin, and Thayer (2006) postulate that perseverative cognition (such as rumination) can influence the mental health consequences of stressful situations, as it can prolong stress-related affective and physiological activation. The meta-analysis of Aldao and colleagues (2010) reported a large overall effect for rumination on psychopathology ( $r = .49$ ).

Given that adolescence is a risk period for development of psychopathology (Essau, Conradt, & Petermann, 2000; Newman et al., 1996) and that accumulating adverse life experience is additional risk factor for poor mental health outcomes (Appleyard et al., 2005), establishing whether emotion regulation and rumination moderate and/or mediate the relationship between adverse life experience and psychological distress during adolescence is of both theoretical and applied importance. There is evidence that psychological interventions can both improve emotion regulation (e.g. cognitive behavioural therapy) and reduce rumination (e.g. mindfulness-based therapies) in clinical populations (Butler, Chapman, Forman, & Beck, 2006; Querstret & Cropley, 2013). If emotion regulation and rumination do moderate and/or mediate relationships between adverse life experiences and psychological distress, they may provide promising targets for early intervention efforts with vulnerable youth.

Research examining emotion regulation as a moderator of the relationship between adverse life experience and adolescent mental health is equivocal. A review by Grant et al. (2006) reported a number of studies that examined variables related to emotion regulation

(such as coping, attributional style, support seeking) as moderators of relationships between specific life stressors (such as divorce and family history of alcoholism) and both emotional and behavioural problems in adolescence. Approximately half have reported interaction effects; however, little can be concluded from this literature as no studies have examined the same constructs using the same measures and no studies have examined accumulated adverse life experience (Flouri & Mavroveli, 2013; Grant et al., 2006). In addition, we could find no studies examining rumination as a potential moderator of the relationship between adverse life experiences and psychological distress in adolescence.

With regard to mediation, almost no research has examined emotion regulation or rumination as potential mediators of the relationship between accumulated adverse life experiences and adolescent mental health (Flouri & Mavroveli, 2013). One study, using a community sample of US adolescents, reported that emotional dysregulation mediated the relationship between stressful life events and symptoms of depression and anxiety measured seven months later (McLaughlin & Hatzenbuehler, 2009). Additionally, a number of studies have demonstrated that emotion regulation mediates the relationship between specific life experiences, such as social rejection (Sontag & Graber, 2010) and community violence (Schwartz & Proctor, 2000), and a variety of adolescent mental health outcomes (including perceived stress, anxiety, depression, and aggression). Given that life stressors do not occur in isolation but are often inter-related (Dong et al., 2004) and that it is their accumulation that generally predicts psychological distress (Appleyard et al., 2005) further research in this area is clearly warranted.

To date, only a single study has examined moderating and mediating effects of emotion regulation in the context of accumulated adverse life events. Flouri and Mavroveli (2013) examined emotional regulation as a moderator and mediator of the relationship between accumulated adverse life events and adolescent problem behaviour (emotional and behavioural problems measured by the Strengths and Difficulties Questionnaire; Goodman, 1997) in a

sample of 159 adolescents. Expressive suppression was directly associated with problem behaviour while cognitive reappraisal moderated the relationship between adverse life events and problem behaviour. Specifically, adverse life events were only associated with adolescent problem behaviour when cognitive reappraisal scores were low. No evidence was obtained for cognitive reappraisal or expressive suppression as mediators of the relationship between adverse life events and problem behaviour (Flouri & Mavroveli, 2013).

However, this study has a number of limitations. First, the outcome measure was a summation of both emotional and behavioural problems and it is not known whether any effects were associated specifically with emotional or psychological distress, and which were related specifically to behavioural problems. Second, the sample was relatively small and the study may not have been powered to find small indirect effects operating via cognitive reappraisal and expressive suppression. Third, emotion regulation variables and mental health variables were measured concurrently, therefore no conclusions regarding prospective relationships between emotion regulation and mental health outcomes could be made. Finally, rumination, a variable strongly linked with emotional problems and psychological distress, was not measured (Flouri & Mavroveli, 2013).

The current study aimed to address these limitations. Specific aims were 1) to determine whether accumulated adverse life experience, cognitive reappraisal, expressive suppression, and rumination were *prospectively* associated with psychological distress in a large sample of adolescents, and 2) determine whether cognitive reappraisal, expressive suppression, and rumination (measured at baseline assessment) moderated and/or mediated the prospective relationship between adverse life experience and psychological distress measured one year later. We aimed to address the possibility that the relationship between adverse experience and distress might be both moderated *and* mediated by emotion-regulation and rumination. It is possible that the disposition to habitually use cognitive reappraisal, expressive suppression, or rumination may attenuate the association between stressful events and

psychological distress (i.e. moderate this relationship). However, it is also plausible that experiencing more adverse events provides greater opportunity or need to engage specific emotion-regulation strategies or ruminate, which in turn might be associated with psychological distress (suggesting the possibility of mediation). As previous studies have reported both moderating (Flouri & Mavroveli, 2013) and mediating (McLaughlin & Hatzenbuehler, 2009) effects, we thought it imperative to investigate both possibilities. Given the relatively small body of research and the equivocal findings in the literature, this study was conceptualised as exploratory in nature and specific hypotheses were not proposed.

## Method

### *Participants*

Adolescents ( $n = 2637$ , 844 male and 1793 female) were recruited from 41 schools (23 Catholic and 18 independent) across five Australian states as part of a larger study on non-suicidal self-injury (Tatnell, Kelada, Hasking, & Martin, 2014). Participants' ages ranged between 12-18 years at baseline ( $M = 13.93$ ,  $SD = 0.99$ ). Comparisons with Australian census data indicated females were overrepresented in the sample, due to the participation of several girl only schools. Metropolitan areas and areas of higher socioeconomic status were also overrepresented (Australian Bureau of Statistics, 2008). The majority of adolescents were in their second (37%) or third (30%) year of secondary school, consistent with data indicating these year levels have the highest proportion of students (Australian Bureau of Statistics, 2012). The majority of participants (89%) were born in Australia and two percent identified as Aboriginal or Torres Strait Islander, consistent with the national profile for adolescents (Australian Bureau of Statistics, 2012). Adolescents were followed up after one year (75% retention rate,  $n = 1973$ , 559 male and 1414 female). Reasons for attrition included absence

from school at second assessment point ( $n = 428$ ), school withdrew from the study ( $n = 114$ ), transfer to another school ( $n = 96$ ), parent or student withdrew from the study ( $n = 26$ ), and participant deceased ( $n = 1$ ).

### *Measures*

#### *Psychological distress*

Psychological distress was measured at both baseline and follow-up assessments with the short form of the General Health Questionnaire (GHQ12; Goldberg & Williams, 1998). The GHQ12 is a 12-item measure of current psychological distress containing six positively phrased (e.g., “Felt capable of making decisions about things”) and six negatively phrased (e.g., “Lost much sleep over worry”) items. Items are responded to on a four-point Likert scale (*1: Better than usual; 4: Much worse than usual*) and are summed to give a total psychological distress score. The GHQ12 is widely used and well validated (French & Tait, 2004; Tait, French, & Hulse, 2003). Reliability of the GHQ12 was excellent in the current sample ( $\alpha = .90$ ).

#### *Adverse life experience*

Adverse life experience was measured at baseline assessment using the Adolescent Life Event Survey (ALES; Hawton, Rodham, & Evans, 2006). The ALES is a 20-item measure assessing negative life events that adolescents may have experienced (e.g., “Have your parents separated or divorced”). Items are responded to on a three-point scale (*1: Never, 2: Yes, more than a year ago, 3: Yes, in the past 12 months*). Items are summed to give a total accumulated adverse life experience score. Incidents that took place more than 12 months previously are included in the total score to account for any residual effects these may have had on current psychological state (Voon, Hasking, & Martin, 2013). Reliability of the ALES in the current sample was adequate ( $\alpha = .74$ ).



### *Emotion Regulation*

Cognitive reappraisal and expressive suppression were measured at baseline assessment using the Emotion Regulation Questionnaire (ERQ; Gross & John, 2003). The ERQ is a 10-item scale assessing antecedent (i.e. cognitive reappraisal; six items) and response-focused (i.e. expressive suppression; four items) emotion regulation strategies. It includes both positively (e.g., “When I want to feel more positive emotion, I change the way I’m thinking about the situation”) and negatively (e.g., “When I am feeling negative emotions, I make sure not to express them”) worded items. Items are responded to on a seven-point Likert scale (*1: Strongly disagree; 7: Strongly agree*). Relevant items are summed to give a cognitive reappraisal score and an expressive suppression score. Reliabilities of the cognitive reappraisal ( $\alpha = .81$ ) and expressive suppression ( $\alpha = .70$ ) subscales were acceptable in the current sample.

### *Rumination*

Rumination was measured at baseline assessment using the Ruminative Thought Style Questionnaire (RTSQ; Brinker & Dozois, 2009). The RTSQ is a 20-item measure assessing negative (e.g., “When I have a problem, it will gnaw on my mind for a long time”), positive (e.g., “I like to sit and think about pleasant events from the past”), and neutral (e.g., “I can’t stop thinking about some things”) components of global rumination. Items are responded on a seven-point Likert scale (*1: Not at all descriptive of me; 7: Describes me very well*) and summed to give a total rumination score. The RTSQ is well validated (Brinker & Dozois, 2009) and demonstrated excellent reliability in the current sample ( $\alpha = .94$ ).

### *Procedure*

Ethical approval for the study was obtained from Monash University, the University of Queensland, and relevant education authorities. Schools distributed information regarding the

larger study and consent forms to all students and parents/guardians in years 7-10 ( $n = 14841$ ). Of 4119 adolescents for whom parent/guardian consent was provided, 2637 consented to participate in the study. Participants completed the pen-and-paper questionnaire at school and participation took approximately one hour at each assessment session. Researchers were present to answer participant questions. A unique identifier was created to match data from baseline and follow-up assessments, yet maintain confidentiality. Participants received a mental health information pack (including information on relevant mental health services) after completing each assessment session.

### *Analysis Strategy*

Analyses were conducted in four stages. First, we checked for any differences in sociodemographic characteristics, adverse life experience, cognitive reappraisal, expressive suppression, rumination, and psychological distress between participants lost and retained at follow-up. Second, we assessed gender and age-related differences in these variables. Third, prospective relationships between adverse life experience, cognitive reappraisal, expressive suppression, rumination and psychological distress were tested in multiple regression models (adjusting for age, gender, and psychological distress at baseline assessment). In order to determine whether cognitive reappraisal, expressive suppression, and rumination moderated the prospective relationship between adverse life experience and psychological distress measured one year later, interaction terms were created and tested. Significant interactions were probed using simple slopes analysis (Aiken & West, 1991). Finally, tests of multiple mediation determined whether the relationship between adverse life experiences and psychological distress operated indirectly via cognitive reappraisal, expressive suppression, and rumination.

## Results

### *Participants lost and retained at follow-up assessment*

Adolescents lost to follow-up did not differ from those retained at follow-up with regard to adverse life experience [ $F(1, 2327) = 2.79, p = .095$ ], psychological distress [ $F(1, 2496) = 2.21, p = .137$ ], expressive suppression [ $F(1, 2549) = .63, p = .426$ ], or rumination [ $F(1, 2362) = .01, p = .920$ ] scores at baseline assessment. However, adolescents lost to follow-up scored lower on cognitive reappraisal [ $F(1, 2498) = 5.16, p = .023$ ] and were older than those who completed the follow-up assessment [ $F(1, 2637) = 14.25, p < .001$ ]. Additionally, males were disproportionately lost to follow-up [ $\chi^2(1) = 48.83, p < .001$ ]. The sample was limited to adolescents assessed at both time points for all further analyses ( $n = 1973$ ).

The proportion of missing data on the variables of interest ranged between 2% (psychological distress measured at follow-up) and 12% (adverse life experience measured at baseline) and data were missing completely at random [Little's test:  $\chi^2(173) = 168.44, p = .584$ ]. Therefore, missing data were multiply imputed (Rubin, 1987) in SPSS, using an MCMC algorithm (fully conditioned specification) with 10 imputations and 300 iterations.

### *Gender and age differences in psychological distress, adverse life experience reappraisal, expressive suppression, and rumination*

Scores on the GHQ12 were similar to those previously reported in Australian adolescents (Tait et al., 2003). Females reported significantly higher psychological distress scores than males at both baseline and follow-up assessments, although these effects were small. There were also small but significant gender differences in baseline rumination and expressive suppression

scores, with females reporting higher rumination scores than males and males reporting higher expressive suppression scores than females (Table 1). Small but significant correlations were obtained between age and psychological distress scores at both baseline ( $r = .12, p < .001$ ) and follow-up ( $r = .11, p < .001$ ), as well as adverse life experience ( $r = .13, p < .001$ ), cognitive reappraisal ( $r = -.07, p = .002$ ), expressive suppression ( $r = .07, p = .001$ ), and rumination ( $r = .12, p < .001$ ) scores. Given the significant gender and age-related differences in the majority of variables of interest, gender and age were adjusted for in all further analyses.

**(Insert Table 1 approximately here)**

*Does adverse life experience predict psychological distress one year later and is this relationship moderated by reappraisal, expressive suppression, and rumination?*

Adverse life experience was positively correlated with psychological distress, expressive suppression, and rumination, and was negatively correlated with cognitive reappraisal.

Expressive suppression and rumination were both positively correlated with psychological distress and cognitive reappraisal was negatively correlated with psychological distress (Table 2).

**(Insert Table 2 approximately here)**

Prospective relationships between adverse life experience, cognitive reappraisal, expressive suppression, and rumination (measured at baseline) and psychological distress (measured at follow-up) were examined in a series of multivariate linear regression models. As one of the primary aims of the current research was to examine potential moderating effects of cognitive reappraisal, expressive suppression, and rumination on the relationship between adverse life

experiences and psychological distress, all predictor variables were mean centred.

Additionally, as a result of the multiple imputation process only unstandardized coefficients are outputted and reported. Adjusted  $R^2$  and  $R^2$  change were calculated by pooling estimates using Rubin's (1987) formula.

Psychological distress at follow-up assessment was the dependent variable in all models (Table 3). As hypothesized, after adjusting for gender, age, and psychological distress measured at baseline, adverse life experience was a significant predictor of psychological distress measured one year later (Model 1). Cognitive reappraisal, expressive suppression, and rumination (all measured at baseline assessment) were entered in Model 2. Adverse life experience remained a significant predictor in this model; however, cognitive reappraisal, expressive suppression, and rumination explained additional variance in psychological distress. Cognitive reappraisal was negatively associated with psychological distress and expressive suppression and rumination were both positively associated with psychological distress.

In order to determine whether the relationship between adverse life experience and psychological distress was moderated by cognitive reappraisal, expressive suppression, and rumination, interaction terms were created and tested in simple regression models (including only the interaction term and its associated main effects). There was a significant interaction between adverse life experience and cognitive reappraisal, ( $B = -.01, p = .003$ ); however, the interactions between adverse life experiences and expressive suppression ( $B = .01, p = .175$ ) as well as rumination ( $B = .00, p = .549$ ) were not significant.

**(Insert Table 3 approximately here)**

To determine whether the interaction between adverse life experience and cognitive reappraisal maintained significance in the full multivariate model, this interaction was included in Model 3. This final model accounted for 22.2% of the variance in psychological distress at follow-up

assessment. Adverse life experience, cognitive reappraisal, expressive suppression, and rumination all remained significant prospective predictors of psychological distress. Additionally, the interaction between adverse life experience and cognitive reappraisal remained significant in the full multivariate model and was associated with a significant  $R^2$  change. Simple slopes tests (adjusting for age, gender, and baseline distress – illustrated in Figure 1) revealed that the positive relationship between adverse life experience and psychological distress was substantially stronger at low levels (1SD below the mean) of cognitive reappraisal ( $b = .18, t = 5.53, p < .001$ ) than at high levels (1SD above the mean) of cognitive reappraisal ( $b = .06, t = 1.99, p = .046$ ).

**(Insert Figure 1 approximately here)**

*Is the relationship between adverse life experience and psychological distress one year later mediated by reappraisal, expressive suppression, and rumination?*

The reduction in the strength of the relationship between adverse life experience and psychological distress from Model 1 ( $B = .16$ ) to Model 2 ( $B = .12$ ) suggested this relationship may be partially mediated by cognitive reappraisal, expressive suppression, and/or rumination. A test of multiple mediation was conducted using the PROCESS macro for SPSS (Hayes, 2013) and all coefficients were estimated using 5000 bootstrapped resampling draws. Hayes (2013) argues that unstandardized coefficients are the preferred metric in causal modelling, and following this recommendation unstandardized coefficients are reported (adjusting for age, gender, and psychological distress at baseline assessment). Although adverse life experience was directly associated with later psychological distress ( $B = .122, 95\% \text{ CI} = .105 \text{ to } .139$ ), the indirect effect was also significant ( $B = .034, 95\% \text{ CI} = .029 \text{ to } .039$ ). Specifically, small but significant indirect effects operating via cognitive reappraisal ( $B = .007, 95\% \text{ CI} = .005 \text{ to } .009$ ,

$z = 7.08, p < .001$ ), expressive suppression ( $B = .004, 95\% \text{ CI} = .003 \text{ to } .006, z = 5.50, p < .001$ ), and rumination ( $B = .023, 95\% \text{ CI} = .019 \text{ to } .028, z = 10.87, p < .001$ ) were observed (Figure 2).

**(Insert Figure 2 approximately here)**

## Discussion

Adverse life experiences are associated with poor psychological outcomes for children and adolescents, and these can persist into adulthood (Chapman et al., 2004; Low et al., 2012; Rutter, 1979). As many life stressors are uncontrollable, identifying variables amenable to change that might mediate or moderate the relationship between adverse life experience and mental health is important from an intervention and prevention perspective. This study aimed to extend the work of Flouri and Mavroveli (2013) and determine 1) whether adverse life experience, cognitive reappraisal, expressive suppression, and rumination are prospectively associated with psychological distress in a large sample of Australian adolescents, and 2) whether the prospective relationship between adverse life experience and psychological distress is moderated and/or mediated by cognitive reappraisal, expressive suppression, and rumination.

As predicted, accumulated adverse life experience at baseline assessment was associated with psychological distress measured one year later, consistent with a broad literature documenting links between life stress and psychological maladjustment (Chapman et al., 2004; Edwards et al., 2003; Low et al., 2012; Rutter, 1979; Sameroff et al., 1998; Sandberg et al., 2001; Tiet et al., 2001). Additionally, expressive suppression and rumination scores were also associated with psychological distress one year later. In contrast, baseline cognitive reappraisal was a protective factor, and was negatively associated with symptoms of

psychological distress. Importantly, these effects were all maintained after adjusting for age, gender, and psychological distress at baseline. These findings support previous research demonstrating that, in general, expressive suppression and rumination are associated with elevated risk and cognitive reappraisal is negatively associated with emotional and behavioural problems (Aldao et al., 2010; Flouri & Mavroveli, 2013; Gross & John, 2003).

Additionally, cognitive reappraisal was also a significant moderator of the prospective relationship between adverse life experience and psychological distress. Specifically, the relationship between adverse life experience and psychological distress was substantially stronger among individuals with low levels of cognitive reappraisal than among individuals with high levels of cognitive reappraisal. Neither expressive suppression nor rumination moderated the relationship between adverse life experience and psychological distress. While consistent with the findings of Flouri and Mavrovelli (2013), the current findings extend them, by examining the relationships between emotion regulation and psychological distress *prospectively* and demonstrating that, although rumination is a general risk factor for later psychological distress, it does not appear to moderate the relationship between adverse life experience and psychological distress. The current findings also extend previous research by demonstrating that cognitive reappraisal, expressive suppression, and rumination all partially mediate the relationship between adverse life experience and psychological distress. Specifically, adverse life experience was associated with lower cognitive reappraisal scores and thereby higher scores on later psychological distress. In contrast, adverse life experience was also associated with more expressive suppression and rumination, which in turn was associated with higher psychological distress scores one year later.

Future research should examine why expressive suppression and rumination appear to mediate but not moderate the relationship between adverse life experience and psychological distress. One possibility is that experiencing more adverse life events provides greater opportunity or need to engage in expressive suppression and rumination, which in turn might



be associated with psychological distress. As adverse experience, emotion regulation, and rumination were measured concurrently in the current analyses it is not possible to test the direction of this effect empirically; however, future research should consider testing whether accumulated life events predict changes in expressive suppression and rumination over time, and whether these changes are associated with adolescent mental health.

Taken together, these findings suggest that promoting cognitive reappraisal and reducing rumination and expressive suppression may promote improved mental health amongst adolescents exposed to adverse life experiences. Importantly, there is evidence that mindfulness-based therapies may reduce rumination (Querstret & Copley, 2013) and that cognitive behavioural therapy approaches, which include enhancing emotion regulation skills as well as cognitive restructuring and reappraisal, have been demonstrated to be effective in reducing psychological distress in clinical samples (Butler et al., 2006). Given the current findings identifying cognitive reappraisal, expressive suppression, and rumination as mechanisms that may mitigate or interrupt the impact of adverse life experience on adolescent mental health, future research should examine whether training cognitive reappraisal and teaching strategies to reduce expressive suppression rumination might prevent development of psychopathology, specifically amongst adolescents experiencing accumulating adverse life events but also amongst adolescents more generally.

However, the study did have a number of limitations that should be acknowledged. First, the sample was disproportionately female and findings should be interpreted with this in mind. Additionally, all participating schools were either Catholic or independent (i.e., non-government), participants were disproportionately from higher socioeconomic status areas, and males and older adolescents were disproportionately lost to follow-up. Generalizability of our findings may therefore be questionable. Second, all measures utilised adolescent self-report and it is always possible that common method error may have inflated relationships between adverse life experience, emotion regulation variables, and psychological distress. However, the

longitudinal design of the study does overcome this limitation to an extent, as adverse life experience and emotion regulation variables were measured one year prior to the mental health outcome and baseline psychological distress is adjusted for in all analyses. Even so, future research should consider the use of multiple informants (e.g., adolescent, parent/guardian, and teacher report) to improve accuracy of findings. Third, adverse life experience, emotion regulation, and rumination were measured concurrently at baseline assessment. This limits the interpretation of the mediational analysis, as the temporal ordering of the predictor and mediator variables is ambiguous. Future research should examine these relationships using three time points, so that adverse life experience can be measured prior to the emotion regulation and rumination variables, which in turn can be measured prior to mental health outcomes. Finally, our final model only accounted for 22% of the variance in psychological distress. Future research should investigate additional potentially modifiable factors that moderate and/or mediate relationships between adverse life experience and psychological distress (e.g., locus of control, stressor appraisal, coping, and social support).

Bearing these limitations in mind, these findings illustrate the importance of both emotion regulation and rumination in prospectively predicting psychological distress. Promoting cognitive reappraisal and minimising expressive suppression and rumination is likely to improve mental health outcomes for adolescents who have experienced adverse life events, as well as amongst adolescents more generally. Future research should examine whether adolescents who have experienced accumulating adverse life stressors can be trained in effective emotion regulation strategies, and whether this training can prevent development of psychological maladjustment.

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*Table 1.* Mean psychological distress, adverse life experience, reappraisal, expressive suppression, and rumination scores disaggregated by gender.

	Male	Female	<i>p</i>	Cohen's <i>D</i>
GHQ score (follow-up), <i>M</i> (SD)	9.67 (5.44)	11.98 (6.77)	<b>&lt; .001</b>	.38
GHQ score (baseline), <i>M</i> (SD)	9.78 (5.68)	10.97 (6.02)	<b>&lt; .001</b>	.20
Adverse life experiences, <i>M</i> (SD)	27.70 (4.97)	28.09 (5.27)	.117	.08
Reappraisal, <i>M</i> (SD)	28.74 (6.15)	28.50 (6.39)	.446	.04
Expressive Suppression, <i>M</i> (SD)	15.06 (4.73)	13.41 (4.89)	<b>&lt; .001</b>	.34
Rumination, <i>M</i> (SD)	83.61 (23.19)	88.67 (23.32)	<b>&lt; .001</b>	.22

*Note:* Means and standard deviations are pooled estimates. Significant *p* values are bolded.



Table 2. Correlations between adverse life experience, cognitive reappraisal, expressive suppression, rumination, and psychological distress

	Adverse Life Experience	GHQ Score T1	GHQ Score T2	Cognitive Reappraisal	Expressive Suppression	Rumination
Adverse Life Experience	--					
GHQ Score T1	.42***	--				
GHQ Score T2	.28***	.42***	--			
Cognitive Reappraisal	-.17***	-.28***	-.19***	--		
Expressive Suppression	.17***	.30***	.18***	-.04	--	
Rumination	.37***	.43***	.28***	-.02	.25***	--

Note: \*\*\*  $p < .001$ . T1 = variable measured at baseline assessment. T2 = variable measured at follow-up assessment. Correlations are pooled estimates.

Table 3. Summary of multiple regression models

	Model 1	<i>p</i>	Model 2	<i>p</i>	Model 3	<i>p</i>
	<i>B</i> (Standard Error)		<i>B</i> (Standard Error)		<i>B</i> (Standard Error)	
Constant	11.36 (.13)	< .001	11.39 (.13)	< .001	11.33 (.13)	< .001
Age	.35 (.14)	.011	.29 (.14)	.033	.31 (.14)	.023
Gender	1.81 (.29)	< .001	1.92 (.29)	< .001	1.93 (.29)	< .001
GHQ score (baseline)	.38 (.03)	< .001	.30 (.03)	< .001	.30 (.03)	< .001
Adverse life experience	.16 (.03)	< .001	.12 (.03)	< .001	.12 (.03)	< .001
Cognitive Reappraisal			-.09 (.02)	< .001	-.09 (.02)	< .001
Expressive suppression			.09 (.03)	.002	.09 (.03)	.002
Rumination			.02 (.01)	< .001	.02 (.01)	< .001
Adverse life experience *					.01 (.00)	.021
Cognitive Reappraisal						
Adjusted $R^2$	.205		.220		.222	
$\Delta R^2$	.205	< .001	.014	< .001	.002	.021

*Note:* Outcome variable is GHQ score measured at follow-up assessment. All predictor variables measured at baseline assessment and are mean centred. Significant  $p$  values are bolded. Adjusted  $R^2$  and  $\Delta R^2$  are pooled estimates using on Rubin's (1987) formula.

Figure 1. Interaction between adverse life experience and reappraisal

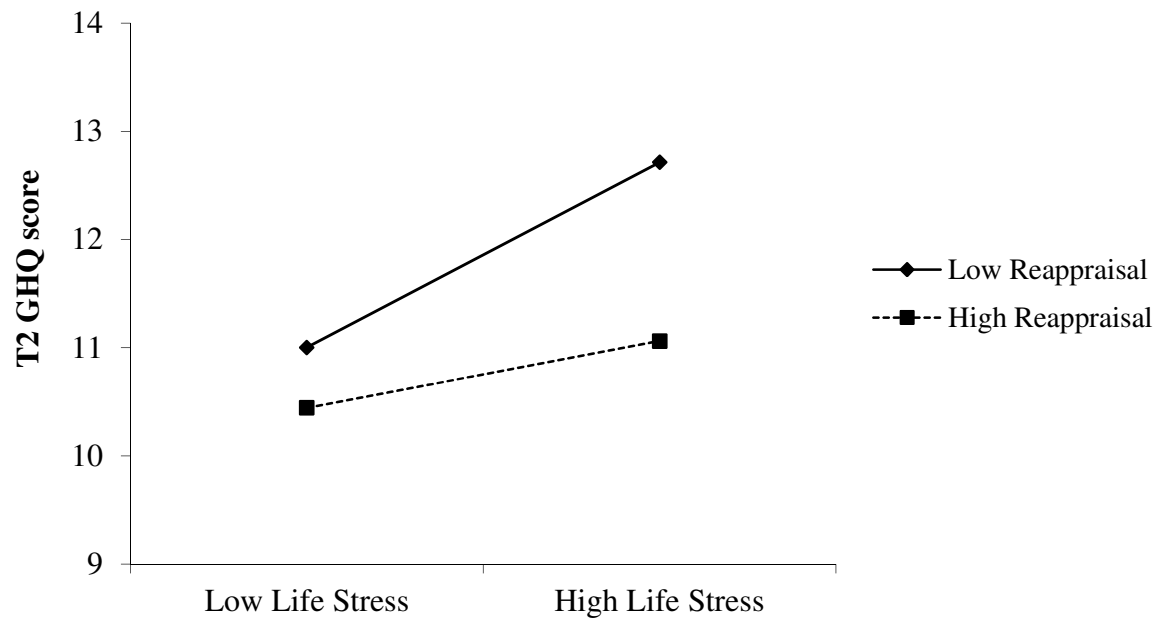
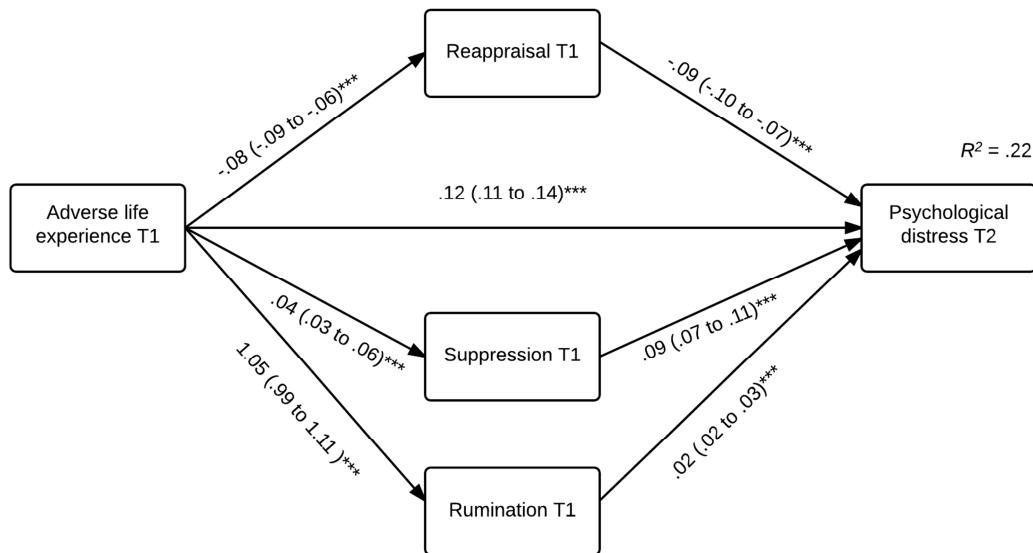


Figure 2. Multiple mediation model of the prospective relationship between adverse life experience and psychological distress (adjusting for age, gender, and baseline psychological distress).



Notes: \*\*\*  $p < .001$ . Unstandardized coefficients are reported. T1 = variable measured at baseline assessment. T2 = variable measured at follow-up assessment. Analyses adjust for age, gender, and baseline psychological distress.