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Interactive models of depression vulnerability: The role of childhood trauma, dysfunctional attitudes, and coping

Matthew C. Morris¹, Chrystyna D. Kouros, Kathryn R. Fox, Uma Rao, and Judy Garber

Department of Family and Community Medicine (MCM) and the Center for Molecular and Behavioral Neuroscience (MCM and UR) and the Department of Psychiatry and Behavioral Sciences (UR), Meharry Medical College, from the Department of Psychology at Southern Methodist University (CDK), from the Department of Psychology at Harvard University (KRF), and from the Departments of Psychology and Human Development (JG), Psychiatry (JG, UR), and Kennedy Center (JG, UR), Vanderbilt University, Nashville, Tennessee

Abstract

Objectives—This prospective study investigated whether within-individual relations between depression vulnerability factors (childhood trauma, dysfunctional attitudes, maladaptive coping) and depressive symptom trajectories varied as a function of the number of prior major depressive episodes experienced in their lifetime.

Design—Participants were 68 young adults who varied with regard to their history of depression; 32 were remitted depressed and 36 were never depressed

Methods—Depressive symptoms and disorders were assessed using semi-structured psychiatric interviews conducted twice over a 6-month period; interviews yielded weekly ratings of depressive symptoms during the follow-up interval. Childhood trauma, dysfunctional attitudes and coping were assessed with self-report measures. Data analyses were conducted using time-lagged multilevel models.

Results—Individuals with more previous major depressive episodes (MDEs) who reported greater childhood trauma exposure, more dysfunctional attitudes, or greater use of maladaptive coping strategies experienced more rapid increases in depressive symptoms during the follow-up period. A significant interaction of coping, number of previous MDEs, and time was found indicating that among individuals with less adaptive coping (i.e., lower primary or lower secondary control coping scores), depressive symptoms (DSR) increased significantly in relation to number of prior depressive episodes; no change in DSR was observed for never-depressed individuals. Among individuals with *higher* primary control coping scores, significant increases in DSR scores were observed for individuals with 3 prior MDEs only.

Conclusions—Findings highlight the need for treatment and prevention programs that target stress reactivity and coping strategies early in the course of depression.

¹Corresponding Author: Matthew C. Morris, Ph.D., Meharry Medical College, 1005 Dr. D. B. Todd Jr. Boulevard, Nashville, TN 37208, Phone: (615) 327-6962, Fax: (615) 327-6144, mmorris@mmc.edu.

Keywords

depression; childhood trauma; dysfunctional attitudes; coping

Individuals who experience a major depressive episode (MDE) are at elevated risk for developing subsequent episodes (Dunn & Goodyer, 2006). Moreover, risk for recurrence increases with each successive MDE (American Psychiatric Association, 2000; Solomon et al., 2000). The mechanisms underlying this increased risk remain unclear. Depression vulnerability factors can be psychological, biological, and/or genetic predispositions to experience MDEs as well as maladaptive responses to stress (Monroe, Kupfer, & Frank, 1992). Whereas trait theories propose that individuals who experience multiple recurrences possess relatively stable vulnerabilities that were present before their first MDE onset, scar theories assert that individuals who experience multiple recurrences may become more vulnerable over time due to the experience of depression itself; that is, MDEs may trigger psychobiological changes that increase risk for subsequent depression (Burcusa & Iacono, 2007).

Scarring of sufficient magnitude to elevate risk for depression recurrence may occur particularly in cases of severe or chronic depression or in the presence of serious risk factors, such as childhood trauma (Holsboer, 2001; Post, 1992; Ormel, Oldehinkel, & Vollebergh, 2004). Importantly, trait and scar theories are not incompatible; depression may be predicted by both relatively stable and dynamic transactions between vulnerability factors and stressful life events (Morris, Ciesla, & Garber, 2010). The goal of the present study was to investigate whether within-individual relations between vulnerability factors (childhood trauma, dysfunctional attitudes, maladaptive coping) and depressive symptom trajectories were stronger as a function of the number of depressive episodes that had occurred over lifetime. These interactive models of depression vulnerability can inform the development and refinement of treatment strategies by identifying which vulnerability factors to target over the course of depression.

Childhood Trauma

Exposure to traumatic stress during childhood can have profound and enduring effects on neurobiological development resulting in physical and mental health problems later in life (Nemeroff, 2004). Early adversity has been linked to increased risk for depressive symptoms (Chapman et al., 2004), MDE onset (Green et al., 2010), and MDE maintenance (Brown & Moran, 1994; Riso, Miyatake, & Thase, 2002; McLaughlin et al., 2010). Whereas some studies have reported evidence consistent with an additive risk model (i.e., a dose-response relation between number of adversities and depression severity) for depressive symptoms (Goldberg, 1994; Surtees et al., 2006) and diagnoses (Kendler et al., 2000), other studies have shown that associations between childhood adversity and depression were non-additive and stronger for particular types of adversity (Kessler, Davis, & Kendler, 1997).

In the present study, as an alternative to the additive model, we adopted an idiographic approach to examine the relation of childhood trauma to depressive symptom trajectories. According to this adaptation of the 'weakest link' perspective (Abela & Sarin, 2002), an

individual's vulnerability to depression is determined by his/her most severe exposure to any one of several different types of childhood trauma. A history of childhood adversity has been linked with an increased duration of depressive illness and more recurrences (Klein et al., 2009). Less clear, however, is whether early trauma is associated with non-chronic depression, and whether the relation of early trauma to depression is stronger for individuals with a greater number of prior MDEs. Hence, we also examined whether the relation of childhood trauma to depressive symptom trajectories was moderated by the number of previous MDEs experienced. We hypothesized that more severe trauma exposure would predict increases in depressive symptoms, and that this relation would be stronger for individuals with more prior MDEs.

Dysfunctional Attitudes

Cognitive theories of depression propose that relatively stable negative schemas, reflecting dysfunctional beliefs confer vulnerability to depression by influencing the interpretation of life events (Beck, 1967). Dysfunctional attitudes are elevated during MDEs (Ingram, Miranda, & Segal, 1998; Power, Duggan, Lee, & Murray, 1995), and may persist into remission (Beevers & Miller, 2004; Peselow, Robins, Block, Baraouche, & Five, 1990; Zuroff, Blatt, Sanislow, Bondi, & Pilkonis, 1999). Several prospective studies have found that dysfunctional attitudes interact with stressful life events to predict depression (Abela & D'Alessandro, 2002; Abela et al., 2011; Hankin, Abramson, Miller, & Haefffel, 2004; Hankin, Wetter, Cheely, & Oppenheimer, 2008; Joiner, Metalsky, Lew, & Klocek, 1999; Lewinsohn, Joiner, & Rohde, 2001), although some studies have not shown support for this interaction (Alloy, Reilly-Harrington, Fresco, Whitehouse, & Zechmeister, 1999; Barnett & Gotlib, 1988; Otto et al., 2007).

Few studies have examined whether the relation between dysfunctional attitudes and depression varies as a function of number of prior MDEs. One study found that higher dysfunctional attitude scores predicted earlier time to recurrence, with this relation diminishing over successive MDEs (Bockting et al., 2006). Another study reported that the predictive relation of dysfunctional attitudes to MDEs became non-significant after controlling for prior depression (Otto et al., 2007). The current study investigated whether the relation between dysfunctional attitudes and depression trajectories became stronger with an increasing number of prior MDEs..

Responses to Stress: Primary and Secondary Control, and Disengagement, Coping

How individuals respond to stress can increase their vulnerability to depression. Coping has been defined as "conscious volitional efforts to regulate emotion, cognition, behavior, physiology, and the environment in response to stressful events or circumstances" (Compas, Connor-Smith, Saltzman, Thomsen, & Wadsworth, 2001, p. 89), and is distinguished from stress responses that are involuntary and outside of conscious control. The present examined a well-validated model of coping (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000) that included primary control coping (problem-solving, emotional expression, emotional modulation), secondary control coping (acceptance, cognitive

restructuring, positive thinking, distraction), and disengagement coping (avoidance, denial, wishful thinking). Higher levels of primary and secondary control coping have been linked to fewer affective and internalizing problems (Compas et al., 2010; Jaser, Champion, Dharamsi, Riesing, & Compas, 2011; Jaser et al., 2005; Langrock et al., 2002; Wadsworth & Compas, 2002; Weisz, Francis, & Bearman, 2010), whereas higher levels of disengagement coping have been linked to more such problems (Jaser et al., 2011; Sandler, Tein, Mehta, Wolchik, & Ayers, 2000).

Less is known about the relations between coping and depression across successive MDEs. More avoidant coping and less use of positive thinking each have been associated with earlier depression recurrence in individuals with a history of recurrent depression, and these relations weakened with each additional MDE (Bockting et al., 2006; ten Doesschate et al., 2010). Avoidant coping also has been found to predict relapse among individuals treated for depression (Cronkite, Moos, Twohey, Cohen, & Swindle, 1998; Sherbourne, Hays, & Wells, 1995). Additionally, maladaptive coping has been shown to function as a relatively stable risk factor for depression across recurrences (Ormel et al., 2004). The final aim of the current study was to examine whether the interaction of these distinct coping factors with the number of previous MDEs predicted depression trajectories over the six-month follow-up.

Method

Participants

Participants were 68 individuals, ages 18 to 31 years. Baseline demographic and clinical data are presented in Table 1. Participants were recruited primarily from undergraduate and graduate programs at a mid-size university in the southeastern United States, and were part of a larger study examining responses to a standardized psychosocial stressor. Exclusion criteria based on the primary goals were current MDE, lifetime bipolar or posttraumatic stress disorder (PTSD), and health conditions or medications known to affect stress response systems.

All participants were screened for current and prior MDEs. Individuals had either (a) a history of MDE but were not currently in a depressive episode (i.e., remitted depressed; RD; $n=32$), or (b) no current or prior MDE (i.e., never depressed; ND; $n=36$), according to the *Diagnostic and Statistical Manual of Mental Disorders*, 4th Edition (*DSM-IV-TR*; American Psychiatric Association, 2000) criteria as determined by the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I; First et al., 1996). Full remission was defined as an absence of significant symptoms of depression for at least two months according to the criteria set forth by Frank and colleagues (1991). Of the 32 RD participants, 13 experienced one prior MDE, 10 had two episodes, and 9 experienced 3 episodes.

Participants received 6 course credits or \$30 for the baseline assessment and \$10 for the follow-up assessment. All procedures were approved by the Institutional Review Board. Informed consent was obtained at baseline and follow-up.

Baseline Measures

Depression—The SCID-I assessed current and lifetime diagnoses of a subset of Axis I disorders (i.e., mood disorders, PTSD). Detailed information on all previous depressive episodes was obtained to determine the number of prior MDEs. Inter-rater reliability for history of depression yielded a kappa of 1.00.

The *Beck Depression Inventory-second edition* (BDI-II; Beck et al., 1996a) is a 21-item, self-report measure of current level of depressive symptoms. The BDI-II has good reliability and validity (Beck et al., 1996b). In this sample, coefficient alpha for the BDI-II was .85.

Childhood Trauma—The Childhood Trauma Questionnaire (CTQ; Bernstein et al., 1994) is a 28-item, self-report measure of the frequency of different types of maltreatment experienced during childhood. Each item is rated on a 5-point scale from “never true” to “very often true.” The CTQ has five subscales: emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. The CTQ has good reliability and validity (Bernstein et al., 1994). In this sample, coefficient alphas for the subscales were .86 for emotional abuse, .76 for physical abuse, .92 for sexual abuse, and .92 for emotional neglect. These four subscales were combined to form a ‘weakest link’ composite (highest score on any subscale; Abela & Sarin, 2002). The physical neglect subscale was excluded in the analyses because it was unreliable (coefficient alpha = .21).

Dysfunctional Attitudes—The Dysfunctional Attitudes Scale (DAS; Weissman & Beck, 1978) is a 40-item self-report measure of rigid, negative, and perfectionistic attitudes regarding the self, world, and future. Total scores range from 40 to 280, with higher scores reflecting more dysfunctional attitudes. In this sample, coefficient alpha for the DAS was .78.

Coping—The young adult version of the Responses to Stress Questionnaire (RSQ; Connor-Smith et al., 2000) was used to assess coping. The RSQ has good internal consistency and construct validity as evident in confirmatory factor analyses (Connor-Smith et al., 2000). Coefficient alphas for the RSQ factors used in the current study were .80 for primary control coping, .82 for secondary control coping, and .63 for disengagement coping.

Socio-demographics—Socioeconomic status (SES) was calculated using a four factor index based on education level and employment of self and parents (Hollingshead, 1975).

Follow-up Measures

Depression—The Longitudinal Interval Follow-Up Evaluation (LIFE; Keller et al., 1987), which parallels the SCID-I, was administered at the follow-up assessment to determine the level of depressive symptoms during each week of the follow-up interval. The LIFE yields a depressive symptom rating (DSR) score from 1 to 6, reflecting the extent of depressive symptoms and impairment. Scores of 3 indicate fewer symptoms (e.g., two to three symptoms) than the full *DSM-IV* criteria for MDE, with mild or moderate impairment; DSRs of 4 indicate four symptoms with moderate to marked impairment, and 5 or 6 indicate an MDE with significant impairment.

Life events—The 90-item, young adult version of the Perceived Events Scale (PES; Compas et al., 1987) assessed the number and severity of life events participants experienced during the six-month follow-up interval. Participants indicated whether each event had occurred during the follow-up, and rated the valence of those events on a 9-point scale (-4 = Extremely Bad; 0 = Neither Good or Bad; $+4$ = Extremely Good). Participants were interviewed regarding the onset and offset dates of each reported life event. Total weekly stress scores were calculated by summing ratings for all negative events (rated -1 to -4 on desirability) occurring each week. Stress scores were multiplied by -1 so that higher scores indicated higher stress levels.

Data Analytic Plan

All variables were examined for distributional properties and cases were screened for univariate and multivariate outliers. To address hypotheses regarding within- and between-individual change simultaneously, we specified a series of multilevel models (MLM) using hierarchical linear models (HLM6; Raudenbush, Bryk, & Congdon, 2004) consisting of a within-person (i.e., level-1) sub-model describing how each individual changed over time, and a between-person (i.e., level-2) sub-model describing how these changes varied across individuals (Bryk & Raudenbush, 1992; Singer & Willett, 2003). For MLM, all level-1 predictors were person-centered (i.e., means of these variables equaled zero for each person), and person means for time-varying predictors were included in level-2 models to remove between-person variance from within-person variables and prevent predictors from correlating with individual intercepts or between-person factors (Hoffman & Stawski, 2009). MLM was used to examine whether associations between individual predictors (childhood trauma, dysfunctional attitudes, coping) and depressive symptom trajectories were moderated by number of MDEs that had occurred prior to the baseline assessment. A final model was tested that included all vulnerability factors as main effects and moderators. Covariates significantly associated with weekly DSR were included in the MLM. Variables included in interactions were centered. Simple slope analyses were conducted on all significant interactions, per Aiken and West (1991).

Results

Descriptive Analyses

History of depression was indexed by number of prior MDEs at baseline. Table 2 shows the correlations among the primary measures. Analyses of potential covariates revealed that sex, age, and SES were not significantly associated with mean DSR scores over the follow-up period. Baseline depressive symptoms (BDI-II scores) were significantly associated with DSR scores [$(b = .03)$, $t(66) = 3.62$, $p < .001$], and therefore were included as a covariate in subsequent analyses. All models controlled for lagged DSR scores and stress levels, person means for depressive symptom ratings and stress levels, depressive symptoms at baseline, and time.

The specification of time-varying predictors such as lagged effects helps to clarify the temporal ordering of events. As described elsewhere (AUTHOR CITATION), a series of lagged effects indicated that the strongest predictive association ($b = .03$, $p < .0001$) between

total stress level and DSR scores was at 7 weeks. For all subsequent analyses, Level 1 covariates (i.e., prior stress levels and DSR scores) were lagged 7 weeks behind the dependent variable (i.e., DSR scores); this provided a conservative test of interactive models predicting DSR scores by controlling for the effects of prior stress levels and prior DSR scores.

Individual Depression Vulnerability Models

Childhood Trauma—The interaction of childhood trauma, number of prior MDEs, and time predicting trajectories of depressive symptoms was significant [$(b = .023)$, $t(64) = 2.65$, $p = .011$] (see Table 3; Figure 1). Simple slope analyses revealed that among individuals with greater childhood trauma, DSR scores increased for those with two prior MDEs [$(b = .018)$, $t(64) = 2.95$, $p = .004$], and 3 MDEs [$(b = .029)$, $t(64) = 4.21$, $p < .001$]; DSR scores did not change significantly for individuals with one MDE [$(b = .006)$, $t(64) = 0.90$, $p = .370$], or no MDEs [$(b = -.005)$, $t(64) = -0.61$, $p = .542$]. Among individuals with lower childhood trauma, DSR scores did not change significantly over the six-month follow-up, regardless of depression history.

Dysfunctional Attitudes—The interaction of dysfunctional attitudes, number of previous MDEs, and time predicting trajectories of depressive symptoms was significant [$(b = .009)$, $t(64) = 3.34$, $p = .002$ (Table 3)]. Simple slope analyses revealed that among individuals with more dysfunctional attitudes, DSR scores increased significantly for those with one MDE [$(b = .016)$, $t(64) = 2.67$, $p = .010$], two MDEs [$(b = .021)$, $t(64) = 3.67$, $p < .001$], and 3 MDEs [$(b = .026)$, $t(64) = 4.54$, $p < .001$]; increases in DSR scores among never-depressed individuals was not significant [$(b = .010)$, $t(64) = 1.67$, $p = .099$]. For individuals with less dysfunctional attitudes, number of prior depressive episodes did not significantly predict DSR score trajectories.

Coping—The interaction of primary control coping, number of previous MDEs, and time predicting trajectories of DSR scores was significant [$(b = -.013)$, $t(64) = -3.87$, $p < .001$ (Table 3; Figure 2)]. Simple slope analysis revealed that among individuals with lower primary control coping, DSR scores increased significantly for those with two MDEs [$(b = .019)$, $t(64) = 3.37$, $p = .001$], and 3 MDEs [$(b = .026)$, $t(64) = 4.53$, $p < .001$]; there was a non-significant trend for increases in DSR scores among individuals with one MDE [$(b = .011)$, $t(64) = 1.99$, $p = .051$]; no change in DSRs was observed for never-depressed individuals [$(b = .004)$, $t(64) = 0.64$, $p = .525$]. Among individuals with higher primary control coping scores, significant increases in DSR scores were observed only for individuals with 3 MDEs [$(b = .012)$, $t(64) = 2.03$, $p = .047$]. Thus, individuals with 3 MDEs had higher DSR trajectories over the six-month follow-up regardless of the primary control coping strategies.

The interaction of secondary control coping, number of previous MDEs, and time predicting trajectories of depressive symptoms was significant [$(b = -.009)$, $t(64) = -3.93$, $p < .001$; Table 3]. Simple slope analyses revealed that among individuals with lower secondary control coping scores, DSR scores increased for individuals with one MDE [$(b = .016)$, $t(64) = 2.72$, $p = .008$], two MDEs [$(b = .019)$, $t(64) = 3.51$, $p < .001$], and 3 MDEs [$(b = .023)$,

$t(64) = 4.23, p < .001$]; among never-depressed individuals, increases in DSR scores showed a nonsignificant trend [$(b = .012), t(64) = 1.93, p = .058$]. Among individuals with higher secondary control coping scores, DSR scores did not change significantly, regardless of depression history.

The interaction of disengagement coping, number of previous MDEs, and time predicting trajectories of depressive symptoms was significant [$(b = .018), t(64) = 2.65, p = .010$; Table 3]. Simple slope analyses revealed that among individuals with higher disengagement scores, DSR scores increased for those with one MDE [$(b = .019), t(64) = 3.44, p = .001$], two MDEs [$(b = .030), t(64) = 4.73, p < .001$], and 3 MDEs [$(b = .040), t(64) = 5.04, p < .001$]; no significant change in DSR scores was found for never-depressed individuals [$(b = .009), t(64) = 1.40, p = .166$]. Among individuals with lower disengagement coping scores, DSR scores did not change significantly, regardless of depression history.

Full Model of Interactive Depression Vulnerability

Although childhood trauma exposure, dysfunctional attitudes, and coping factors each interacted with depression history and time to predict depressive symptom trajectories, strong inter-correlations were observed among these vulnerability factors (Table 2). To parse the unique effects of each vulnerability factor, we specified a full model that included all factors as main effects and moderators. Specifically, we tested whether the interactions of vulnerability factors, number of previous MDEs, and time predicted trajectories of depressive symptoms when entered simultaneously into a model controlling for aforementioned covariates. Results indicated that these 3-way interactions remained significant for dysfunctional attitudes [$(b = -.016), t(56) = -3.74, p = .001$], secondary control coping [$(b = -.012), t(56) = -3.60, p = .001$], and disengagement coping [$(b = -.016), t(56) = -2.21, p = .031$]; the 3-way interaction including primary control coping was reduced to a non-significant trend [$(b = -.010), t(56) = -1.91, p = .061$], and the interaction including childhood trauma became non-significant [$(b = -.0002), t(56) = -0.15, p = .881$].

Discussion

The present study investigated interactive models of depression vulnerability in a sample of young adults who varied in MDE history. These models tested whether number of prior MDEs – a well-established predictor of recurrence (e.g., Bockting et al., 2006) – moderated the relations between childhood trauma or cognitive factors (e.g., dysfunctional attitudes, coping) and the trajectories of depressive symptoms over a 6-month period. Separate analyses of each putative risk factor indicated that a greater number of prior MDEs combined with more childhood trauma exposure, more dysfunctional attitudes, or less use of adaptive coping strategies significantly predicted more rapid increases in depressive symptoms during the six-month interval. The final, full model, which included all risk factors simultaneously, revealed significant interactions of depression history with dysfunctional attitudes, secondary control coping, and disengagement coping. These findings extend prior research by demonstrating that prospective, within-person relations between certain vulnerability factors (i.e., childhood trauma, negative cognitions, coping) and depressive symptom trajectories were stronger for individuals with more prior MDEs,

and could be identified during remission even when controlling for recent stress levels and current depressive symptoms.

With regard to the measurement of childhood trauma, we used an idiographic ‘weakest link’ (Abela & Sarin, 2002) approach that focused on each individual’s most severe experience of physical abuse, sexual abuse, emotional abuse, or emotional neglect. Results indicated that greater childhood trauma predicted increases in depressive symptoms for individuals with two or more previous MDEs. The effect size for this interaction (Cohen’s $d = .66$) is considered medium-to-large. These findings complement a recent meta-analysis showing that childhood maltreatment is associated with increased risk for depression recurrence and poor treatment response (Nanni, Uher, & Danese, 2012). Several explanations for how childhood trauma may increase risk for recurrence of depression have been suggested such as through enhancing negative emotional reactivity to stressful life events (Rutter, 1989), lowering the threshold of dysphoric mood activation (Harkness, Bagby, & Kennedy, 2012), or increasing pituitary-adrenal and autonomic stress reactivity (Heim et al., 2000).

When childhood trauma was included as a moderator in the full model testing all vulnerability factors simultaneously, the interaction was non-significant, perhaps due to covariation with the other variables in the model. For example, childhood trauma may contribute to the development of the cognitive vulnerability (Gibb & Abela, 2008), which, in turn, increases risk for depression. Interestingly, dysfunctional attitudes and coping factors continued to moderate the relations between depression history and depressive symptom trajectories in the full model.

Both the individual and full models of depression vulnerability revealed that high levels of dysfunctional attitudes predicted increases in depressive symptoms in individuals with a history of recurrent depression, whereas among those with low dysfunctional attitude scores the relation between prior MDEs and depressive symptom trajectories was not significant. The effect size for this interaction (Cohen’s $d = .84$) is considered large. These results are consistent with a recent study showing that more dysfunctional attitudes predicted depression relapse and recurrence in patients with histories of recurrent depression (Jarrett et al., 2012).

The current results also are in line with the differential activation model of vulnerability to relapse (Teasdale, 1988), which proposes that the association between depressed mood and negative cognitions strengthens with each successive MDE, thereby increasing risk of recurrence (Segal, Williams, Teasdale, & Gemar, 1996). Alternatively, individuals with more recurrent MDEs may have had dysfunctional attitudes even *before* their first depressive episode. Prospective studies that follow high-risk individuals across first-onset and recurrent MDEs are needed to disentangle these various hypotheses.

Maladaptive coping (i.e., less use of primary and secondary control strategies; greater use of disengagement strategies) predicted increases in depressive symptoms for individuals with more prior MDEs. In contrast, among individuals who used more secondary control or less disengagement coping, a history of depression was not significantly associated with depressive symptom trajectories. For individuals with 3 or more prior MDEs, level of use of

primary control coping was unrelated to increases in depressive symptoms. Primary control coping strategies may not be effective in slowing the trajectory of subsequent depressive symptoms in individuals who have had many recurrent episodes as a result of changes in individual characteristics (e.g., stress sensitivity, executive function deficits, perceived control) or in environmental circumstances (e.g., frequency of uncontrollable stressors). Effect sizes for each individual coping model interactions ranged from medium to large (primary control coping Cohen's $d = .97$, secondary control coping Cohen's $d = .98$, disengagement coping Cohen's $d = .66$). When coping factors were included simultaneously in the full model of depression vulnerability, the interactions involving secondary control and disengagement coping remained significant.

A recent review of empirical studies examining the prophylactic effects of psychotherapy specifically targeting depression relapse and recurrence found that history of depression was a moderator (Beshai, Dobson, Bockting, & Quigley, 2011). Cognitive-behavioral and mindfulness-based interventions were found to be most effective for individuals with three or more prior MDEs. Beshai and colleagues suggested that greater acceptance of depression as a chronic and recurrent problem, which is a secondary control coping strategy, could explain why these individuals, in particular, benefit from treatment. Findings from the present study are consistent with this perspective; that is, among individuals with three or more prior MDEs, depressive symptoms did not increase significantly for those who reported higher scores on secondary control coping.

Limitations of the present study suggest directions for future research. First, findings should be replicated in larger samples of remitted and never depressed participants. Nevertheless, detecting significant, medium-to-large interaction effect sizes with a modest sample size supports the robustness of these results. Notably, based on a simulation study, the sample size in this study and the number of data points per participant is sufficient for providing unbiased estimates and standard errors in MLM (Maas & Hox, 2005).

Second, participants were not all assessed before their first MDE and following multiple recurrences; hence, we cannot determine whether childhood trauma, dysfunctional attitudes, or maladaptive coping were trait markers of vulnerability to recurrence (i.e., relatively stable factors present before their first MDE) or scar markers (i.e., dynamic factors that become increasingly capable of triggering recurrences after each successive MDE). Multi-wave prospective studies with large high-risk samples and longer follow-up periods are needed to rigorously parse the vulnerability and scar hypotheses. These studies should include repeated assessments of risk factors to allow for the specification of multilevel mediation models. Investigating changes in the efficacy of the different coping factors across depression recurrences is of particular interest.

The reliance on self-report measures was another limitation. Replication of findings with objective, interview-based measures of stressful life events and childhood trauma that assess contextual threat is needed. In the current study, we augmented data from the Perceived Events Scale by interviewing participants regarding the dates of each event endorsed. Finally, due to the small number of new cases of MDE that occurred during the follow-up

interval, we could not test the interactive vulnerability models with regard to new onsets of depressive episodes.

Strengths of the present study also should be noted. First, we tested interactive vulnerability models using an analytic approach that permitted examination of within-individual changes in weekly depressive symptom ratings and controlled for lagged depressive symptoms and stress levels. Second, the remitted-depressed design allowed us to examine potentially confounding ‘state effects’ of depression. Third, to address the issue of the correlations among trauma history, dysfunctional attitudes, and coping, we conducted a test of the full model that included each of these variables as moderators of the relation between depression history and subsequent depressive symptoms. Results of the full model showed that dysfunctional attitudes and coping each uniquely contributed to the increases in depressive symptoms.

The present study also has several important clinical implications. The finding that the vulnerability factors interacted with depression history to predict depressive symptom trajectories highlights the importance of conducting multi-dimensional assessments of risk factors for depression and examining the interplay among these factors over time. The current study found that relations between risk factors and depressive symptom trajectories were stronger for individuals with more prior MDEs. These results underscore the need for early intervention and prevention programs that target stress responsivity and coping early in the course of depression. Interventions should educate participants about stress sensitization processes and offer strategies for managing lower level stressors and daily hassles, which become increasingly capable of triggering depressed mood with each successive MDE. In addition, interventions for recurrent depression should aim to reduce mood-induced cognitive reactivity by enhancing individuals’ ability to “decenter” from negative cognitions (Watkins, Teasdale, & Williams, 2003). Finally, the results suggest that primary control coping, which often is taught in cognitive-behavioral interventions, may be less effective for individuals with multiple (i.e., 3 or more) MDEs. Rather, interventions for recurrent depression should focus on secondary control coping strategies that emphasize accommodation to stressful (and often uncontrollable) circumstances.

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Practitioner Points

- Findings highlight the need to conduct multi-dimensional assessments of depression vulnerability that examine the interplay among risk factors over time.
- Relations between vulnerability factors (childhood trauma, dysfunctional attitudes, maladaptive coping) and depressive symptoms were stronger for individuals with more prior major depressive episodes (MDEs).
- Interventions for recurrent depression should focus on secondary control coping strategies that emphasize accommodation to stressful life events.
- Future studies should assess high-risk individuals before their first MDE to determine whether vulnerability factors linked with recurrence are preexisting and relatively stable, or if they reflect ‘scars’ from MDEs.

Figure 1.

Interaction of childhood trauma and number of prior MDEs predicting depressive symptom trajectories. Simple slopes depict relations between prior MDEs and depressive symptom trajectories for individuals with higher (+1 standard deviation) and lower (−1 standard deviation) childhood trauma exposure. Estimated means are plotted for +/−1 standard deviation. ** $p < .01$; *** $p < .001$.

Figure 2.

Interaction of primary control coping and number of prior MDEs predicting depressive symptom trajectories. Simple slopes depict relations between previous MDEs and depressive symptom trajectories for individuals with higher (+1 standard deviation) and lower (−1 standard deviation) primary control coping scores. Estimated means are plotted for +/−1 standard deviation. ** $p < .01$; *** $p < .001$.

Table 1

Means and standard deviations of study variables for remitted depressed and never depressed participants.

	Remitted Depressed (n=32)	Never Depressed (n = 36)	RD vs. ND
	<i>M (SD)</i>	<i>M (SD)</i>	<i>t</i>
Age (years)	23.9 (3.9)	23.0 (3.9)	-0.98
Education (years)	15.5 (2.7)	15.1 (2.7)	-0.62
Socioeconomic Status (SES)	53.3 (11.6)	54.7 (12.7)	0.49
	<i>N (%)</i>	<i>N (%)</i>	χ^2
Sex			3.60
Male	8 (25.0)	17 (47.2)	
Female	24 (75.0)	19 (52.8)	
Race			1.76
Caucasian	23 (71.9)	28 (77.8)	
Non Caucasian	9 (28.1)	8 (22.2)	
	<i>M (SD)</i>	<i>M (SD)</i>	<i>F</i>
Depressive symptoms (BDI-II)	8.72 (6.6)	3.42 (3.4)	18.07***
Childhood trauma (CTQ)	11.56 (4.78)	7.56 (2.06)	12.25 ^a **
Dysfunctional Attitudes (DAS)	130.00 (30.1)	118.11 (22.6)	0.24 ^a
Coping Factors			
Primary Control Coping	0.19 (0.04)	0.22 (0.04)	1.74 ^a
Secondary Control Coping	0.23 (0.06)	0.26 (0.04)	0.03 ^a
Disengagement Coping	0.14 (0.03)	0.13 (0.02)	0.95 ^a

**
 $p < .01$;***
 $p < .001$;

^a = controlling for current depressive symptoms; RD = remitted depressed; ND = never depressed; BDI-II = Beck Depression Inventory, second edition; Childhood trauma = weakest link composite (most negative subscale score) of Childhood Trauma Questionnaire (CTQ); DAS = Dysfunctional Attitudes Scale

Table 2
Time 1 Correlations among Childhood Trauma, Dysfunctional Attitudes, and Coping Measures.

Variable	1	2	3	4	5	6
1. Depressive symptoms (BDI-II)	--					
2. Prior MDEs	.29*	--				
3. Childhood trauma	.34**	.05	--			
4. Dysfunctional attitudes (DAS)	.58***	.02	.36***	--		
5. Primary control coping	-.54***	-.003	-.40**	-.41**	--	
6. Secondary control coping	-.62***	-.15	-.44***	-.64***	.39**	--
7. Disengagement coping	.40**	-.13	.13	.36**	-.53***	-.33***

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

p < .001

Note: BDI-II = Beck Depression Inventory, second edition; Prior MDEs = number of previous major depressive episodes; Childhood trauma = weakest link composite score for Childhood Trauma Questionnaire; DAS = Dysfunctional Attitudes Scale

Table 3

Multilevel Models Predicting Depressive Symptom Ratings

Predictors	Early Trauma <i>b</i> (<i>SE</i>)	DAS <i>b</i> (<i>SE</i>)	Primary Coping <i>b</i> (<i>SE</i>)	Secondary Coping <i>b</i> (<i>SE</i>)	Disengagement <i>b</i> (<i>SE</i>)
Intercept	-.20 (.11)	-.25 (.10)*	-.25 (.10)*	-.23 (.10)*	-.30 (.10)**
Week	.01 (.00)*	.01 (.00)**	.01 (.00)**	.01 (.00)**	.01 (.00)**
Lagged Stress Level	.01 (.01)	.01 (.01)	.01 (.01)	.01 (.01)	.01 (.01)
Lagged DSR	-.21 (.05)***	-.21 (.05)***	-.21 (.05)***	-.22 (.04)***	-.21 (.05)***
Stress Person Mean	.00 (.00)	.01 (.00)	.01 (.00)	.01 (.00)	.01 (.00)
DSR Person Mean	.97 (.05)***	.99 (.05)***	.99 (.05)***	.99 (.05)***	.99 (.05)***
Beck Depression Inventory	-.02 (.02)	-.03 (.02)	-.03 (.02)	-.01 (.02)	-.02 (.02)
Prior MDE	-.41 (.11)**	-.26 (.08)**	-.37 (.09)***	-.16 (.08)	-.53 (.13)***
Predictor	-.02 (.08)	-.10 (.08)	.05 (.08)	.14 (.08)	-.20 (.08)*
Predictor × Week	.00 (.00)	.01 (.00)	-.00 (.00)	-.01 (.00)	.01 (.00)*
Predictor × Prior MDEs	-.42 (.18)*	-.17 (.05)**	.24 (.07)**	.17 (.04)**	-.37 (.14)*
Prior MDEs × Week	.02 (.01)***	.01 (.00)**	.02 (.00)***	.01 (.00)*	.03 (.01)***
Predictor × Prior MDEs × Week	.02 (.01)*	.01 (.00)**	-.01 (.00)***	-.01 (.00)***	.02 (.01)*

*
 $p < .05$;

**
 $p < .01$;

 $p < .001$

Note: DSR = Depressive Symptom Ratings; Prior MDEs = Prior Major Depressive Episodes; Stress = stress level; BDI = Beck Depression Inventory 2nd Edition at baseline; DAS = Dysfunctional Attitudes Scale; Primary Coping = Primary Control Coping; Secondary Coping = Secondary Control Coping; Disengagement = Disengagement Coping.