

How Alexithymia Increases Mental Health Symptoms in Adolescence: Longitudinal Evidence for the Mediating Role of Emotion Regulation

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Abstract

Alexithymia is characterised by difficulties identifying and describing feelings, as well as a lack of focus on feelings. Alexithymia is a transdiagnostic risk factor for developing a wide array of psychopathologies, such as anxiety and depression, with a key hypothesised mechanism being the impairing impact of alexithymia on emotion regulation. However, no study has tested whether difficulties with emotion regulation mediate the link between alexithymia and clinically relevant symptoms using longitudinal designs. The present study aimed to address this limitation by collecting data from 242 Iranian high school students at two time points, seven months apart. The results revealed that baseline alexithymia levels not only related to future emotion regulation difficulties but predicted increased emotion regulation difficulties in the future. Furthermore, these increased difficulties in emotion regulation mediated the relationship between baseline alexithymia and worsening of psychological distress (e.g., depression, anxiety, and stress symptoms) over time. This study, therefore, supports the *attention-appraisal model of alexithymia* in its theoretical account linking alexithymia and emotion regulation difficulties and highlights the critical role that alexithymia plays in emotional health and illness during adolescence.

Keywords: Alexithymia; Psychopathology; Emotion Regulation; Longitudinal design

Highlights:

- Investigates longitudinal effects of alexithymia, emotion regulation, and distress.
- Adolescents' alexithymia worsens their emotion regulation in the future.
- Alexithymia predicts greater future distress due to worsening emotion regulation.

How Alexithymia Increases Mental Health Symptoms in Adolescence: Longitudinal Evidence for the Mediating Role of Emotion Regulation

Alexithymia is a trait characterised by difficulties identifying one's feelings, difficulties describing one's feelings, and a tendency not to focus on one's feelings (Preece & Gross, 2023; Luminet & Nielson, 2024). Since the term was first coined in the 1970s (Sifneos, 1973), alexithymia has been touted as a key transdiagnostic risk factor for developing psychopathologies, such as anxiety and depressive disorders (e.g., Taylor et al., 1999). Levels of alexithymia vary in the general population, and individuals with greater levels of alexithymia generally report poorer emotional wellbeing, including increased mental health symptoms (Preece et al., 2024), depression (Li et al., 2015), anxiety (De Berardis et al., 2008), eating disorder symptoms (Muir et al., 2023), substance use (Honkalampi et al., 2022), self-harm (Norman et al., 2020), and suicidal ideation and behaviour (Hemming et al., 2019).

One life stage of particular research interest for the development of mental health symptoms is adolescence (McLaughlin et al., 2015). Adolescents face several significant stressors (e.g., academic pressures and increased importance of peer relationships) and are vulnerable to developing a range of psychopathologies (Lynch et al., 2021), which often persist into adulthood, leading to chronic and severe impacts (Johnson et al., 2018). Runcan's (2020) review identified that alexithymia in adolescents has been linked to myriad emotional and behavioural challenges, including depression, anxiety, and stress.

Why does alexithymia seem to put adolescents at greater risk for mental health problems? One useful theoretical framework for addressing this question is the *attention-appraisal model of alexithymia* (Preece et al., 2017), which sits within the broader *process model of emotion regulation* (Gross, 1998, 2015). The attention-appraisal model specifies how alexithymia impairs key stages in emotion processing, reflecting deficits in one's ability

to focus *attention* on emotions and to *appraise* those emotions accurately. Because the appraisal of emotions is a central determinant of downstream emotion regulation decisions (Gross, 2015), the attention-appraisal model predicts that alexithymia should impair emotion regulation and, in turn, put those high in alexithymia at risk of developing psychopathologies characterised by emotion dysregulation (e.g., depression and anxiety).

In line with the attention-appraisal model of alexithymia (Preece et al., 2017) research has begun investigating whether emotion regulation competency explains the link between alexithymia and psychopathologies. In the first empirical study investigating this link, Preece et al. (2022) found that greater alexithymia was associated with higher psychological distress in a manner that was mediated by greater emotion regulation difficulty.

While promising, this study had three limitations that should be noted. First, they employed a cross-sectional design, which, while it provided evidence consistent with the idea that alexithymia may lead to psychological distress by increasing emotion regulation difficulties, does not allow for causal inferences. Second, they focused on adults rather than adolescents. Third, they did not investigate whether this mediation was dependent on the emotional valence of the emotions being regulated. Adolescents' ability to regulate both positive and negative emotions may be a vital protective factor against developing anxiety and depression (Young et al., 2019). There has been increasing evidence showing the potential importance of difficulty in regulating positive emotions in psychopathology (e.g., bipolar disorders; see Kurtz et al., 2021). For example, Muir et al. (2024) found that difficulty in regulating positive emotions and not negative emotions mediated the relationship between alexithymia and eating disorder symptoms. However, to date, no study has employed a longitudinal design to investigate whether difficulties in regulating positive or negative emotions mediate the link between alexithymia and psychological distress in adolescents.

Present Study

The present study seeks to fill this gap, examining alexithymia in adolescents. We use a longitudinal design, examining the potential mediating role of emotion regulation on the relationship between alexithymia and psychological distress (i.e., a composite of depression, anxiety, and stress symptoms). Alexithymia, emotion regulation, and psychological distress were measured across two time points, approximately seven months apart.

We hypothesised that an individual's current level of alexithymia not only would be related to their future difficulties in emotion regulation and their future levels of distress but also to changes in emotion (dys)regulation and distress levels over time. Furthermore, we hypothesised that a key pathway linking alexithymia to future increases in distress would be the impairing effect of alexithymia on emotion regulation. As such, we predicted that changes in emotion regulation, for both negative and positive emotions, would mediate the relationship between alexithymia and changes in psychological distress.

Methods

Transparency and Openness

The current study's de-identified data, data dictionary, and R scripts are openly available in the Open Science Framework at <https://osf.io/jwhna/>.

Participants

Participants included adolescents from two elementary schools in Tehran, Iran. A total of 557 students were assessed at Time 1 (T1), with 242 of the initial sample also completing the Time 2 (T2) assessment. The variation in participation primarily occurred because some students changed schools in the new academic year or were absent when the data was collected. The participants who provided data at T1 and T2 had minimal missing data (less than 0.1%), which was replaced using the multiple imputation method (Austin et al., 2021; Li et al., 2015). Careless responding was also checked according to current guidelines (Curran, 2016; Ward & Meade, 2023). We excluded participants who responded

too quickly, spending less than two seconds on average per question ($n = 14$), or those who had incorrect responses to more than one attention check item in any assessment sessions ($n = 60$). Finally, four participants were excluded due to being multivariate outliers using Mahalanobis distance (Becker & Gather, 1999). The final sample, that completed T1 and T2, comprised 164 students (73.17% male). The mean age of the final sample (as measured at the second assessment) was 14.77 years ($SD = 1.34$ years), with an age range of 13 to 18 years. On average, 7.37 months ($SD = 0.93$) had elapsed between the two points of data collection. Participants were given bonus course credits for completing the surveys. Data from T1 was previously used in published studies examining the psychometric properties of the Perth Alexithymia Questionnaire (Mazidi et al., 2023a) and the Perth Emotion Regulation Competency Inventory (Mazidi et al., 2023b).

Materials

Perth Alexithymia Questionnaire (PAQ). The PAQ (Preece et al., 2018b) measures participants' level of alexithymia by asking them to respond to 24 items on a 7-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (7). The PAQ assesses all facets of alexithymia across negative and positive emotions. Various subscale and composite scores can be derived, including a total score as an overall marker of alexithymia. Higher scores indicate greater alexithymic traits. The PAQ has shown good validity in assessing alexithymia in Iranian adolescents and adults (Lashkari et al., 2021; Mazidi et al., 2023a), including good discriminability from general distress (e.g., Chan et al., 2023; Preece et al., 2020). A copy of the Persian version of the PAQ is provided in the supplementary materials.

Perth Emotion Regulation Competency Inventory (PERCI). The PERCI (Preece et al., 2018a) measures participant's difficulties regulating their positive and negative emotions. Items are answered on a 7-point Likert scale, with higher scores indicating greater emotion dysregulation (i.e., lower emotion regulation ability). Various subscale and composite scores

can be derived from the PERCI. In the present study, we used PERCI's composite scores for overall difficulties regulating negative emotions (N-ER) and overall difficulties regulating positive emotions (P-ER). The PERCI has shown good validity in assessing alexithymia in Iranian adolescents and adults (Mazidi et al., 2023b). A copy of the Persian version of the PERCI is provided in the supplementary materials.

Depression Anxiety and Stress Scale-21 (DASS-21). The DASS-21 (Lovibond & Lovibond, 1995) was employed to assess participants' levels of psychological distress. The DASS-21 asks participants, on a four-point Likert scale, to respond to items aimed at assessing their level of depression, anxiety, or stress symptoms. Psychometric studies have shown that a total scale score best represents DASS-21 as a general indicator of psychological distress (e.g., Lee et al., 2019). The scale has shown good psychometric properties in Iranian samples (e.g., Asghari et al., 2008).

Procedure

The current project was carried out in accordance with the Declaration of Helsinki and was approved by the ethics committee of Babol University of Medical Sciences in Iran. Parents provided a consent form for their adolescents to participate in the study. Additionally, all adolescents assented to participate, ensuring they had the opportunity to agree or decline involvement and withdraw from the study at any time without providing any justification. Participants were given bonus course credits for completing the survey. Participants completed the Persian version of the questionnaires via Porsline online survey platform (<https://survey.porsline.ir/>) and with the following order: demographic questions, PERCI, PAQ, and DASS-21.

Analytic Strategy

Change Scores. To measure change in negative and positive emotion regulation difficulties and psychological distress, standardised residual change scores were calculated.

Standardised residual change scores are the residuals from bivariate regressions whereby the outcome of interest at T1 predicts that outcome at T2 (Cronbach & Furby, 1970; Traub, 1967). This is akin to including T1 scores as covariates in a multiple regression. Accordingly, those with greater standardised residuals exhibit an increase in that outcome over time. This method provides a measure of change that reliably controls for variability among individual differences at baseline. Three change scores were computed: negative emotion regulation difficulties, positive emotion regulation difficulties, and psychological distress.

Alexithymia's Influence on Change in Emotion Regulation Difficulties and Psychological Distress. To investigate the influence that alexithymia at T1 had on future changes in valence-specific emotion regulation difficulty and psychological distress, a series of bivariate regression analyses were conducted. Firstly, to replicate previous findings suggesting that higher alexithymia is associated with greater emotion regulation difficulties and higher psychological distress, analyses examined whether alexithymia at T1 significantly predicted positive and negative emotion regulation difficulties and psychological distress at T2. Secondly, to examine our first hypothesis that alexithymia predicts future changes in emotion regulation and psychological distress, analyses examined whether alexithymia at T1 significantly predicted residual change scores of positive and negative emotion regulation difficulties and psychological distress.

Emotion Regulation Difficulties as a Mechanism Explaining the Link Between Alexithymia and Psychological Distress. To examine our second hypothesis that increasing difficulties in emotion regulation is a mechanism through which alexithymia increases psychological distress, parallel mediation models were tested using the PROCESS macro for R (model 4; Hayes, 2018). A parallel mediation model allows greater complexity in this context by assessing whether emotion regulation difficulties for either negative or positive emotions provides unique contributions to mediating this relationship. Accordingly, there will

be two indirect effects through negative emotion regulation and positive emotion regulation. The difference between these two indirect effects can be tested to investigate whether difficulties in regulating one emotional valence explains more of the relationship between alexithymia and psychological distress than the other. To assess the significance of the indirect effects, 95th percentile bootstrap confidence intervals (CIs) based on 10,000 bootstrap samples were used.

Assumptions. The assumptions of multiple regression were tested and addressed appropriately. The Durbin-Watson test statistic ($p < .01$) was used to assess the assumption of independence of residuals. Studentised residuals (with Bonferroni adjustment) were used to identify outliers influencing the regression models. The Breusch-Pagan test ($p < .05$) was used to assess the assumption of homoscedasticity. Lastly, the Shapiro-Wilk test ($p < .05$) was used to assess the assumption of normality of residuals. Studentised residual outliers were removed. Heteroscedasticity consistent standard errors (HC3) were used if the assumption of homoscedasticity was violated (as recommended by Hayes & Cai, 2007). Bootstrapped confidence intervals were used when the assumption of normality of residuals was violated. R studio [version 4.3.0] was used to conduct all analyses.

Results

Table 1 presents descriptive statistics and reliability coefficients for all questionnaires at T1 and T2. All measures showed excellent Alpha and Omega internal consistency reliabilities.

Table 1

Descriptive statistics and Cronbach's alpha and McDonald's omega reliability coefficients for the administered measures in T1 and T2

Variable	Time 1				Time 2			
	M	SD	α	ω	M	SD	α	ω
Total Alexithymia	74.55	27.91	.93	.95	76.57	27.68	.93	.95
Psychological Distress	13.08	12.38	.94	.95	14.27	12.95	.94	.95
Negative Emotion Regulation	58.86	18.90	.89	.90	57.28	18.39	.88	.90
Positive Emotion Regulation	37.42	18.15	.93	.93	37.59	16.50	.91	.91

Note. No skewness or kurtosis values exceeded ± 2 .

Alexithymia's Influence on Change in Emotion Regulation Difficulties and

Psychological Distress

The bivariate regressions (Table 2) indicated that alexithymia at T1 provided large effects (see Fey et al., 2023) in predicting future difficulties with regulating positive and negative emotions, and psychological distress. In addition to predicting future levels, individuals with higher levels of alexithymia at T1 exhibited future increases in regulating negative and positive emotions (medium effects; Fey et al., 2023).¹ As such, not only does alexithymia relate to emotion regulation difficulties and distress, but alexithymia predicts increased difficulties in regulating emotions.

¹ Bivariate and multiple regression analyses of the PAQ's subscales predicting change in emotion regulation and general psychological distress can be found in the supplementary materials (Table S2). Additionally, alexithymia's influence on depression, anxiety, and stress can be found in the supplementary materials (Table S3).

Table 2

The standardised beta-weights of alexithymia at T1 predicting valence-specific emotion regulation and psychological distress at T2 and their changes from T1.

	N-ER	P-ER	Distress
At T2	.52*** [.39, .66]	.52*** [.36, .68]†	.46*** [.31, .61]
Change	.24** [.09, .39]	.19* [.01, .37]†	.09 [-.06, .23]†

Note: N-ER = negative emotion regulation; P-ER = positive emotion regulation. Bootstrapped 95% CIs are provided inside square brackets.

* $p < .05$; ** $p < .01$; *** $p < .001$.

†Removed one to three outliers due to significant studentised residuals (with Bonferroni adjustment).

Emotion Regulation Difficulties as a Mechanism Explaining the Link Between Alexithymia and Psychological Distress

The parallel mediation model had alexithymia scores at T1 entered as the predictor variable, the change scores of negative emotion regulation and positive emotion regulation as mediators, and the change score of psychological distress as the outcome variable.

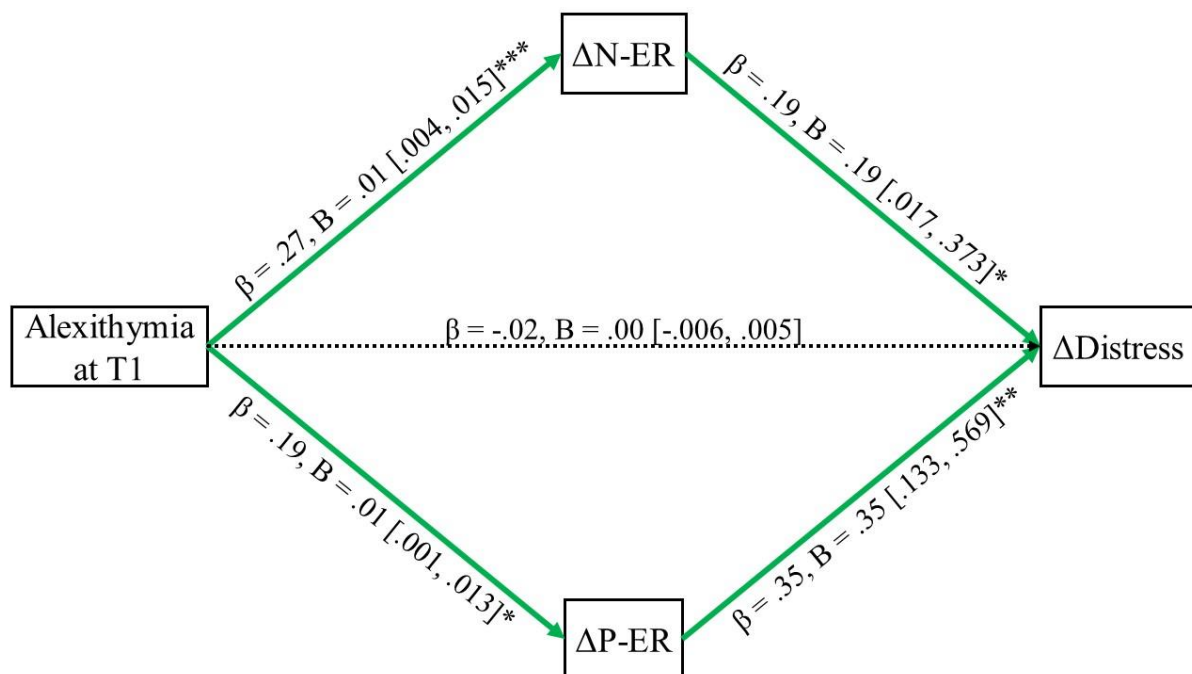
The parallel mediation analysis results are shown in Figure 1². The model accounted for 18.78% of the variance in psychological distress change, $R^2 = .19$, $F(1, 159) = 4.34$, $p = .039$. Individuals' levels of alexithymia at T1 predicted increased difficulties in regulating positive and negative emotions from T1 to T2, and these increased difficulties in regulating positive and negative emotions, in turn, predicted greater psychological distress from T1 to T2. While alexithymia at T1 did not directly predict changes in psychological distress, indirect effects indicated that alexithymia at T1 indirectly predicted individuals' increased future psychological distress via increased difficulties in emotion regulation (total indirect effect: $B = .004$, $\beta = .123$, 95% CI = [.037, .210]). Valence-specificity was important as increasing difficulties in regulating both positive ($B = .002$, $\beta = .054$, 95% CI = [.004, .118])

² There were violations of the assumptions of homoscedasticity and normally distributed residuals, as such heteroscedasticity consistent standard errors (HC3; as recommended by Hayes & Cai, 2007), bootstrapping, and removal of three outliers (i.e., significant studentized residuals with Bonferroni Adjustment) were used to ensure the current results were not biased (see Knief & Forstmeier, 2021).

and negative ($B = .002$, $\beta = .068$, 95% CI = [.006, .148]) emotions mediated this relationship, with neither valence-specific emotion regulation having a more significant effect than the other ($B = -.001$, $\beta = -.014$, 95% CI = [-.119, .079]). As such, baseline alexithymia levels in Iranian adolescents predicted increased future psychological distress due to increased difficulty in regulating both positive and negative emotions.

Figure 1

The parallel mediation model of alexithymia at T1 predicting change in psychological distress over time, mediated by change in valence-specific emotion regulation.



Note: N-ER = Negatively valenced emotion regulation, higher scores indicate worse regulation; P-ER = Positively valenced emotion regulation, higher scores indicate worse regulation. Solid lines indicate significant effects (green = positive), and dotted lines indicate non-significant effects.

* $p < .05$, ** $p < .001$, *** $p < .001$.

Discussion

The present study investigated whether adolescents' baseline levels of alexithymia predicted future change in psychological distress and whether this link could be explained by increasing emotion regulation difficulties. Overall, in line with our expectations, we found that alexithymia not only related to emotion regulation difficulties and psychological distress

but significantly predicted increased difficulties in regulating both positive and negative emotions. Furthermore, the mediation analysis indicated that baseline alexithymia indirectly increased psychological distress via these increased difficulties in emotion regulation.

How Alexithymia and Psychological Distress Are Linked Over Time

While adolescence has been suggested as a pivotal period for emotion regulation development (Blakemore & Mills, 2014), empirical work in this important area has been scarce. Our results extend previous research by being the first longitudinal study investigating the relationships between alexithymia and emotion regulation. In this context, our novel findings provide important evidence that alexithymia not only relates to adolescents' current emotion regulation abilities but, importantly, predicts a future increase in emotion regulation difficulties. While studies using cross-sectional data (e.g., Preece et al., 2022; Laloyaux et al., 2015; Pollatos & Gramann, 2012; Swart et al., 2009) highlight that alexithymia and emotion regulation are related, the present results provide evidence to suggest that alexithymia is likely a driving factor in increasing emotion dysregulation for both negative and positive emotions. Accordingly, alexithymia may hinder the development of emotion regulation during adolescence, which is likely to have significant cascading effects, such as poorer educational attainment (Martin & Ochsner, 2017), social difficulties (Zeman et al., 2006), and mental health concerns (Schäfer et al., 2017; Young et al., 2019).

Indeed, of these outcomes, our study focused on mental health symptoms through psychological distress (i.e., depression, anxiety, and stress symptoms). Here, a critical question addressed in the current study was about the mechanisms through which alexithymia may be a risk factor for future psychological distress. The attention-appraisal model of alexithymia (Preece & Gross, 2023) and the process model of emotion regulation (Gross, 2015), predict that a key pathway explaining the link between alexithymia and psychological

distress should be the impairing impact of alexithymia on emotion regulation. In support of these conceptual perspectives, our mediation analysis revealed that alexithymia appears to indirectly increase psychological distress due to its influence on increasing difficulties regulating both positive and negative emotions. Both the negative and positive valence domains were involved in this process, highlighting the importance of considering both valence domains in this area. This is consistent with the findings of past cross-sectional work in adults (e.g., Preece et al., 2022) and, importantly, extends this focus on mental health outcomes to adolescents with a more robust longitudinal design.

Clinical Implications

Past work in the alexithymia field has focused on adults, possibly due to the relative absence of validated or reliable alexithymia assessment tools in adolescents (e.g., Parker et al., 2010). Our study extends prior work by focusing on the detrimental effects of alexithymia on mental health during adolescence.

With respect to clinical applications, our findings, therefore, highlight the importance of considering alexithymia in the understanding, assessment, and treatment of mental health issues during this crucial developmental stage. If alexithymia is neglected, our results suggest that this will contribute significantly to future declines in emotional health. In terms of treatment, the attention-appraisal model emphasises the utility of approaches that increase *knowledge* of emotions and decrease *avoidance* of emotions, as these are both fundamental mechanisms contributing to alexithymia (for a discussion of treatment techniques, see Preece & Sikka, 2024). Indeed, there is evidence supporting the effectiveness of such a focus in adults (e.g., Edwards et al., 2018; Norman et al., 2019), and future empirical work will be essential to determine the best ways to target alexithymia in adolescents.

Strengths and Limitations

The current paper has significant strengths, particularly given its usage of longitudinal data to investigate changes in relevant emotional constructs over time, although limitations should be noted. Firstly, the sample consisted of Iranian adolescents, and future research will be needed to ascertain whether the current results can be generalised to other cultures (e.g., Chan et al., 2023). Secondly, while the study design provides some evidence of causality due to investigating alexithymia, emotion regulation, and psychological distress across time, these variables were not directly manipulated. As such, future research that provides alexithymia and emotion regulation specific interventions to adolescents will be able to provide stronger causal inferences. Thirdly, the current results reflect the emotional processing of non-clinical participants only. Further research will be needed to ascertain whether the present findings can be generalised to clinical populations or whether the impact of emotional processing is different in clinical samples (e.g., amplified effects). Lastly, we focussed here on depression, anxiety, and stress symptoms, but given the transdiagnostic status of alexithymia, conceptually, these relationships should also be relevant for a wide range of psychopathologies characterised by emotion dysregulation (Mehta et al., 2024). Future research should examine whether the relationships we observed also hold in adolescents for other symptom categories, such as eating disorders, post-traumatic stress disorder, and emerging personality disorders (De Panfilis et al., 2015; Luminet et al., 2021).

Conclusion

In summary, the current paper provides significant new insights into the impact of alexithymia on the development of emotion regulation and distress in adolescents. The present results highlight that alexithymia is not merely related to future emotion dysregulation and psychological distress but predicts increases in dysregulation and distress.

An adolescent with alexithymia is likely to currently be experiencing difficulties regulating their positive and negative emotions, which can lead to greater psychological distress.

However, the current findings suggest that, without intervention for their alexithymia, their emotional difficulties and general distress may worsen further in the future. These findings expand our understanding that alexithymia may hinder the development of emotion regulation in adolescents and that alexithymia may be an essential early intervention target for adolescents experiencing mental health symptoms.

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