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Dampening of positive affect partially accounts for the association between women's history of child maltreatment and current depressive symptoms

Lindsey B. Stone[1*] and Alisha Sylvester[1]

Abstract

Background Child maltreatment exerts lasting effects on emotion regulation, which in turn accounts for adult's risk for psychopathology such as depression. In this vulnerable population, deficits in emotion regulation of negative affect are well established and include reliance on emotional suppression and rumination strategies. In contrast, alterations in the regulation of positive affect associated with child maltreatment history are less understood. We examined the role of positive rumination and dampening of positive affect, two emotion regulation strategies that may be impaired by the experience of child maltreatment and are associated with depression risk. We hypothesized that alterations in positive rumination and dampening would explain the association between women's childmaltreatment history and heightened risk for current depressive symptoms. To determine if positive affect regulation accounts for unique variance between child maltreatment history and depression risk we controlled for brooding rumination.

Methods Undergraduate women ($n = 122$) completed surveys on child maltreatment, depressive symptoms, and their tendency to dampen or engage in positive rumination in response to positive affect, reflecting cross-sectional data. The PROCESS macro, model 4 was run in SPSS to examine the extent to which emotion regulation strategies accounted for the association between child maltreatment history and current depressive symptoms.

Results Child maltreatment history was associated with a higher tendency to dampen positive affect but was not linked with positive rumination. Dampening partially explained the link between child maltreatment and women's current depressive symptoms. Dampening and brooding rumination each accounted for unique variance in the association between child maltreatment and depressive symptoms.

Conclusions Results suggest that emotion suppression strategies among child maltreatment survivors may also extend to positive affect, with impairments in specific regulation strategies. Currently dysphoric women with a history of child maltreatment tend to dampen their positive moods and reactions to events as well as ruminate on their dysphoric moods, both tendencies accounted for unique variance in current depression risk. Longitudinal research

*Correspondence:
Lindsey B. Stone
LindseyStone@georgiasouthern.edu

Full list of author information is available at the end of the article

is warranted to clarify the role of alterations in positive emotion regulations strategies in understanding how child maltreatment fosters risk for psychopathology such as depression.

Keywords Child maltreatment, Depression, Dampening, Positive rumination, Emotion regulation

Background

Child maltreatment refers to the abuse (sexual, emotional, or physical) and/or neglect (physical, or emotional) of children from the time of birth to age 18 [1] and is an acknowledged global threat to public health and human rights [2]. Unfortunately, though horrific, child maltreatment is not rare and rates have increased in the wake of the COVID-19 pandemic [3]. In 2022 over 7 per 1,000 children experienced child maltreatment, with 558,899 cases submitted to Child Protective Services (CPS) in the United States [4]. This is likely an under-estimate, given most cases are reported to CPS via informants (e.g., teachers, police) and rates of child maltreatment are exponentially higher when self-report data is collected [5].

Child maltreatment is frequently chronic in nature and increases transdiagnostic risk for a range of psychopathology across the lifespan, including Major Depressive Disorder (MDD) [6–9]. Child maltreatment is also a predictor of suicidal ideation and attempts [10, 11] a common symptom and risk associated with depression. MDD is one of the most common mental illnesses that has increased in prevalence over the past decade and in response to the COVID-19 pandemic [12]. MDD is also frequently a debilitating disorder [13, 14]. Among individuals with MDD, those with a history of child maltreatment tend to have a poorer prognosis, with lower treatment response, and experience more severe, chronic depression and associated difficulties across the lifespan [15, 16]. Delineating how the experience of child maltreatment fosters risk for psychopathology such as MDD is critical to divert risk for chronic struggles with mental health.

Girls experience higher rates of child abuse than boys. This pattern is one of multiple risk factors theorized to work synergistically (interacting with genetic risk, personality, cognitive vulnerability etc.) to account for gender differences in MDD [17]. Research consistently supports that girls experience higher rates of child maltreatment than boys, particularly sexual abuse [18]. Starting in adolescence, girls are twice as likely to develop MDD as boys, and this gender difference is maintained across the lifespan [19, 20]. There is also evidence of gender moderation, such that child abuse [21] or child physical abuse specifically [6] has been found to increase vulnerability to depression among women; but not men. Therefore, understanding how child maltreatment increases risk for depression among girls and women is particularly essential.

One mechanism by which child maltreatment fosters chronic risk for depression is by impairing emotion regulation [22]. Emotion regulation refers to the internal and external processes by which an individual, monitors, evaluates and modifies emotions in order to achieve their goals [23], and necessarily involves initial emotional activation to stimuli/events [24]. Thus, emotion regulation includes both automatic as well as ongoing voluntary processes, that may reflect relevant prevention and intervention targets. Substantial evidence supports that child maltreatment alters emotion regulation of negative affect. Individuals with child maltreatment history display hypervigilant emotional reactivity to potential threats (corresponding with alterations in neural, autonomic and neuro-endocrine stress response systems) [25–32], which they then struggle to down-regulate [8, 33]. The impairment in down-regulation of negative affect is due to reliance on maladaptive regulation strategies such as emotional suppression and brooding rumination [34–37]. Emotional suppression involves efforts to lessen or diminish internal experiences of distress as well as minimizing emotional expressions. Emotional suppression is ineffective at down-regulating negative affect; serving to maintain sadness, fear, anger in the short-term, and increase risk for depression prospectively [38]. Brooding rumination, or the tendency to dwell on negative moods and related events [39] serves to amplify negative emotions in the short term and fosters depression risk among youth and adults long-term [40, 41]. A recent meta-analysis supports that rumination mediates the relationship between child maltreatment and risk for psychopathology [42]. Thus, research confidently supports that child maltreatment leads to deficits in down-regulating negative affect at least partially due to avoidant and perseverative strategies (such as suppression and rumination respectively) that serve as one mechanisms of risk between child maltreatment history and depression.

In contrast, although there is ample evidence that child maltreatment also impairs positive affective functioning, how emotion regulation strategies of positive affect are altered remains unclear. Research consistently shows that child maltreatment is associated with blunted initial emotional reactivity to positive stimuli and events [43, 44], corresponding with deficits in neural regions implicated in reward sensitivity [8, 43, 45, 46]. Further, research on positive moods (sustained emotions over time) supports individuals with a history of child maltreatment report less frequent and less intense positive moods and experience higher levels of anhedonia [47–50]. How initial

blunted emotional reactivity to positive events leads to chronic deficits in positive moods seen in this vulnerable population is not currently known. The strategies individuals employ on an ongoing daily basis to regulate their experience with positive emotions and events may explain this link. We propose individuals with a history of child maltreatment may also struggle to upregulate positive affect in response to and anticipation of rewards and initial experiences of positive affect whether happiness, excitement, or surprise.

Reliance on ineffective strategies such as emotional suppression and rumination for down-regulating negative affect may inform the use of a similar (repetitive and avoidant) strategy that serves to hinder upregulation of positive affect. Dampening refers to the tendency to stifle positive moods and ongoing reactions to events *as or after they are acknowledged or felt* [51], reflecting emotional suppression of positive affect. For example, an individual may respond to joy with unease or focus on how the present feeling of joy will not last, which in turn lessens the emotional experience instead of amplifying or sustaining the feeling. The tendency to down-regulate or suppress positive affect and thoughts in the moment may lead to deficits in positive moods (or anhedonia) over time. In line with this theory, dampening increases risk for depressive symptoms [51–53] and anhedonia even when greater positive life events occur [54]. To date there is limited research on whether the tendency to suppress (or dampen) extends to positive emotions and experiences in this vulnerable population. Dampening has been linked with Post-Traumatic Stress Disorder (PTSD) [55]. Individuals who tend to dampen positive affect and report stressful life events or having lost a loved one are at heightened risk for PTSD symptoms [56, 57]. This pattern may indicate that dampening is associated with a history of trauma, or alternatively moderation, such that individuals who experience traumatic events *and* tend to dampen positive affect are at heightened risk for PTSD. To our knowledge, only one study has linked dampening of positive affect with childhood trauma severity, and found that dampening indirectly explained the association between childhood trauma history and current (PTSD) symptoms [58]. Similar to other repetitive emotion regulation strategies (rumination/worry), dampening likely involves both automatic processes and voluntary aspects under individuals' control. Understanding whether women with a history of child maltreatment tend to dampen their positive emotions and experiences may have clinical implications given that dampening has voluntary components that may be malleable when targeted in psychosocial interventions.

Alternatively, impairments in upregulating positive affect among individuals with a history of child maltreatment may be due to a lack of reliance on adaptive emotion regulation strategies that amplify and maintain positive affective experiences. Positive rumination refers to the tendency to react to positive affect and stimuli by focusing on positive self-qualities (self-focused positive rumination) and/or focus on enjoying the affective and bodily experience (emotion-focused rumination) [51]. Thus, although both positive rumination and dampening involve mindful responses to ongoing positive experiences, positive rumination involves approach strategies designed to focus-on, savor and maintain the moment, in contrast to the goal of suppressing the experience with dampening. Deficits in positive rumination would align with the research supporting reward insensitivity seen among individuals with a history of maltreatment. The implication would be that the lack of positive moods (anhedonia) in this population could be driven by a lack of awareness to mindfully tend to and experience positive experiences as they occur, perhaps due to deficits in recognizing and learning from positive experiences [59]. Positive rumination has consistently been linked with depression risk [51, 56, 60], however the role of positive rumination among individuals with a history of child maltreatment is less certain. While some studies have found an association between lower positive rumination and heightened PTSD symptom severity [55, 61] others have failed to find a significant association [56–58]. One explanation may be that most research has not focused specifically on history of childhood maltreatment. The initial study to examine this link failed to find an association between childhood trauma severity and positive rumination among a sample of indivuals with a history of childhood trauma [58]. Thus, exploring if positive rumination is more common among individuals without child maltreatment history has not yet been done. Overall the evidence for anticipating positive rumination to explain the assocation between childhood maltreatment and current depressive symptoms is less certain, but replication of initial findings are warranted before discounting this regulation strategy.

Reliance on dampening of positive affect and deficits in positive rumination may be common emotion regulation patterns among individuals with child maltreatment history for several reasons. The combination of reduced motivation for positive stimuli paired with enhanced emotional reactivity to threatening stimuli among child maltreatment survivors is thought to be particularly detrimental to resilience and mental well-being [33]. This pattern has been interpreted as a strategic survival strategy whereby individuals prioritize avoiding threats and thus are motivated to focus on avoiding punishment instead of seeking or savoring rewards [62]. Thus, women with a history of child maltreatment may minimize positive rumination and instead dampen their responses to positive experiences to maintain safety by

keeping resources alert to threats in the environment. In this scenario, down-regulation of positive affect (whether engaged in consciously or not) may have been an adaptive strategy for navigating a currently threatening environment in childhood.

Additional reasons to suspect links to dampening and positive rumination is that child maltreatment has insidious effects on youth's developing identity, sense of self-worth and self-esteem [63–66]. Individuals with a history child maltreatment may feel they are undeserving of positive experiences, thus positive events and emotions may also elicit co-occurring feelings of shame and discomfort [67], which might interfere with the capacity to engage in emotion-focused or self-focused positive rumination. Furthermore, evidence supports that trauma history alters long term memory, including impairments in retrieving, maintaining, and integrating positive autobiographical memories over time [68, 69, 70]. Thus, there are also reasons to suspect that women with a history of child maltreatment may be less likely to engage in positive rumination to enhance the experience of positive events and/or instead may be more likely to dampen positive emotions and reactions, such that they may not identify with positive experiences, and thus are less likely to focus on actions, thoughts, or situations that may illicit and maintain positive feelings. It is worth noting that though positive rumination and dampening each involve voluntary aspects, engaging in or avoiding either strategy is not necessarily intentional (consciously done) nor fully understood by the individual, which still leaves ample opportunity for cognitive interventions if clinically indicated. The primary aim of the current study was to examine if dampening and positive rumination explained the association between child maltreatment and current depressive symptoms among emerging-adult women.

Undergraduate women were recruited to complete self-report measures on dampening, positive rumination, brooding rumination, child maltreatment history and current depressive symptoms. We hypothesized (H1) that women with a history of child maltreatment would report a higher tendency to dampen and lower tendency to engage in positive rumination in response to positive affect and positive stimuli. We then hypothesized (H2) that dampening and positive rumination would explain the association between history of child maltreatment and higher depressive symptom levels. That is, we expected an indirect effect between child maltreatment severity and depressive symptoms such that child maltreatment severity would be associated with impaired regulation of positive affect (lower positive rumination and higher dampening tendency), which in turn would be associated with higher current depressive symptom levels. Although we are testing a statistical mediation model "exploring how a third variable affects the relation between two other variables," we intentionally avoid the term 'mediation' given the common connotation of testing directional, causal pathways that we are unable to explore with cross-sectional data [71]. That said, experts have called for identifying modifiable targets in trauma informed care [72]. Our study provides one of the initial examinations on the role of positive rumination and dampening as emotion regulation strategies with modifiable aspects not currently included in suggested treatment and prevention targets for individuals with a history of child maltreatment [73].

For positive rumination and/or dampening to have clinical utility, either strategy needs to account for unique variance in the association between child maltreatment history and current depressive symptom levels. That is, to justify further research and resources on deficits in regulation of positive affect, either positive rumination and/or dampening should account for additional, unique variance in depression risk after controlling for established mechanisms, such as dysregulation of negative affect. Therefore, we also examined whether positive rumination and dampening of positive affect continued to account for variance in the link between child maltreatment history and women's current depressive symptom levels after covarying for brooding rumination. This model allows an examination of whether impairments in upregulating positive affect captures distinct risk from impairments in downregulating negative affect among individuals with child maltreatment history. We hypothesized (H3) that both brooding rumination *and* positive rumination/ dampening would account for heightened risk for depressive symptoms among women with greater child maltreatment history.

Methods

Participants and procedure

Undergraduate women were recruited from the research participant pool of a small liberal arts college in the southeastern US ($n = 122$). Undergraduates currently enrolled in psychology classes could enroll to participate in a study on emotion regulation through SONA (participant pool management software system). Interested potential participants received instructions to refrain from drinking alcohol 48 h beforehand and refrain from smoking cigarettes the day of the visit. Potential participants came to the on-campus laboratory for a one-hour visit during which they completed self-report questionnaires as well as psychophysiological assessments as part of a larger study on emotion regulation. At the onset of the visit, written informed consent was first obtained before proceeding with the study. Demographic details for the sample are presented in Table 1. Ages ranged between 18 and 22, except one participant was 37.

Table 1 Sample characteristics

Demographics	Range	Mean	SD
Age	18–37	20.03	1.94
Race, *n* (%)		97	80%
White		11	9%
Multi-Racial		10	8%
Black/African American		4	3%
Asian			
Hispanic ethnicity, *n* (%)		6	5%
BMI	17.60–41.90	23.62	4.51
SSRIs, *n* (%)		16	13%

Note: BMI: body mass index; SSRIs: participants currently prescribed selective serotonin reuptake inhibitors

Participants received course credit as compensation for their time.

Measures

Depressive symptoms were assessed via the Center of Epidemiologic Studies Depression scale which was designed to assess depression symptoms in the general population [CES-D: 74]. Internal reliability in our sample was excellent (α = 0.87). Summary scores ranged from 0 to 44, with 25% of the sample scoring at or above the cut-off (≥ 21) for moderate depressive symptoms among college aged samples [75]. Research consistently supports that depression presents along a continuum rather than as discrete categories [76, 77]. Therefore, depressive symptoms was entered as a continuous variable in all analyses in the current study.

Child maltreatment history was examined via the Child Trauma Questionnaire [CTQ: 78]. The CTQ has 25 items that are rated on a 5-point Likert-type scale, with response options ranging from "*Never true*" to "*Very often true*." The CTQ has five subscales: child sexual abuse, physical abuse, emotional abuse, emotional neglect, and physical neglect. Each scale has five items. Subscale scores may be calculated by summing responses within each abuse/neglect subtype. Alternatively, all items may be summed for a total score of child maltreatment. The CTQ provides established thresholds to determine moderate levels of abuse (or higher) for each subscale. In the current sample of 122 women, 30 reported experiencing one or more types of at least moderate levels of abuse and/or neglect (25% of the sample), with comorbid subtypes common. Given that child maltreatment severity is dimensional in nature [79, 80] and the comorbidity of maltreatment in the current sample, childhood maltreatment was calculated by summing across all 25 items for one continuous variable. The CTQ has demonstrated excellent psychometric properties in both clinical and nonclinical samples, including high levels of concurrent validity with therapists' ratings of abuse [78, 81]. Internal validity in the current sample was high (α = 0.90).

Positive affect regulation strategies were measured via the Response to Positive Affect scale [RPA: 51]. The RPA has 17 items and asks participants to think about how they respond when they feel happy. The RPA has three subscales. Self-focused positive rumination is assessed via 4-items, e.g., *When you are feeling happy how often do you think "I am living up to my potential".* Emotion-focused rumination is assessed via 5-items, e.g., *When you are feeling happy how often do you "think about how happy you feel? ".* The dampening subscale has 8-items, e.g., *When you are feeling happy how often do you think, "I don't deserve this."* The RPA has a Likert-type format with responses ranging from 1 *almost never* to 4 *almost always and* is scored by summing all subscale items. In the current study internal reliability was good for the dampening scale (α = 0.83). In contrast neither positive rumination subscale met typical internal reliability standards independently (α = 0.62 for each). When emotion-focused and self-focused positive rumination items were combined for a general score of positive rumination, satisfactory internal reliability was met (α = 0.77). Thus, only two emotion regulation strategies of positive affect were examined in analyses: dampening and general positive rumination.

Rumination was measured via the brooding subscale of the Ruminative Response Scale [RRS-B: 82]. The RRS-B has 10-items and two subscales, reflection and brooding. The RRS-B asks participants to consider what they usually do when they feel sad. Answers are given via a Likert-type format ranging from 1 *almost never* to 4 *almost always.* We focused on the 5-item brooding subscale (α = 0.70), given that brooding has consistently been found to be the more maladaptive component associated with psychopathology risk, including depression [82]. The brooding subscale exhibited satisfactory internal reliability in the current sample (α = 0.75).

Data analytic method

Pearson correlations were conducted to examine the bivariate associations between child maltreatment history, emotion regulation strategies, and depressive symptoms. The PROCESS SPSS Macro 3.3, [Model 4, 83] was used to simultaneously test direct and indirect effects on depressive symptoms. Models were run by generating bias-corrected bootstrapped effect with 95% confidence intervals (CI). The indirect path (child maltreatment → dampening/ positive rumination → depressive symptom levels) is interpreted as statistically significant if the CI does not include zero, indicating that dampening and/or positive rumination serve as intervening variables that explain variance in the association between child maltreatment history and current depressive symptom levels. Given the cross-sectional nature of the data, we also examined an alternative model where dampening/

positive rumination served as the independent variable and entered child maltreatment as the intervening variable.

Results

Data preparation

Some survey item-level data was missing (< 0.01%). To justify data imputation via maximum likelihood estimation, we examined if data were missing at random [84]. Little's missing completely at random test was non-significant, $\chi^2(428) = 435.324$, $p = .394$, supporting the imputation of missing values [85]. Next, we explored whether variables were significantly skewed, which could compromise results. Transformations were applied to depressive symptoms (square root), dampening (log) and child maltreatment (inverse) to meet assumptions of normality. To ensure that results could not be attributed to suppressor effects, we display bivariate correlations in Table 2.

H1: Is child maltreatment history associated with positive rumination and/or dampening of positive affect?

Our first hypothesis was only partially supported. Women who reported a greater history of child maltreatment were significantly more likely to dampen positive affect ($r = .31$, $p < .001$). Consistent with prior research, dampening was associated with higher current depressive symptom levels ($r = .60$, $p < .001$). In contrast, positive rumination was not associated with child maltreatment severity ($r = -.05$, $p = .582$) nor current depressive symptom levels ($r = -.11$, $p = .238$). Thus, the role of positive rumination could not be explored further.

H2: Does dampening account for the link between child maltreatment history and women's current depressive symptom levels?

We continued to test if dampening accounted for the association between child maltreatment history and higher current depressive symptoms levels. Model results are displayed in Fig. 1A. Child maltreatment history accounted for 14% of the variance in depressive symptom levels. With the addition of dampening as a predictor, the model explained substantially more variance ($R^2 = .40$, $p < .001$) in depressive symptom levels. Both child maltreatment, $t(120) = 2.67$, $p = .009$, $\beta = 0.20$, and dampening, $t(120) = 7.17$, $p < .001$, $\beta = 0.54$, continued to be associated with higher depressive symptom levels. The indirect path (child maltreatment → dampening → depressive symptoms) was significant: $\alpha\beta = 0.17$, (95% CI: 0.07–0.26). Since the direct effect of child maltreatment remained significant, this pattern indicates that dampening only partially accounted for the association between child maltreatment and women's current depressive symptom levels.

We next tested the alternative model swapping the role of dampening and child maltreatment history. The indirect path (dampening → child maltreatment → depressive symptoms) was also statistically significant: $\alpha\beta = 0.06$, (95% CI: 0.01–0.14) but with a notably smaller effect size. This small effect likely reflects the cross-sectional nature of the data, given there is not a chronological rationale to anticipate this direction of effects.

H3: Does dampening continue to account for unique variance after covarying for the indirect effect of rumination between child maltreatment history and current depressive symptom levels?

To determine if dampening accounted for *unique* variance in women's depressive symptoms the model was re-run with rumination and dampening as simultaneous predictors. Results are displayed in Fig. 1B. This model explained half the variance, $R^2 = .50$, $p < .001$) in depressive symptom levels. Both rumination, $t(119) = 5.00$, $p < .001$, $\beta = 0.39$, and dampening, $t(119) = 4.53$, $p < .001$, $\beta = 0.35$, were associated with higher current depressive symptom levels. The indirect effect of dampening between child maltreatment and depressive symptom levels remained significant, $\alpha\beta = 0.11$, (95% CI: 0.04–0.19), even with the significant indirect effect of rumination, $\delta\varepsilon = 0.12$, (95% CI: 0.05–0.20). With both dampening and rumination in the model, the direct association between child maltreatment history and current depressive symptom levels was no longer statistically significant, $t(119) = 1.97$, $p = .051$, $\beta = 0.14$. This pattern suggests that dampening and rumination account for the association between child maltreatment and higher current depressive symptom levels.

Table 2 Bivariate associations and variable statistics

Variables	1	2	3	4	Raw		Transformed	
					Mean	SD	Mean	SD
1 Child Maltreatment	—				33.98	10.30	0.03	0.07
2 Positive Rumination	-0.05	—			24.46	4.30	—	—
3 Dampening	0.31***	0.04	—		13.38	4.10	1.11	0.12
4 Brooding Rumination	0.31***	0.03	0.53***	—	11.43	3.17	—	—
5 Depressive Symptoms	0.37***	-0.11	0.60***	0.62***	15.98	9.34	3.81	1.20

Note: raw scores are presented for clarity

***$p < .001$

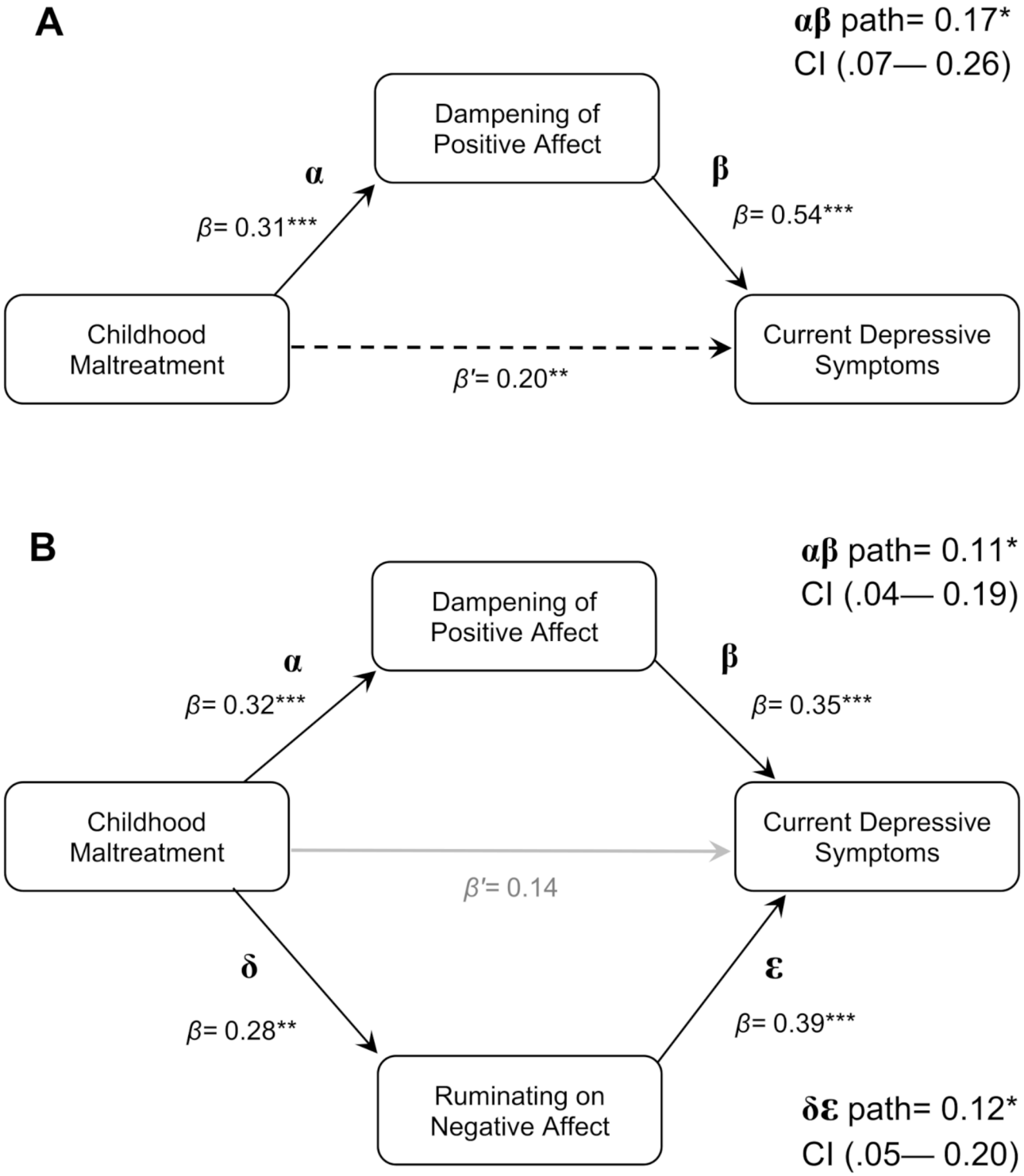

Fig. 1 Ineffective strategies for regulating positive and negative affect accounted for the association between childhood maltreatment and women's current depressive symptoms. *** $p < .001$, ** $p < .01$, * $p < .05$

Finally, we considered whether the model held when controlling for current psychiatric intervention. Sixteen women were currently on SSRI's, which correlated with depressive symptom severity in the current sample, $t(120) = 2.51$, $p = .014$. The model was re-run covarying for current SSRI medication (present/absent). Both indirect paths of dampening and rumination on the link between child maltreatment and current depressive symptoms maintained statistical significance: $\alpha\beta = 0.11$, (95% CI: 0.04–0.18), $\delta\varepsilon = 0.12$, (95% CI: 0.05–0.19). The association

between SSRI's and current depressive symptoms was no longer significant, $t(118) = 0.88$, $p = .378$, $\beta = 0.06$. This suggests that the alterations in positive and negative emotion regulation strategies associated with current depression severity were not driven by current psychiatric intervention.

Discussion

Reliance on maladaptive emotion regulation strategies for down regulating negative affect, including rumination, reflects one mechanism by which child maltreatment increases risk for psychopathology such as depression across the lifespan. The goal of the current study was to extend current research on emotion regulation strategies of positive affect that may be implicated in the link between child maltreatment severity and depression risk among emerging adult women. We found that child maltreatment severity was associated with a tendency to dampen positive affect but was not linked with positive rumination. Further, dampening continued to explain unique variance in the association between child maltreatment severity and current depressive symptom levels after controlling for brooding rumination. Results provide preliminary data indicating the need to examine the role of alterations in regulating positive affect among individuals with child maltreatment history.

The association between child maltreatment history and dampening in the current sample aligns with research indicating that the experience of child maltreatment may alter upregulation of positive affect. Individuals with a history of child maltreatment tend to not to be motivated by rewards [62], and may even experience discomfort or shame during positive experiences [67]. Child maltreatment history has long been associated with maladaptive emotion regulation of negative affect including emotional suppression [42]. To our knowledge the current study is one of the first to assess the link between child maltreatment severity and a greater tendency to dampen positive moods and reactions. The pattern of findings replicates and extends one prior study conducted among individuals with trauma history [58]. The current results suggest that women with a greater history of childhood maltreatment tend to suppress their experiences of positive affect. Consistent suppression of positive affect over time may explain why individuals with child maltreatment history report higher levels of anhedonia in their daily lives [48, 49, 86, 87].

We found that ineffective emotion regulation of positive and negative affect each explained significant variance in the association between child maltreatment history and women's current depressive symptom levels. Both dampening and brooding rumination served as significant intervening variables, each accounting for unique variance in the association between child maltreatment history and current depressive risk. This model is exciting for multiple reasons. Brooding rumination is a strong, established risk factor for depression among both children and adults [40], as well as a mechanism of risk between child maltreatment and depression [42]. Therefore, the current results support the robustness of the effect of dampening, with emotional suppression of positive affect reflecting a separate alteration in emotion regulation that accounted for women with child maltreatment history having heightened depression risk. Additionally, our results are consistent with an initial study demonstrating dampening accounted for the association between child maltreatment severity and current PTSD symptoms [58]. Taken together, initial research suggests that child maltreatment history is linked with difficulty with down-regulating negative affect and upregulating positive affect, with each impairment accounting for unique risk in current psychological distress in young women. Given the established role of rumination as a mechanism of risk between child maltreatment and depression, future research clarifying the role of dampening between child maltreatment and prospective risk for psychopathology is warranted. Cross-sectional data limits our capacity to interpret directional effects between child maltreatment, dampening, and depression risk in the current study. It is also possible that women currently struggling with depressive symptoms have a higher tendency to dampen positive affect, and history of child maltreatment identifies which individuals engage in dampening among dysphoric adults. Though, given that dampening is a risk factor for depression that maintains and exacerbates depressive symptoms [51–53], identifying which dysphoric clients dampen may still have important treatment implications.

Finding that positive rumination was not associated with young women's depression risk or child maltreatment history contributes to a mixed literature on the role of this regulation strategy. The lack of association between positive rumination and depressive symptoms contrasts prior research supporting an association between positive rumination and depression risk [51, 56, 60]. Our failing to find an association between positive rumination and child maltreatment aligns with the one other study to examine this association [58], and other research indicating positive rumination is not linked with PTSD risk [56–58]. Taken together, research to date suggests that positive rumination may not be a regulation strategy implicated in the link between child maltreatment and associated distress. However, the inconsistency across studies may also suggest future research that examines potential moderators will account for current discrepancies.

The current results converge with ongoing research supporting the role of alterations in emotion regulation

of both positive and negative affect among individuals with a history of child maltreatment and offer multiple theoretical implications. Finding that rumination and dampening each served as intervening variables between child maltreatment and current depressive symptoms aligns with research supporting that the combination of alterations in responding to positive and negative experiences among individuals with child maltreatment history is especially caustic for increasing vulnerability to psychopathology [62]. Substantial research supports that individuals with a history of child maltreatment display deficits in reward sensitivity coinciding with alterations in neural activation [8, 43, 45, 46]. One possibility of the current results is that the blunted emotional responses displayed to positive stimuli may be at least partially driven by a regulation strategy with voluntary aspects that suppresses emotional responses to positive stimuli, rather than only reflecting a fixed neurobiological scar of trauma history. Additionally, individuals with trauma histories also display deficits in their long-term memory of positive events [68, 70], and long term memory deficits are implicated in depression risk [88, 89]. Thus, another possibility is that dampening may contribute to the impairments seen in individuals with maltreatment history inability to consolidate positive experiences into their autobiographical memory. Future, longitudinal research is necessary to support the potential role of dampening as a risk factor in both potential implications. Taken together, finding that dampening explains unique variance between child maltreatment and women's depressive symptoms aligns with prior models on the role of emotional suppression in fostering risk in this vulnerable population. These preliminary results may suggest exciting directions for future research such as exploring whether dampening, as an emotion regulation strategy with modifiable aspects, contributes to the alterations in reward sensitivity, long-term memory, and higher levels of anhedonia displayed in individuals with a history of child maltreatment.

With the high rate of moderate depressive symptoms levels in the current sample (25%), we also consider whether the current sample is representative of undergraduate women. Rates of MDD have been increasing among adolescent and adults samples, even before the COVID-19 pandemic [90]. In a national US sample ($N > 275{,}000$) that stratified data by age, rates of MDD were highest among young adults (18–25) in 2020 (17.2%) [91]. We would expect this statistic to be much closer to the high rates in the current sample if the rates were reported only among young women. A meta-analysis examining rates of MDD in college students found the average rate of clinically significant depressive symptoms was 30.6% [92]. Thus, although depressive symptoms levels are high in this sample, it is unfortunately consistent with the high rate of MDD in emerging adults in higher education.

Clinical implications are limited by the cross-sectional nature of the data. The current results emphasize the utility of assessing child maltreatment history and emotion regulation strategies for positive and negative affect when working with depressed women. Dampening has been found to maintain and exacerbate depressive symptoms [51–53]. As an emotion regulation strategy with voluntary aspects, targeting dampening in treatment may be beneficial. Future research is needed to determine the role of dampening as a potential risk factor and/or maintenance factor of MDD and other forms of psychopathology among individuals with a history of child maltreatment.

Several limitations of the current study must be acknowledged. Foremost, the cross-sectional data makes it impossible to explore directional effects between child maltreatment, dampening and depressive symptoms. Future, longitudinal research is warranted. Additionally, our assessment of child maltreatment was limited to retrospective report, which has inherent limitations, including memory deficits and mood bias. Further, there are several potential sources of variance that we were not able to control for in the current study. Variance in depressive symptoms could also have been affected by current and historical psychotherapy and psychiatric treatment. Alterations in cognition including attention, memory, learning and executive functioning are also established in major depression disorder [93], thus future work examining the unique effects of emotion regulation strategies should also assess these potential sources of influence. There was also very little diversity in the current sample (including ethnic/racial, sexual orientation and/or gender diversity). Since marginalized communities also experience dehumanizing microaggressions chronically, on a frequent, daily basis [94, 95], it would be inappropriate to generalize results beyond white, middle class, cisgender, heterosexual women. Therefore, further research is needed to understand the role of emotion regulation strategies on child maltreatment history among marginalized groups, especially given the strong links between racial discrimination, transphobia and homophobia on vulnerability to depression [96–98]. The effects of discrimination may also emerge during childhood/adolescence [99] and tend to be more pronounced for BIPOC girls [100]. Thus, we encourage further research to explore the function of emotion regulation strategies, such as dampening, between the experiences of marginalization and child maltreatment and risk for depression.

Conclusions

In summary, the current results highlight the need for clarifying the function of positive emotion regulation strategies among individuals with child maltreatment history. Findings support specificity in which positive emotion regulation strategies account for depression risk among this vulnerable population (specifically dampening, not positive rumination). Further, brooding rumination and dampening of positive affect each accounted for unique variance in explaining the link between child maltreatment and depressive symptoms. This pattern aligns with literature supporting that impairments in the regulation of positive and negative emotions are implicated in how child maltreatment fosters risk for psychopathology across the lifespan. Future, longitudinal studies are needed to better understand the role of emotion regulation of positive affect in risk and resilience models of psychopathology among individuals who have experienced child maltreatment.

Abbreviations

MDD	Major depressive disorder
PAF	Positive affective functioning
PTSD	Post-traumatic stress disorder
SSRIs	Selective serotonin re-uptake inhibitors

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Author contributions

LS developed the study design and oversaw data collection and analyses. Both authors contributed to the literature review and manuscript writing.

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Data availability

The data that support the findings of this study are not publicly available due to ongoing analyses but are available from the corresponding author, L. Stone, upon reasonable request.

Declarations

Ethics approval and consent to participate

This research was approved by Christopher Newport University (CNU), where Dr. Stone recently worked when data was collected. All methods were performed in accordance with CNU's Institutional Review Board guidelines and regulations (#1308936). At the outset of the assessment, informed consent was obtained in writing.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]Department of Psychology, Georgia Southern University, PO Box 8041, Statesboro, GA 30460, USA

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