

Emotion Regulation Partially Mediates the Relation Between Stressful Life Event Exposure and
Adolescent Psychopathology

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Abstract

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Stressful life event exposure (SLEE) is robustly linked with adolescent psychopathology, and prior work suggests emotion regulation (ER) may mediate this relation. However, research incorporating experiences of gender diverse (GD) adolescents has been lacking, despite elevated rates of SLEE and psychopathology in GD individuals. This study examined gender and sex differences in relations between SLEE, ER, and psychopathology in the longitudinal Adolescent Brain Cognitive Development (ABCD) Study. One thousand five hundred eighty-one cisgender (cis) boys, 1439 cis girls, and 169 GD adolescents reported SLEE via the Life Events Scale in early adolescence ($M \pm SD$: 12.00 $\pm$ 0.65 years), ER difficulties via the Difficulties in Emotion Regulation Scale-Parent Report one year later ($M \pm SD$: 12.93 $\pm$ 0.64 years), and

internalizing and externalizing psychopathology symptoms via the Brief Problem Monitor-Youth Report an additional year later ($M \pm SD$: 14.13 $\pm$ 0.68 years). Mediation and moderated mediation analyses were conducted using conditional process modeling. ER difficulties partially mediated relations between SLEE and psychopathology symptoms. Gender moderated relations between SLEE and internalizing symptoms, but not externalizing symptoms, such that direct relations between SLEE and internalizing symptoms were stronger for GD youth and cis girls compared to cis boys. Moderated mediation models with gender as the moderator explained more variance in internalizing symptoms compared to models with sex as the moderator, while models with gender and sex explained similar amounts of variance in externalizing symptoms. Findings highlighted: (1) ER difficulties as a partial mediator of relations between SLEE and psychopathology, and (2) differences in direct relations between SLEE and internalizing symptoms based on gender.

1. Introduction

Adolescence is a period of significant growth and discovery marked by changes with potentially lifelong effects (Dahl et al., 2018; Patton et al., 2018). Many psychological disorders have their initial onset during adolescence, and the peak age of onset of psychiatric disorders is 14.5 years old (Solmi et al., 2022). Additionally, rates of anxiety disorders, depression, and substance use disorders increase from late childhood to early adolescence, and approximately 20% of adolescents have a diagnosed psychiatric disorder (Costello et al., 2011). Adolescence is therefore a crucial period in which to study psychopathology.

Stressful life event exposure (SLEE) is a robust risk factor for the development of psychiatric disorders in adolescence. Higher rates of adolescent psychopathology including suicidality, depression, aggression, rule-breaking, and alcohol and drug use have all been linked to exposure to stressful childhood experiences (Duke et al., 2010; Leban & Gibson, 2020; Yu et al., 2024). Childhood SLEE is also associated with difficulties with emotion regulation (ER), or the ability to identify, assess, and alter or maintain an emotional state to attain one's goals in a given context (McLaughlin & Lambert, 2017; Silvers, 2022). Given the strong link between adolescent emotion dysregulation and psychopathology (Beauchaine, 2015; Brackett et al., 2016; Johnstone & Walter, 2014; Mathews et al., 2014; Sheppes, 2014; Zeman et al., 2006), a better understanding of relations between SLEE, ER difficulties, and psychopathology may shed light on the mechanisms underlying the development of adolescent psychopathology.

1.1. Mediating role of emotion regulation

Developing self-regulation skills is a key task of adolescence. Emerging social situations and increasing emphasis on peer relationships lead to novel socioemotional contexts and goals

which may necessitate new or more nuanced forms of ER in adolescence (Silvers, 2022).

Additionally, neurobiological changes in adolescence support executive function and cognitive development which facilitate the use of new ER strategies such as cognitive reappraisal (Compas et al., 2017; Pessoa & Pereira, 2013; Schäfer et al., 2017; Sheppes, 2014, 2014; Somerville, 2016; Thompson, 2014; Zeman et al., 2006). Thus, the sociocultural shifts and biological changes associated with adolescence position it as a particularly important period for ER development.

Prior work suggests that the relation between stressful childhood events and adolescent psychopathology may be mediated by emotion regulation (ER) (Dvir et al., 2014; Heleniak et al., 2016; McLaughlin & Lambert, 2017; Miu et al., 2022; Weissman et al., 2019). Exposure to stressful life experiences has been linked with increased emotion dysregulation and emotion-driven impulsivity (Crumly, 2023; Weiss et al., 2023), and childhood adversity is associated with difficulties in ER in children and adolescents (Dvir et al., 2014; Gruhn & Compas, 2020; Lavi et al., 2019), including less effective ER strategy choices (Meredith & Silvers, 2024; Qian et al., 2022). ER difficulties, in turn, are strongly associated with adolescent psychopathology (Beauchaine, 2015; Brackett et al., 2016; Johnstone & Walter, 2014; Sheppes, 2014; Zeman et al., 2006). Additionally, evidence suggests ER difficulties mediate the relation between childhood trauma and internalizing and externalizing symptoms in children and adolescents (Heleniak et al., 2016; McLaughlin & Lambert, 2017; Weissman et al., 2019; Zhou et al., 2024). Previous studies therefore strongly support ER difficulties as a mediator of relations between SLEE and adolescent psychopathology.

1.2. Moderating role of gender or sex

SLEE, ER, and psychopathology all vary based on gender. Cisgender (cis) girls have long been reported to show elevated rates of depression (Salk et al., 2017) and anxiety in adolescence (Bender et al., 2012), whereas cis boys have higher rates of substance use disorders (Young et al., 2002). Parenting and other sociocultural influences contribute to gender-based differences in ER (Brody et al., 2016), and types of ER strategies employed may depend on gender (McLafferty et al., 2020; Nolen-Hoeksema & Aldao, 2011). For example, gender may influence the propensity to use emotion-focused versus problem-focused coping, an important mediator of the relation between childhood adversity and psychopathology (Bornscheuer et al., 2024). Despite evidence for gender-based differences in SLEE, ER, and psychopathology, the influence of gender diversity on relations between these factors remains understudied.

1.3. Gender diversity and adolescence

The physical effects of puberty, emergent sexuality, and social emphasis on gender roles during adolescence prompt or accelerate gender identity exploration for some youth during this period (Pullen Sansfaçon et al., 2020; Steensma et al., 2013). Recent reports estimate that 1.4-1.8% of adolescents in the United States identify as transgender (trans), and this percentage increases to 2.7-3.4% when including youth who are unsure of their gender identity or are gender non-conforming but may not identify as trans (Rider et al., 2018; Wittlin et al., 2023). Because most studies assess sex rather than gender and consider gender a binary construct, research on gender diverse (GD; e.g. trans, nonbinary, or otherwise not cis) adolescents lags behind that of cis peers, despite the fact GD individuals experience higher rates of SLEEs and psychiatric problems such as suicidality, self-harm, depression, eating disorders, and anxiety

symptoms (Kreski & Keyes, 2025; Schnarrs et al., 2019; Wittlin et al., 2023). GD individuals also tend to experience greater numbers of stressful life events compared to cis peers (Feil et al., 2023; Schnarrs et al., 2019; Sterzing et al., 2017). Therefore, understanding the relations between ER, SLEE, and psychopathology in GD youth is critical (Meredith & Silvers, 2024). While previous work supports ER difficulties as a mediator of relations between SLEE and adolescent psychopathology, the potential moderating effect of gender, including gender diversity, on these relations remains understudied.

1.4. Theoretical framework

The biopsychosocial model posited by McLaughlin and Lambert (2017) holds that childhood trauma exposure leads to alterations in threat processing which increase the risk of developing psychopathology. These changes in threat processing include ER difficulties, as well as trauma-related changes in emotional learning, information processing biases, and increased emotional reactivity. Biologically, ER difficulties may reflect decreased functional coupling between the amygdala and medial prefrontal cortex. Cognitively, ER difficulties may manifest as difficulty with disengaging from negative stimuli. This biopsychosocial model, therefore, posits that ER difficulties are part of the mechanism underlying the link between childhood trauma exposure and psychopathology (McLaughlin & Lambert, 2017).

GD youth may experience greater ER difficulties compared to their cis peers due to elevated experiences of traumatic invalidation (Cardona et al., 2022). Invalidation, or communication that one's reactions are not understandable or reasonable, becomes traumatic when intense or repeated (Harned, 2022). For GD youth, traumatic invalidation can result from a variety of sources. For example, GD youth may experience traumatic invalidation surrounding

the degree of conformity of their gender presentation or interpersonal trauma including abuse and bullying (Cardona et al., 2022). They may also experience traumatic invalidation resulting from discrimination at home or school or systemic oppression such as discriminatory legislation. These experiences of traumatic invalidation may lead to increased sensitivity to potential invalidation, self-invalidation, and problematic core cognitions (Harned, 2022) which could increase the likelihood of emotion dysregulation and psychopathology when exposed to future SLEE. As a result, GD youth may be more likely to experience ER difficulties and subsequent psychopathology symptoms following SLEE compared to cis peers.

1.5. The present study

The present study examined: (1) the potential mediating role of ER in relations between SLEE and adolescent psychopathology, and (2) whether the relationship between SLEE, psychopathology, and ER differs based on gender (cis boys, cis girls, versus GD youth) and/or based on sex (males versus females). By examining these relations in the Adolescent Brain Cognitive Development (ABCD) Study, the largest existing longitudinal adolescent brain development study similar in composition to the United States, and including GD adolescents, this study aims to fill a critical gap in our knowledge of the relations between SLEE, ER, and psychopathology across genders.

2. Method

2.1. Data source and sample

The Adolescent Brain Cognitive Development (ABCD) Study is an ongoing, longitudinal study with more than 11,000 youth who were ~9-10 years old when enrolled at baseline between 2016 and 2018. Recruitment, sampling, and retention strategies procedures are

described elsewhere and received approval from centralized or local institutional review boards (Auchter et al., 2018; Feldstein Ewing et al., 2018; Garavan et al., 2018; Karcher & Barch, 2021). Briefly, subjects were recruited using probability sampling from 21 sites throughout the United States to create a sample with socioeconomic status, race, ethnicity, and sex similar to that of the United States population (Garavan et al., 2018). The current study involved 3189 subjects (1581 cis boys, 1439 cis girls, and 169 GD youth) with available data for SLEE at year two follow-up visits ($M \pm SD$: 12.00 $\pm$ 0.65 years), ER difficulties at year three follow-up visits ($M \pm SD$: 12.93 $\pm$ 0.64 years), and gender and psychopathology symptoms at year four follow-up visits ($M \pm SD$: 14.13 $\pm$ 0.68 years). Because gender information was not available in Release 6.0 or 6.1, gender and sex data were from Release 5.1. All other data were from Release 6.1.

2.2. Measures

2.2.1. Gender and sex

Gender identity was defined based on youth responses to two questions at year four follow-up visits: 1. “What is your current gender identity?”, and 2. “Are you transgender?” Response options for the first question were *boy, girl, another gender (e.g. nonbinary), I don’t understand the question, or refuse to answer*. Response choices to the second question were *yes, maybe, no, I don’t understand the question, or refuse to answer* (Potter et al., 2022). Based on responses to these questions, subjects were divided into three groups: cis boys, cis girls, and GD youth (Supplementary Table S1). This process has been previously identified as a feasible method for gender identification in the ABCD Study (Dube et al., 2024). Data on gender identity was available for approximately half of the sample at year four follow-up visits. However, the percentage of GD youth was also much larger in year four ($N=255$, 5.37%) compared to year

three ($N=308$, 2.99%). For this reason, the present study used data from gender collected at year four follow-up visits. Sex was defined based on sex assigned at birth. 24 subjects who did not know or refused to provide their sex assigned at birth were excluded from analyses involving sex but not from analyses involving gender to preserve the largest possible sample size.

2.2.2. Stressful life event exposure (SLEE)

SLEE was captured using the Life Events Scale (LES) at year two follow-up visits which asked youth to report whether they had experienced each of 25 potentially stressful events in their lifetime (Grant et al., 2004; Tiet et al., 2001). This study used a cumulative exposure score which was the sum of all events youth reported having experienced as bad.

2.2.3. Emotion regulation

ER was evaluated with the Difficulties in Emotion Regulation Scale-Parent Report (DERS-P) at year three follow-up visits (Bunford et al., 2020). Responses to all items were summed to create a cumulative score for ER difficulties in which a higher score corresponded to more difficulties. Prior work suggests the DERS-P demonstrates acceptable internal consistency ($\alpha=.84$) when used with parents of adolescents (Bunford et al., 2020).

2.2.4. Psychopathology

Internalizing and externalizing symptoms were measured using raw scores from the Brief Problem Monitor – Youth Report (BPM-Y) at year four follow-up visits (Achenbach, 2009). The BPM-Y has demonstrated adequate internal consistency (BPM-Y: $\alpha=.75-.78$) and test-retest reliability (BPM-Y: $r=.80-.85$) (Achenbach, 2001; Achenbach et al., 2017; Chorpita et al., 2010). The present study utilized raw scores, as recent work suggests that scores for other measures

of psychopathology (the Child Behavior Checklist and Youth Self-Report) differ for GD youth based on the normalization template used (McAdaragh et al., 2024).

2.3. Data analysis

Analyses were conducted in R. Subjects missing data for any item used to calculate summary scores on the LES or DERS-P or missing summary scores for the BPM-Y were excluded from analysis. LES, DERS-P, and BPM-Y scores were skewed right and non-normally distributed based on Shapiro-Wilk tests (LES: $W=.84, p<.001$; DERS-P: $W=.92, p<.001$; BPM-Y internalizing: $W=.82, p<.001$; BPM-Y externalizing: $W=.86, p<.001$). Due to this non-normality, gender differences in LES, DERS-P, BPM-Y and age were assessed using Kruskal-Wallis tests followed by Dunn tests, and sex differences were evaluated using Mann-Whitney U tests.

Mediation and moderated mediation analyses were conducted with conditional process models using the PROCESS function from the *bruceR* R package. For outcomes with significant interaction effects between gender and another variable in the model, pairwise comparisons between gender groups were evaluated using Z-tests based on mean and standard error parameter values and corrected for multiple comparisons based on false discovery rate. Models based on gender and models based on sex were compared using Akaike information criterion (AIC), Bayesian information criterion (BIC), and variance in psychopathology explained (R^2). In all mediation and moderated mediation models, age at year-four follow-up visits was included as a fixed-effect covariate, study site was included as a random effect, and all continuous variables were grand mean-centered.

3. Results

3.1. Descriptive statistics and correlations

Gender differences were detected across all variables other than age (Table 1; SLEE: $X^2(2, N=3189)=24.28, p<.001$; ER difficulties: $X^2(2, N=3189)=49.76, p<.001$; internalizing symptoms: $X^2(2, N=3189)=428.06, p<.001$; externalizing symptoms: $X^2(2, N=3189)=56.13, p<.001$; age: $X^2(2, N=3189)=.05, p=.97$). While SLEE was significantly higher for GD youth compared to cis peers, SLEE did not differ significantly between cis girls and cis boys. GD youth had significantly more ER difficulties than cis boys or cis girls, and cis boys also had more ER difficulties compared to cis girls. Internalizing scores were significantly higher for GD youth compared to cis girls or cis boys, and they were also higher for cis girls compared to cis boys. Externalizing scores were highest for GD youth, lower for cis girls, and lowest for cis boys, with significant differences between all gender groups.

In analyses assessing the effects of sex instead of gender, females and males experienced similar SLEE (Table 1). Females had significantly higher internalizing and externalizing symptoms than males. Males had significantly more ER difficulties compared to females.

SLEE and ER difficulties were weakly but significantly correlated ($r=.08, p<.001$; Table 2). Internalizing and externalizing symptoms were both significantly positively correlated with SLEE and with ER difficulties ($r=.12-.19$, all $p<.001$) and with each other ($r=.40, p<.001$). Age was not correlated with any other measure.

3.2. Mediation analysis

Basic mediation models assessed ER as a potential mediator of the relation between SLEE and psychopathology symptoms (Figure 1A). SLEE was significantly, directly associated with internalizing and with externalizing symptoms such that greater SLEE corresponded with

higher psychopathology symptoms (path c' , Table 3). Indirect effects (path ab) of SLEE on psychopathology symptoms via ER difficulties were significant for both internalizing and externalizing symptoms. The indirect effect of SLEE on psychopathology symptoms mediated by ER difficulties accounted for 5.44% of the total relationship between SLEE and internalizing symptoms and 8.81% of the total relationship between SLEE and externalizing symptoms. Overall, ER difficulties partially mediated relations between SLEE and internalizing or externalizing symptoms.

3.3. Moderated mediation analysis

3.3.1 Moderated mediation by gender

Moderated mediation models tested the hypothesized relationship between gender or sex and SLEE, ER difficulties, and psychopathology (Figure 1B). Gender significantly moderated the relationship between SLEE and internalizing symptoms ($F(2,3176)=5.50$, $p=.004$, Figure S1A) but not the relationship between SLEE and ER difficulties ($F(2,3174)=.01$, $p=.99$, Figure S1B) or ER difficulties and internalizing symptoms ($F(2,3175)=2.20$, $p=.11$, Figure S1C). The model was therefore adjusted to include moderation only along path c' , corresponding to the direct association between SLEE and internalizing symptoms. Gender continued to moderate relations between SLEE and internalizing symptoms ($F(2,3178)=6.07$, $p=.002$). The strength of direct relations between SLEE and internalizing symptoms was significantly different for cis boys compared to cis girls ($Z=-2.93$, $p=.01$) and GD youth ($Z=-2.55$, $p=.02$) but did not differ between cis girls and GD youth ($Z=-.97$, $p=.33$). Direct relations were 2.70 times stronger for cis girls compared to cis boys and 3.73 times stronger for GD youth compared to cis boys (Table 4). Direct relations between SLEE and internalizing symptoms were significant for all three gender

groups (Table 4). Because indirect relations were significant and not moderated by gender, this suggests that ER difficulties partially mediated associations between SLEE and internalizing symptoms for cis boys, cis girls, and GD youth.

Gender did not significantly moderate relations between SLEE and externalizing symptoms ($F(2,3176)=0.50$, $p=.61$, Figure S1D), SLEE and ER difficulties ($F(2,3174)=.01$, $p=.99$, Figure S1B), or ER difficulties and externalizing symptoms ($F(2,3175)=.63$, $p=.53$, Figure S1E).

3.3.2. Moderated mediation by sex

Moderated mediation models also examined the effect of sex on relations between SLEE, ER difficulties, and psychopathology (Figure 1B). Sex moderated relations between SLEE and internalizing symptoms ($F(1,3156)=8.65$, $p=.003$, Figure S2A) and between ER difficulties and internalizing symptoms ($F(1,3148)=6.87$, $p=.01$, Figure S2C) but did not moderate relations between SLEE and ER difficulties ($F(1,3154)=.01$, $p=.94$, Figure S2B). The model was therefore adjusted to include moderation only along path c' , corresponding to the direct association between SLEE and internalizing symptoms, and path b , corresponding to the association between ER difficulties and internalizing symptoms. Sex continued to moderate relations between SLEE and internalizing symptoms ($F(1,3156)=8.65$, $p=.003$) and between ER difficulties and internalizing symptoms ($F(1,3148)=6.87$, $p=0.009$). Direct relations were 2.15 times stronger for females compared to males, and indirect relations between SLEE and internalizing symptoms were 2.17 times stronger for females compared to males (Table 5). Because both direct and indirect relations were significant for both sexes, ER difficulties partially mediated relations between SLEE and internalizing symptoms for both males and females.

Sex did not significantly moderate relations between SLEE and externalizing symptoms ($F(1,3156)=.34$, $p=.56$, Figure S2D), SLEE and ER difficulties ($F(1,3154)=.01$, $p=.94$, Figure S2B), or ER difficulties and externalizing symptoms ($F(1,3149)=1.09$, $p=.30$, Figure S2E).

3.3.3. Comparing mediation, mediation moderated by gender, and mediation moderated by sex

For internalizing symptoms, based on AIC, but not BIC values, moderated mediation models with gender as the moderator (AIC = 8509.42, BIC = 8570.09) provided a better fit for the data compared to models with sex as the moderator (AIC = 8597.37, BIC = 8651.91) or without a moderator (AIC = 8973.85, BIC = 9010.25). Moderated mediation models with gender also explained more of the variance in internalizing symptoms ($R^2 = .17$) compared to models with sex as the moderator ($R^2 = .13$) or models without a moderator ($R^2 = .04$). Models including either gender as a moderator ($R^2 = .08$) or sex as a moderator ($R^2 = .07$) explained the same amount of variance in externalizing symptoms, and both explained more variance compared to mediation without a moderator ($R^2 = .06$). Based on AIC and BIC, moderated mediation models of externalizing symptoms with sex as the moderator (AIC = 8801.00, BIC = 8855.54) better fit the data for externalizing symptoms compared to models with gender as a moderator (AIC = 8873.87, BIC = 8946.68) or without a moderator (AIC = 8895.29, BIC = 8931.70).

4. Discussion

The present study evaluated relations between SLEE, ER difficulties, and psychopathology symptoms in adolescence across gender and sex groups in the ABCD study. GD youth experienced more SLEEs, ER difficulties, and psychopathology symptoms compared to peers. Cis girls experienced comparable SLEEs, fewer ER difficulties, and more psychopathology symptoms compared to cis boys. The higher rates of externalizing symptoms for cis girls

compared to cis boys is consistent with predicted values in this sample (Barch et al., 2021). ER difficulties partially mediated relations between SLEE and both internalizing and externalizing symptoms. Gender moderated relations between SLEE and internalizing, but not externalizing, symptoms such that direct relations between SLEE and internalizing symptoms were greater for cis girls and GD youth compared to cis boys. Moderated mediation models with gender as the moderator also explained more of the variance in internalizing psychopathology and better fit the data based on AIC compared to models with sex as the moderator or those without moderators. In contrast, models with either sex or gender as a moderator explained about the same amount of variance in externalizing symptoms. Overall, results suggest that: (1) ER partially mediates relations between SLEE and psychopathology and (2) mediation of relations between SLEE and internalizing symptoms differ based on gender.

The present findings that ER was a reliable mediator of relations between SLEE and psychopathology symptoms in adolescents is consistent with predictions by the biopsychosocial model proposed by McLaughlin and Lambert (2017). This is also consistent with prior work supporting ER difficulties as a transdiagnostic mechanism contributing to the development of psychopathology (McLaughlin et al., 2020; Weissman et al., 2019). While these results echo previous findings, little prior work has examined the role of gender diversity in this mediation. Results from the present study expand prior work on relations between SLEE, ER, and psychopathology in adolescents by assessing differences in these relations based on a non-binary definition of gender.

Present results indicate that gender moderates relations between SLEE and internalizing, but not externalizing, symptoms. However, gender does not moderate relations

between SLEE and ER difficulties or between ER difficulties and internalizing symptoms. Importantly, GD youth have more ER difficulties and psychopathology symptoms compared to cis peers, consistent with a potential role of traumatic invalidation in the generation of emotion dysregulation and subsequent psychopathology. Results may suggest the presence of additional, unmeasured factors which contribute to stronger relations between SLEE and internalizing symptoms specifically for cis girls and GD youth compared to cis boys. These factors could include additional mechanisms linking trauma exposure and psychopathology proposed by McLaughlin and Lambert (2017), such as changes in emotional learning, increased emotional reactivity, and biased information processing. Gender-based variation in peer victimization or bullying could also explain the greater strength in direct relations between SLEE and internalizing symptoms for GD youth and cis girls compared to cis boys. Higher levels of peer victimization have been linked with more internalizing symptoms, and this association was stronger in adolescent girls compared to boys (Ledwell & King, 2015). Also, higher levels of gender nonconformity were found to be associated with more internalizing problems three years later, and this association was partially mediated by peer victimization (Robertson, 2024). Future work clarifying mediators of relations between SLEE and internalizing symptoms in cis girls and GD youth is necessary.

Compared to models including sex, mediation models with gender as the moderator explained more of the variance in internalizing symptoms and better fit the data based on lower AIC, but not BIC, scores. This suggests that variation in internalizing scores may be better captured by using gender, rather than sex, and explicitly accounting for GD youth. In contrast, models including either gender or sex as moderators explained approximately the same

amount of variance in externalizing symptoms, though both explained more variance as compared to models without either sex or gender. Thus, these findings highlight the importance of accounting for gender diversity when assessing relations between SLEE, ER difficulties, and internalizing symptoms.

4.1. Limitations

Some limitations to the current study should be noted. While recruitment and sampling strategies in the ABCD Study made efforts to approximate the United States in terms of race, ethnicity, sex, and socioeconomic status (Garavan et al., 2018), the sample is not fully representative, as it differs in key attributes which affect development such as urbanicity (Compton et al., 2019). This limits generalizability. Additionally, gender as a construct is heavily influenced by many aspects of culture, and results may not generalize to adolescents in other countries. In the current study, trans boys, trans girls, and nonbinary (or “other” gender) individuals were combined to create a GD group due to sample size. These groups, however, have important social and developmental differences, and future studies with larger samples of GD youth should conduct more granular analyses of differences within the GD umbrella.

4.2. Conclusion

The present study leveraged a large, diverse sample of youth with longitudinal data in the United States to examine relations among SLEE, ER difficulties, and psychopathology symptoms in adolescents. Results identified robust associations between these variables and confirmed prior findings that ER difficulties act as a partial mediator between SLEE and both internalizing and externalizing symptoms in adolescence. Gender moderated relations between SLEE and internalizing, but not externalizing symptoms. Furthermore, internalizing symptoms

were best captured through moderated mediation models with gender, rather than sex, as the moderator. This study adds foundational knowledge needed to support mental health needs of youth of all genders and underscores the importance of continued investigation of gender-based differences in the relations between SLEE, ER difficulties, and psychopathology.

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Table 1*Summary statistics (M±SD) for all variables*

	Gender				Sex ^a		
	All	Cis boy	Cis girl	GD	All	Male	Female
N	3189	1581	1439	169	3165	1586	1579
Age (years)	14.13±.68	14.13±.68	14.13±.68	14.11±.69	14.13±.68	14.13±.68	14.13±.68
SLEE (LES)	2.31±2.19	2.26±2.16 [‡]	2.25±2.14 [‡]	3.16±2.62 ^{^†}	2.31±2.18	2.28±2.18	2.33±2.19
ER difficulties (DERS-P)	54.66±17.25	55.70±17.23 ^{†‡}	52.77±16.75 ^{^†}	60.92±19.36 ^{^†}	54.65±17.25	55.82±17.23 [‡]	53.48±17.19 [‡]
Internalizing symptoms (BPM-Y)	2.18±2.50	1.40±1.95 ^{†‡}	2.70±2.55 ^{^†}	5.12±3.21 ^{^†}	2.18±2.50	1.44±2.00 [‡]	2.93±2.72 [‡]
Externalizing symptoms (BPM-Y)	1.95±1.96	1.76±1.87 ^{†‡}	2.03±1.97 ^{^†}	3.00±2.38 ^{^†}	1.94±1.96	1.77±1.88 [‡]	2.12±2.02 [‡]

Note. Gender-based comparisons: [^]=significantly different from cis boys, [†]=significantly different from cis girls, [‡]=significantly different from GD youth. Sex-based comparisons: [‡]=significant differences between males and females. ^a=excludes 24 participants who answered “*don’t know*” or refused to answer when asked to report their sex. SLEE=stressful life event exposure, LES=Life Events Scale, ER=emotion regulation, DERS-P= Difficulties in Emotion Regulation Scale-Parent Report , BPM-Y=Brief Problem Monitor-Youth Report, cis=cisgender, GD = gender diverse.

Table 2*Pairwise bivariate correlations for all continuous variables*

	Age	SLEE (LES)	ER difficulties (DERS-P)	Internalizing symptoms (BPM-Y)
SLEE (LES)	-.03			
ER difficulties (DERS-P)	-.03	.08***		
Internalizing symptoms (BPM-Y)	.01	.15***	.12***	
Externalizing symptoms (BPM-Y)	-.003	.16***	.19***	.40***

Note. ***= $p < .001$. All p-values corrected for multiple tests using false discovery rate. SLEE=stressful life event exposure, LES=Life Events Scale, ER=emotion regulation, DERS-P= Difficulties in Emotion Regulation Scale-Parent Report , BPM-Y=Brief Problem Monitor-Youth Report.

Table 3

Mediation models testing associations between SLEE, ER difficulties, and psychopathology symptoms

	Internalizing symptoms					Externalizing symptoms				
	Effect	SE	95% CI	Z	p	Effect	SE	95% CI	Z	p
Direct effect of SLEE on psychopathology (path c')	.14	.02	[.11,.17]	7.97	<.001	.15	.02	[.11,.18]	8.46	<.001
Indirect effect of SLEE on psychopathology (path ab)	.01	.002	[.004,.01]	3.60	<.001	.01	.003	[.008,.02]	4.13	<.001

Note. SLEE=stressful life event exposure, ER=emotion regulation, SE=standard error, CI=confidence interval.

Table 4

Moderated mediation model testing associations between SLEE, ER difficulties, and internalizing symptoms moderated by gender

	Effect	SE	95% CI	<i>t</i>	<i>p</i>
Direct effect of SLEE on internalizing symptoms (path c')					
Cis boy	.06	.02	[.01,.11]	2.54	.01
Cis girl	.16	.03	[.11,.21]	6.44	<.001
Gender diverse	.22	.06	[.11,.34]	3.75	<.001
Indirect effect of SLEE on internalizing symptoms (path ab)	.01	.002	[.01,.01]	3.74	<.001

Note. SLEE=stressful life event exposure, ER = emotion regulation, cis=cisgender, SE=standard error, CI=confidence interval.

Table 5

Moderated mediation model testing associations between SLEE, ER difficulties, and internalizing symptoms moderated by sex

	Effect	SE	95% CI	<i>t</i>	<i>p</i>
Direct effect of SLEE on internalizing symptoms (path c')					
Male	.09	.02	[.04,.13]	3.58	<.001
Female	.18	.02	[.14,.23]	7.74	<.001
Indirect effect of SLEE on internalizing symptoms (path ab)					
Male	.01	.002	[.002,.01]	2.71	.01
Female	.01	.003	[.007,.02]	3.84	<.001

Note. SLEE=stressful life event exposure, ER = emotion regulation, SE=standard error, CI=confidence interval.

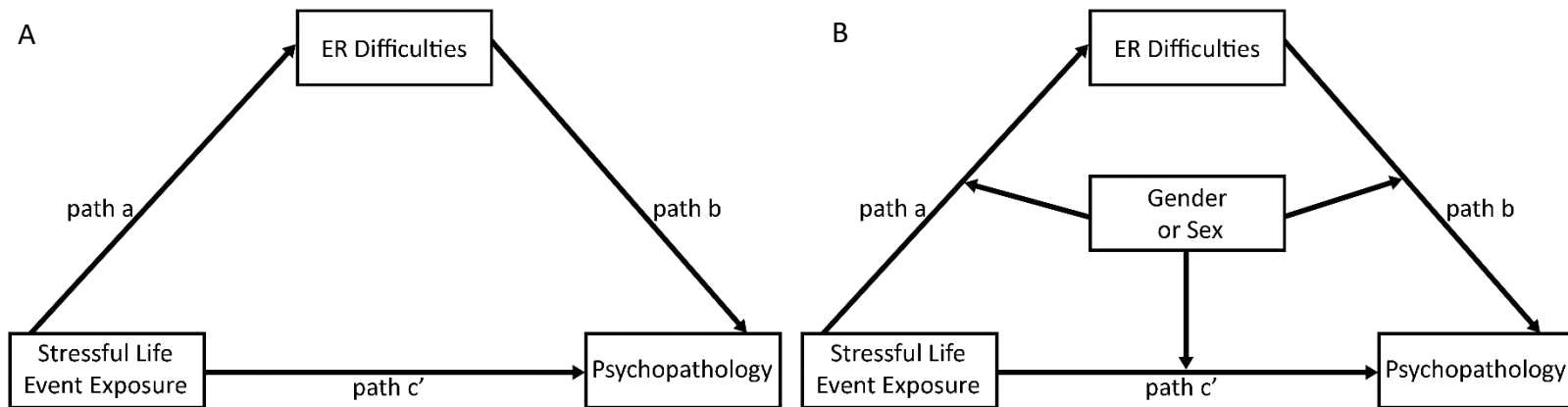
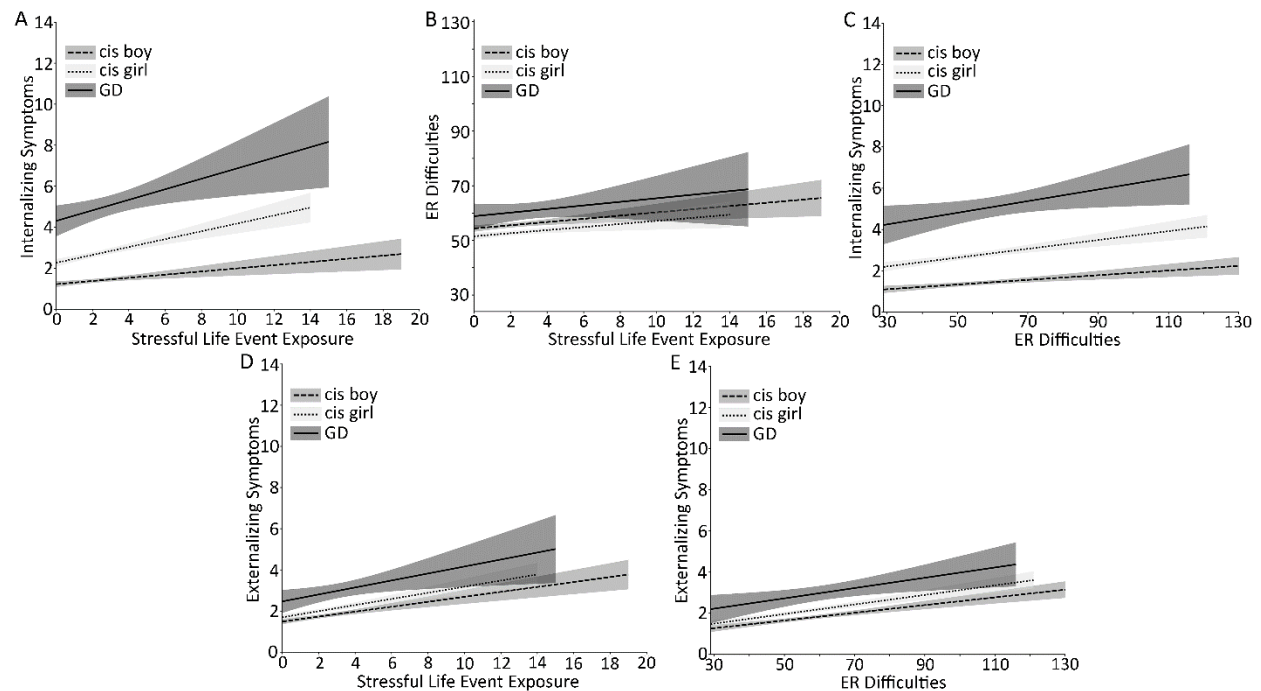


Figure 1. *Hypothesized mediation and moderated mediation diagrams.* (A) Hypothesized basic mediation diagram with ER difficulties mediating relations between SLEE and psychopathology. (B) Hypothesized moderated mediation diagram with gender or sex moderating relations between SLEE and psychopathology, SLEE and ER difficulties, and ER difficulties and psychopathology.

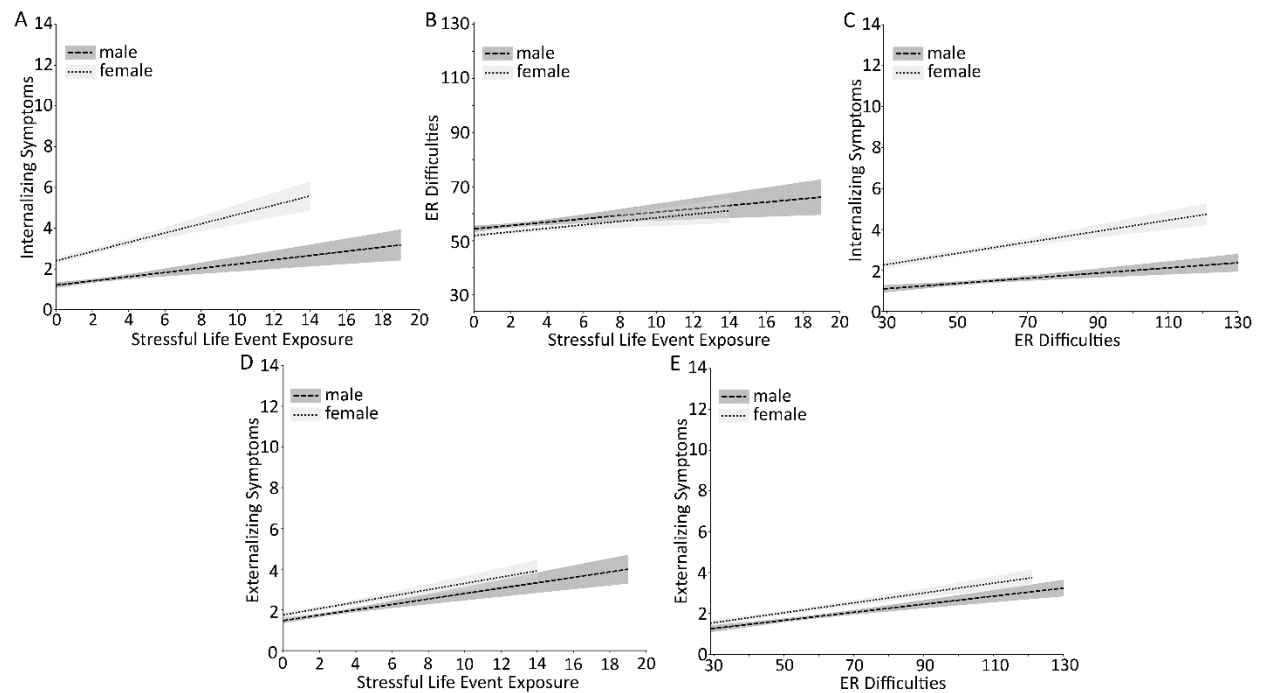
Supplementary Table 1*Gender group categorization*

Gender group	Question 1 Responses (“What is your current gender identity?”)	Question 2 Responses (“Are you transgender?”)
Cis boy	Boy	No
Cis girl	Girl	No
Gender diverse	Another gender (e.g. nonbinary)	No, maybe, or yes
Gender diverse	Boy or girl	Yes or maybe



Supplementary Figure 1. *Relations between SLEE, ER difficulties, and psychopathology*

symptoms based on gender. As SLEE increases, (A) internalizing symptoms and (B) ER difficulties increase for all genders. (C) As ER difficulties increase, internalizing symptoms tend to increase for all genders. (D) As SLEE increases or (E) ER difficulties increase, externalizing symptoms increase for all genders. Shaded regions indicate 95% confidence intervals. SLEE=stressful life event exposure, ER=emotion regulation, cis=cisgender, GD=gender diverse.



Supplementary Figure 2. *Relations between SLEE, ER difficulties, and psychopathology*

symptoms based on sex. As SLEE increases, (A) internalizing symptoms and (B) ER difficulties increase for both sexes. (C) As ER difficulties increase, internalizing symptoms tend to increase for both sexes. (D) As SLEE increases or (E) ER difficulties increase, externalizing symptoms increase for both sexes. Shaded regions indicate 95% confidence intervals. SLEE=stressful life event exposure, ER=emotion regulation.