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Is sensitivity to injustice a precursor to anxiety? The moderating role of stress: Evidence from cross-sectional and longitudinal studies

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ABSTRACT

Justice sensitivity (JS) plays a key role in prosocial behavior but is also linked to anxiety, especially under stress. This study examines how JS predicts generalized anxiety (GA) under different levels of perceived stress (PS). In Study 1, a cross-sectional survey of 621 college students assessed the relationship between JS, GA, and the moderating role of PS. In Study 2, a longitudinal natural experiment with 164 students explored how JS influenced GA at the beginning (T1) and end (T2) of the semester under stressful conditions. Both victim justice sensitivity (VJS) and altruistic justice sensitivity (AJS) predicted GA through negative affect (NA). Higher levels of PS intensified the relationship between VJS and GA by increasing NA. Students with high VJS experienced greater NA during stressful events, such as final exams, while those with low VJS showed minimal changes in NA. The findings indicate that JS, particularly VJS, can contribute to emotional problems under high-stress conditions, suggesting the importance of addressing JS in interventions aimed at improving emotional health for students with high JS. These results offer new perspectives on understanding anxiety and stress in relation to JS and inform potential strategies for supporting mental well-being.

1. Introduction

Justice sensitivity (JS) is a multidimensional personality construct that captures individual differences in cognitive, emotional, and behavioral responses to perceived injustice. It encompasses perspectives from perpetrators, victims, observers, and beneficiaries (Schmitt et al., 2010). Distinct from moral sensitivity, which emphasizes awareness of potential moral violations (Rest et al., 1999) and justice perception, which measures cognitive evaluations of fairness (Ambrose & Schminke, 2009), JS specifically reflects an individual's concern about unfair experiences. It focuses on the intensity of proactive responses to unfairness rather than mere perceptions of it (Schmitt et al., 2006). Heightened JS may increase risks for mental health issues—the more sensitive to injustice, particularly as victims, the more susceptible to internalizing problems such as depression and anxiety (Bondü & Esser, 2015; Hong et al., 2021; Liu, Yu, Huang, et al., 2023; Schmitt & Dörfel, 1999; Yu et al., 2016). The vulnerability to psychological problems among individuals with high JS may be exacerbated in certain contexts, such as high-stress environments (Cachón-Alonso & Elovainio, 2022; Li et al., 2023). However, few empirical studies have examined how the relationship between JS and psychological problems may be moderated by stressful environments.

Justice sensitivity has been categorized into four perspectives: observer JS, beneficiary JS, perpetrator JS, and victim JS (VJS). While observer, beneficiary, and perpetrator justice sensitivity differ in the roles involved–witnessing injustice, benefiting from it, or actively committing it–they all reflect a genuine concern for the injustice suffered by others. Consequently, these three forms of justice sensitivity are collectively categorized as altruistic justice sensitivity (AJS) (Fetchenhauer & Huang, 2004; Schlösser et al., 2018; Schmitt, 1996; Schmitt et al., 2010; Strauß & Bondü, 2022). AJS has been consistently associated positively with various socially desirable traits and prosocial behaviors, such as empathy (Zou et al., 2022), interpersonal trust (Gerlach et al., 2012), and cooperation (Gollwitzer et al., 2009). In contrast, VJS reflects a concern for the injustices inflicted upon oneself, and victims of injustice typically experience more intense emotional

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feelings than do observers, beneficiaries, or perpetrators (Xie et al., 2013; Yuan et al., 2015). VJS tends to be associated with socially undesirable traits and antisocial behavior, such as aggression (Bondü, 2018; Gollwitzer et al., 2005; Gollwitzer et al., 2009), crime (Astanina, 2017), non-cooperation (Baumert et al., 2020; Fetchenhauer & Huang, 2004), and bullying (Bondü et al., 2016; Strauß et al., 2021).

Perceived injustice is a significant psychosocial risk factor influencing individual mental and behavioral health (Cachón-Alonso & Elovainio, 2022; Greenberg, 2006, 2010; Murtaza et al., 2023; Resnicow et al., 2021; Robbins et al., 2012; Sichel et al., 2022; Syed et al., 2021). While AJS dimensions occasionally correlate with negative outcomes, such as beneficiary JS predicting social phobia symptoms (Bondü & Inerle, 2020), VJS has been consistently linked to both internalizing and externalizing maladjustment across various contexts. This includes depression (Bondü et al., 2017; Cui et al., 2020; Liu, Yu, Huang, et al., 2023; Yu et al., 2016), ADHD (Bondü & Esser, 2015; Schäfer & Kraneburg, 2015), eating disorders (Bondü et al., 2020), and general anxiety (Bondü & Inerle, 2020).

Generalized Anxiety Disorder (GAD) is a prevalent worldwide mental health issue, exhibiting high comorbidity rates with other clinical problems such as major depression disorder, and obsessive-compulsive disorder (Breteler et al., 2021; Macdonald-Gagnon et al., 2024). It affects up to 21% of adults at some point in their lives, causing detrimental effects on their overall well-being (Angst et al., 2016; Su et al., 2024; Sunderland et al., 2010). Generalized anxiety (GA) symptoms encompass persistent and intense affective states (e.g., pervasive nervousness, psychomotor restlessness, and anticipatory fear), coupled with maladaptive cognitive patterns characterized by a pronounced tendency towards catastrophic rumination and attentional deficits. Critically, these symptoms are further compounded by a self-reinforcing cycle wherein impaired coping capacity exacerbates the severity of coexisting symptoms (Dugas & Koerner, 2005).

While the pursuit of justice may yield certain positive effects and potentially alleviate anxiety (Yu et al., 2016), individuals with heightened sensitivity to injustice, especially from a victim's perspective, may face an increased risk of experiencing excessive anxiety across various situations (Baumert et al., 2022; Patriquin & Mathew, 2017; Strauß et al., 2021). This is probably due to a pronounced inclination towards over-interpretation and distortion of injustice-related events (Hong et al., 2021; Liu, Yu, Huang, et al., 2023; Maltese et al., 2016; Rothschild & Keefer, 2018), as well as heightened negative affect (NA) triggered by unjust events, such as anger, guilt, and jealousy (Bondü et al., 2017; Bondü & Inerle, 2020). Early theorists underscored the concept of inequity distress (Greenberg, 2010; Pfeifer, 2017; Sprecher, 2018), and individuals perceiving themselves as inequitably deprived of rewards undergo a range of intense negative affect, including anger, fear, and distress (Greenberg, 2010; Rousseau et al., 2009). Consistent with this argument, studies have shown a strong link between VJS and neuroticism—individuals with higher VJS are more susceptible to experience negative affect in general (Schmitt et al., 2006; Schmitt et al., 2010). The increased negative affect in the face of perceived injustice can in turn significantly increase symptoms such as insomnia, fatigue, and depression (Gluschkoff et al., 2017; Greenberg, 2006). To the best of our knowledge, only one study has to date demonstrated that negative affect mediates the relationship between VJS and GA (Bondü & Inerle, 2020). However, their study relied solely on a cross-sectional design, which limited its ability to provide temporal information regarding the impact of JS on GA through NA. Moreover, it remains unclear how this relationship might be influenced by the presence of potential moderators. For instance, whether the heightened vulnerability associated with sensitivity to injustice may be further exacerbated by the presence of stress (Coyne & Downey, 1991).

Stress is widely recognized as a major factor influencing individuals' psychological well-being. Chronic exposure to stress in daily lives has been linked to adverse mental health outcomes including anxiety, depression, and post-traumatic stress disorder (Bruno et al., 2022; Figueiredo & Umeoka, 2024; Ibrahim et al., 2024; Liu, Yu, & Shi, 2023; McEwen & Stellar, 1993). Daily stressors can precipitate rapid affective shifts from positive to negative valence (Zautra et al., 2005), with exaggerated emotional reactivity serving as a critical pathway linking stress exposure to psychopathology (Almeida, 2005; Chiang et al., 2018; Rahal et al., 2023). In other words, when individuals face stressors, their emotional volatility increases, potentially exacerbating internalizing problems related to negative events (Du et al., 2018; Fu et al., 2018; Peng et al., 2017). Notably, individuals with elevated VJS exhibit heightened vulnerability to stress-induced maladaptation (Schulte-Braucks et al., 2019), as their neurocognitive systems are predisposed to amplify negative responses to unfair treatment (a type of stressor), potentially triggering dysfunctional behavioral responses (Dickerson & Kemeny, 2004). Therefore, high VJS individuals may experience high level of negative affect when perceiving more stress in the environment. In this context, perceived stress (PS) may contribute to the manifestation of anxiety symptoms by moderating NA as an intermediary variable. However, this hypothesis has not been empirically tested.

Despite the consistent associations in previous research between JS (particularly VJS) and various internalizing problems, the evidence regarding its relationship to GA remains limited. Furthermore, that evidence primarily relies on correlational and cross-sectional studies, lacking longitudinal data. More importantly, few studies have examined the role of stress as a contextual factor that moderates the connection between JS and anxiety. This study aims to examine the relationship between JS and GA under different levels of stress by combining the moderated mediation model and half-longitudinal mediation model (HLMM) through two online surveys. As conceptualized in Fig. 1, in the first study, we examined the moderating role of stress in the association between JS and self-reported GA using a cross-sectional design. We hypothesized that increased levels of JS would exhibit a positive correlation with self-reported GA, mediated by NA. The association of JS with GA might change across individuals at a specific time, contingent upon their self-reported levels of stress which may vary at different time points. For instance, college-student participants typically show significantly more stress towards the end of a semester with the approach of the final examinations (Beiter et al., 2015). Therefore, in the second study, we examined how JS might contribute to GA at different stress periods. We hypothesized that higher JS is associated with a higher level of NA, which in turn increases the GA. PS may moderate the relationship between JS and GA by exerting an influence on the level of NA.

2. Study 1

2.1. Methods

2.1.1. Participants and procedures

A total of 758 college students participated in a survey administered through Sojump (www.sojump.com), a widely recognized online data collection platform widely used in Chinese behavioral research. After excluding invalid questionnaires with a completion time <3 min or exhibiting regular response patterns, the final sample consisted of 621 participants (33% males) aged between 18 and 22 years old ($M = 18.94$, $SD = 0.75$). All participants provided informed consent prior to the participation in the study and they were compensated with a pen worth 5 Chinese yuan for their participation.

2.1.2. Measures

2.1.2.1. Justice sensitivity inventory (JSI). The study employed the 40-item scale originally developed by Schmitt et al. (2010) and validated in Chinese populations by Chen et al. (2013). The scale comprises 10 items assessing victim justice sensitivity (VJS) and 30 items measuring altruistic justice sensitivity (AJS). Participants were instructed to indicate their reactions to specific instances of injustice from the

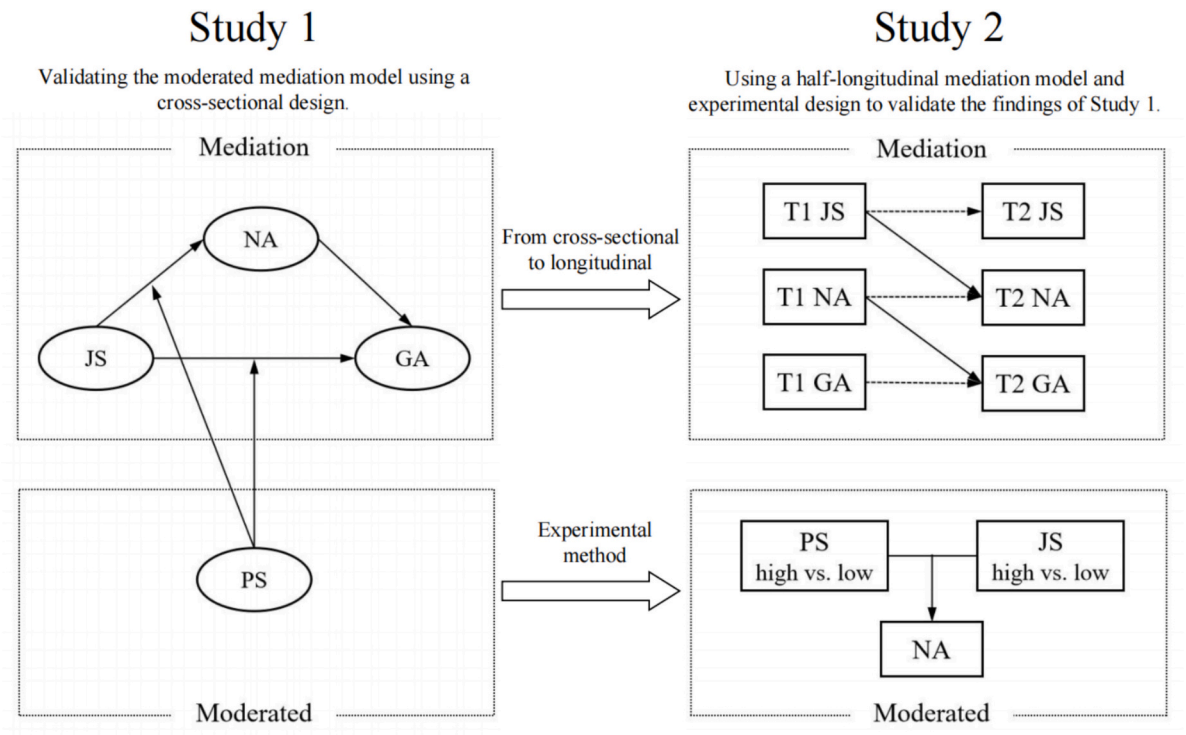

Fig. 1. The research model diagram.

perspectives of self or others (i.e., observer, beneficiary, perpetrator). Responses were recorded on a 6-point Likert scale (1 = not at all, 6 = exactly), with higher total scores reflecting greater sensitivity to justice violations. Similar to previous studies in Chinese university populations (Chen et al., 2013; Hong et al., 2021), the scale demonstrated excellent internal consistency, as evidenced by Cronbach's α coefficients of 0.88 for VJS, 0.93 for AJS (with OJS at 0.91, BJS at 0.87, and PJS at 0.91), and 0.93 for the total scale.

2.1.2.2. General anxiety disorder scale (GAD-7). The GAD scale, as revised by He et al. (2010) for the Chinese population and comprising 7 items, was used to evaluate the severity of generalized anxiety symptoms. Participants were instructed to evaluate the frequency of their anxiety symptoms (e.g., nervousness, restlessness, excessive worry) experienced over the preceding two weeks using a 4-point Likert scale (0 = almost never; 1 = occasionally; 2 = often; 3 = nearly every day). The total score was calculated as the sum of all seven items, ranging from 0 to 21. Scores between 0 and 4 indicated no anxiety, scores between 5 and 9 indicated mild anxiety, scores between 10 and 14 indicated moderate anxiety, and scores between 15 and 21 indicated severe anxiety. The scale demonstrated good reliability, with a Cronbach's alpha coefficient of 0.91.

2.1.2.3. Negative affect schedule. Negative affect was measured by the subscale of the Positive and Negative Affect Schedule (PANAS), which was originally developed by Watson et al. (1988) and revised by Huang et al. (2003) for the Chinese population. Participants were instructed to report the intensity of 10 negative emotional experiences over the past two weeks using a 5-point Likert scale (1 = very slightly or not at all, 5 = extremely). Higher scores indicated greater levels of NA. This subscale showed satisfactory reliability as evidenced by a Cronbach's alpha coefficient of 0.92.

2.1.2.4. Perceived stress scale (PSS-10). The PS Scale with 14 items (PSS-14), developed by Cohen et al. (1983), was designed for assessing individual stress levels in the community sample over the past month. PSS-10 is the abbreviated version of the original instrument (PSS-14) and has demonstrated superior psychometric properties compared to the PSS-14 (Lee, 2012). Chen et al. (2021) successfully adapted this scale for use in the Chinese population. Respondents rate statements regarding how unpredictable, uncontrollable, and overloaded they find their lives on a 5-point Likert scale ranging from “never” to “very often”. Higher scores indicated higher levels of PS. In the current study, the Cronbach's alpha coefficient for the scale was 0.77.

2.1.3. Data analysis

We presented descriptive results and calculated correlations between variables using *SPSS* 25.0 and then analyzed the moderation and mediating effects with Structural Equation Modeling (SEM) using *Mplus* 8.3.

We constructed and tested a latent moderated mediation model using the XWITH command within the latent moderated structural equations (LMS) approach, as developed by Klein and Moosbrugger (2000). All variables except for the dependent variable were mean-centered during the latent analyses. Odd-even random algorithm approach was used to parcel items into two parts with similar common degree and error variance index (Landis et al., 2000; Little et al., 2002). A two-step estimation approach was used to estimate the fit indices of the moderated mediation model. First, a baseline model (Model 0: interaction was not included) was estimated and the model fit was considered acceptable when $\chi^2/df < 5$, CFI > 0.90, TLI > 0.90, RMSEA <0.08, and SRMR <0.08 (Kline, 2011). Then, we examined the moderated mediation model (Model 1: the interaction was included) and compared it with the baseline model (see Supplementary material 1). The log-likelihood ratio test was employed to assess whether the goodness-of-fit of Model 1 exhibited a significant improvement over Model 0 (Satorra & Bentler, 2010), by examining if the *p* value of chi-square test of the -2LL (i.e., −2 [(log-likelihood for model 0) – (log-likelihood for model 1)]) fell below 0.05 (Klein & Moosbrugger, 2000; Maslowsky et al., 2015).

2.2. Result

2.2.1. Preliminary analyses

Internal consistency coefficients, means, standard deviations, gender comparisons, and bivariate correlations of study variables are presented in Table 1. As shown in Table 1, both VJS and AJS exhibited significant positive correlations with NA ($r = 0.276$ and 0.133, respectively) and GA symptom severity ($r = 0.345$ and 0.143, respectively). However, AJS showed a comparatively smaller size of association with negative emotional experiences and self-report generalized anxiety symptoms than that of VJS, replicating prior evidence that victim-focused JS is more closely related to psychopathological problems than other perspectives (Bondü & Inerle, 2020). Independent samples *t*-tests indicated that female participants reported significantly elevated levels of both VJS ($t = 4.063$, $p < 0.001$) and AJS ($t = 2.733$, $p < 0.01$) compared to males. However, no significant gender differences emerged in either PS or GA symptoms (ps > 0.05). Age showed no significant correlations with any of the variables in the study ($|r| < 0.04$, ps > 0.05).

2.2.2. Simple mediation model

The latent mediation model of VJS and AJS both demonstrated a robust fit (VJS: $\chi^2/df = 2.214$, CFI = 0.994, TLI = 0.988, RMSEA = 0.044 , SRMR = 0.042; AJS: $\chi^2/df = 3.524$, CFI = 0.979, TLI = 0.965, RMSEA = 0.064, SRMR = 0.058) (see Supplementary Table S1). As illustrated in Fig. 2a, a significant direct path emerged between VJS and GA ($B = 0.246$, $SE = 0.053$, $p < 0.001$) after controlling for age and gender. Additionally, the paths from VJS to NA ($B = 0.343$, $SE = 0.048$, $p < 0.001$) and from NA to GA ($B = 0.864$, $SE = 0.077$, $p < 0.001$) were also statistically significant. We applied a 1000 bootstrap resampling to analyze the mediating effect and showed that the 95% CI did not include zero ($B = 0.296$, $p < 0.001$, 95 BCE% CI [0.212, 0.391]). The mediating effect accounted for 54.6% of the total effect. Fig. 2b showed that the paths from AJS to NA ($B = 0.111$, $SE = 0.047$, $p = 0.018$) and from NA to GA ($B = 0.955$, $SE = 0.079$, $p < 0.001$) were also statistically significant, while the path from AJS to GA showed no significance ($B = 0.074$, $SE = 0.046$, $p = 0.109$). Bootstrapping analyses suggested the indirect effect of "AJS → NA → GA" was significant ($B = 0.106$, $p = 0.020$, 95 BCE% CI [0.020, 0.196]).

2.2.3. Moderated mediation model

We employed the LMS procedure to conduct the moderated mediation analysis to examine the direct effect of JS on GA, the mediating effect of NA between JS and GA, and whether this relationship was moderated by PS.

First, we assessed the baseline model of VJS (Model 0). The results showed that all fit indices of the model reached accepted level ($\chi^2/df = 1.692$, CFI = 0.995, TLI = 0.992, RMSEA = 0.033, SRMR = 0.038). Then the moderated mediation model (Model 1) was estimated. Compared to Model 0, Model 1 exhibited an increase in −2LL value by 6.884 (Model 0: Log Likelihood = −3303.999; Model 1: Log Likelihood = −3297.115), along with an increase in the degree of freedom by 2. Therefore, Model 1 demonstrated a more favorable goodness-of-fit than Model 0 (Maslowsky et al., 2015).

The results of the structural model (see Table 2 and Fig. 3) showed a significant predictive effect of the interaction between VJS and PS on NA ($B = 0.136$, $SE = 0.057$, $p = 0.016$) and a marginally significant effect of the interaction between VJS and PS on GA ($B = 0.122$, $SE = 0.066$, $p = 0.062$). Simple slope tests showed that VJS exhibited a significant positive effect on NA only under high PS conditions (M + SD; $B_{simple} = 0.273$, $SE = 0.088$, $p = 0.002$; M-SD; $B_{simple} = 0.000$, $SE = 0.059$, $p = 0.998$). Moreover, the mediating effect is only significant under high PS condition (Boot effect = 0.111, Boot SE = 0.039, 95% CI [0.043, 0.195]) and not significant under low PS conditions (Boot effect = 0.000, Boot SE = 0.024, 95% CI [−0.051, 0.046]).

The same procedure was employed to examine the moderated mediation model in which AJS as the independent variable. However, the results of AJS presented poor model fit, along with non-significant effects regarding the mediating role of NA and the moderating role of PS (see Supplementary material 2, Table S2 and Figure S1).

2.3. Discussion

The findings of this study provided more empirical evidence supporting the association between JS and GA through NA, with PS acting as a moderator. Specifically, college students with high VJS were more likely to experience NA only under conditions of elevated PS. In other words, perceiving more stress in daily lives increased the association between VJS and heightened anxiety severity.

The results align with previous studies positively linking VJS to various internalizing problems, including depressive symptoms, eating disorders, and emotional difficulties (Bondü et al., 2017; Bondü & Elsner, 2015). In particular, one study has shown association between VJS and both generalized anxiety and social phobia through the mediator of NA and fear of rejection and criticism (Bondü & Inerle, 2020). We provided additional evidence for the clinical relevance of VJS and demonstrated that the emotional problems associated with high VJS may become more severe under stressful conditions.

Consistent with established gender differences in JS, female participants reported significantly elevated levels of both VJS and AJS compared to males. This gender disparity aligns with evidence suggesting women exhibit heightened vigilance towards interpersonal injustice, whether experienced personally (VJS) or witnessed vicariously (AJS) (Schmitt et al., 2010).

To date, the examination of the relationship between JS and internalizing problems has primarily relied on cross-sectional data; longitudinal data is needed to establish the directional predictive effect of JS on emotional problems. Towards this end, we employed a cross-lagged panel design in Study 2 to test the relationship between JS and GA while also aiming to validate the moderating effect of PS in linking VJS with NA by examining how the level of NA may change for individuals

Table 1
Descriptive statistics, gender comparisons, and correlations between study variables.

Variable	α	Total M (SD)	Male M (SD)	Female M (SD)	t (p)	1	2	3	4	5	6
1. VJS	0.876	3.095 (0.774)	2.907 (0.848)	3.187 (0.718)	4.063***	1					
2. AJS	0.933	3.123 (0.628)	3.017 (0.731)	3.176 (0.565)	2.733**	0.381***	1				
3. PS	0.765	1.660 (0.516)	1.610 (0.485)	1.685 (0.529)	1.690	0.328***	0.125**	1			
4. NA	0.921	2.005 (0.730)	2.092 (0.752)	1.963 (0.715)	2.080*	0.276***	0.133**	0.600***	1		
5. GA	0.909	0.838 (0.593)	0.789 (0.584)	0.862 (0.596)	1.444	0.345***	0.143***	0.619***	0.636***	1	
6. Age	–	18.939 (0.745)	19.059 (0.798)	18.880 (0.711)	2.825**	−0.03	−0.002	0.018	0.039	0.006	1

Notes: VJS = victim justice sensitivity; AJS = altruistic justice sensitivity (the average score of observer justice sensitivity, beneficial justice sensitivity and perpetrator justice sensitivity); PS = perceived stress; NA = negative affect; GA = generalized anxiety. Cronbach's α (α), means (*M*), standard deviations (*SD*) and Pearson correlation ($n = 621$).

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

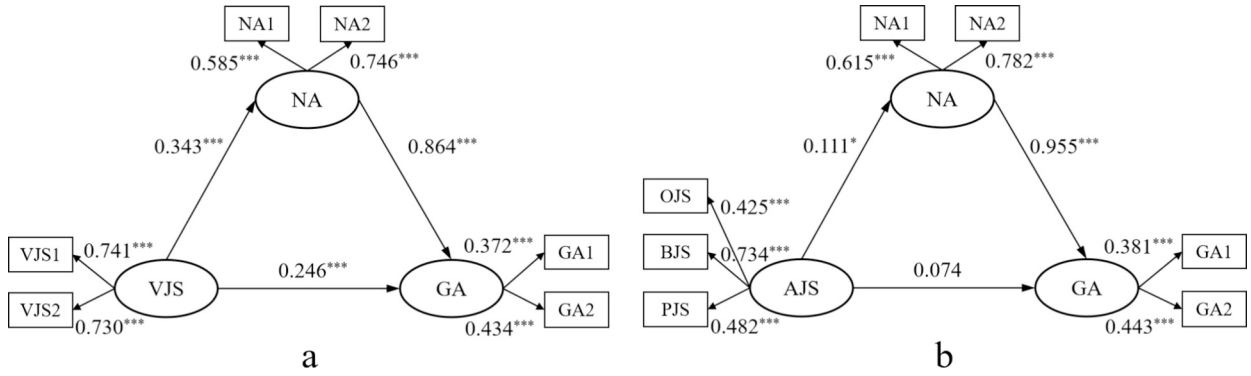

Fig. 2. Models on the mediating role of negative affect (NA) in the relationship between (a) victim justice sensitivity (VJS) / (b) altruistic justice sensitivity (AJS) and generalized anxiety (GA).
Note. Values are all unstandardized path coefficients. *$p < 0.05$. ***$p < 0.001$.

Table 2
Testing for the moderated mediation model.

Variable	NA			GA		
	B	*SE*	*t*	*B*	*SE*	*t*
VJS	0.136	0.057	2.404*	0.180	0.068	2.639**
NA				0.408	0.068	5.963***
PS	0.940	0.088	10.652***	0.693	0.105	6.598***
VJS * PS	0.136	0.049	2.806**	0.122	0.066	1.866

Note. VJS=Victim justice sensitivity; PS = Perceived stress; NA = Negative affect; GA = Generalized anxiety.
* $p < 0.050$.
** $p < 0.010$.
*** $p < 0.001$.

with high VJS at different times of the semester, when students may encounter varying levels of stress.

3. Study 2

3.1. Methods

3.1.1. Participants and procedures

We conducted two rounds of online data collection using the same platform as study 1. At Time 1 (T1, March 2022), a total of 323 college students participated in the survey at the beginning of the semester when participants were experiencing relatively low levels of stress (low-stress condition). Eventually, responses from 258 participants were included for analysis. Three months later at Time 2 (T2, June 2022), 172 of these students completed follow-up assessments at the end of the semester when participants were likely facing relatively high levels of stress due to approaching final examinations (high-stress condition). Ultimately, a sample size of 164 samples (24% males) aged between 16 and 23 years old (M = 18.91, SD = 0.75) were used for subsequent analysis after excluding invalid samples following the same criteria as study 1.

Furthermore, participants were categorized into two groups based on the average scores on the VJS Scale across the two distinct time points. After ranking the scores from high to low, the top 27% of scorers were classified as the high VJS group (n = 43 participants, Mean age = 18.91 years, SD = 0.718; 79.1% female), while the bottom 27% constituted the low VJS group (n = 43 participants, Mean age = 18.91 years, SD = 0.947; 72.1% female).

All participants provided informed consent before participating in the study. Each participant received a pen as compensation for their involvement in each round of data collection.

3.1.2. Measures

All measurements used during the T1 and T2 periods were the same as Study 1 (see 2.1.2).

3.1.3. Data analysis

The statistical analyses were conducted using *SPSS* 25.0 including descriptive statistics, correlation analysis, independent samples *t*-tests,

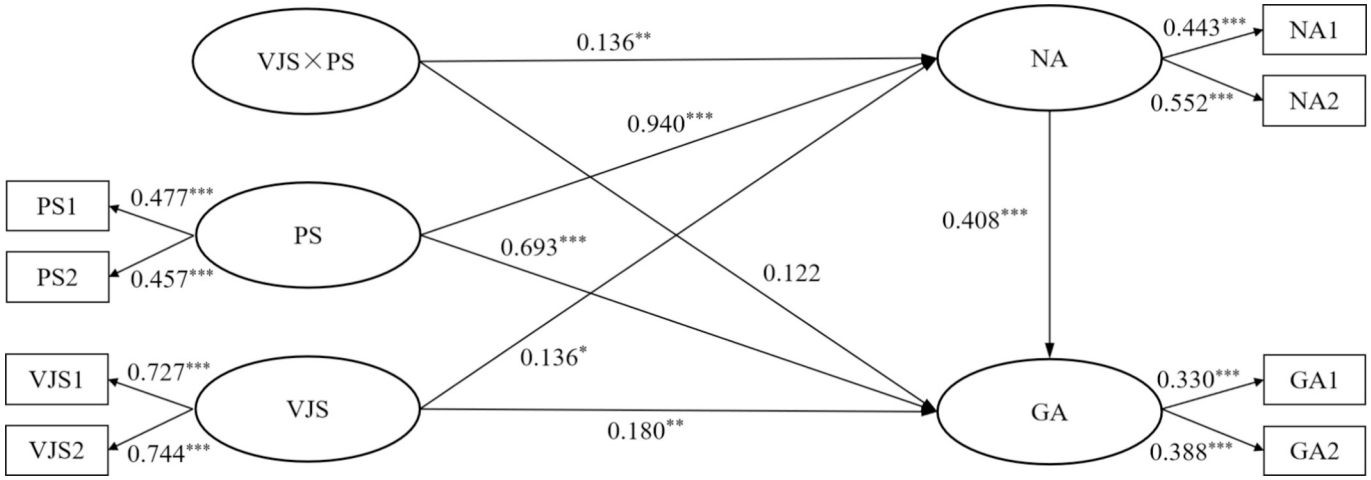

Fig. 3. The model on the moderating role of perceived stress (PS) on the direct/indirect relationship between VJS and GA.
Note. Values are all unstandardized path coefficients. *$p < 0.050$; **$p < 0.010$; ***$p < 0.001$.

and repeated measures ANOVA. The half-longitudinal mediation model (Cole & Maxwell, 2003) was performed with *Mplus* 8.3 using FIML to test the relationship between JS and GA, and the mediating role of NA (Fig. 4). A half-longitudinal mediation model is an auto-regressive, cross-lagged path model. In this study, the "a" path of the proposed mediation model was evaluated by regressing NA at T2 on JS at T1, with NA at T1 controlled (path a_1 and a_3). Simultaneously, the "b" path was assessed by regressing GA at T2 on NA at T1, while controlling for GA at T1 (path b_1 and b_3). We also constructed a reverse mediation model to test whether the relationship between JS and GA is bidirectional. The mediating effects in the half-longitudinal model were assessed using Selig and Preacher's Monte Carlo Calculator, an online tool for generating confidence intervals for indirect effects (Selig & Preacher, 2008).

Furthermore, we tested the moderating effects of stress by conducting two 2 × 2 repeated measures analyses of variance (ANOVAs) to investigate the interaction between stress and VJS on NA and GA, with the VJS group (high VJS and low VJS) as a between-subjects factor, while the stress level (high stress and low stress) was treated as a within-subjects factor.

3.2. Result

3.2.1. Descriptive statistic

With the exception of the non-significant correlation between T1 PS and T2 VJS, all other variables exhibited significant positive correlations with VJS. However, there was no significant correlation observed between AJS and the other variables at the same time point. Descriptive statistics and bivariate correlation values among the variables measured at both T1 and T2 time points can be found in Supplementary Table S3.

3.2.2. Half-longitudinal mediation model

Results from the half-longitudinal mediation model are presented in Table 3. The model of VJS and AJS both had acceptable fit (VJS: $\chi^2/df = 1.924$, CFI = 0.955, TLI = 0.942, RMSEA = 0.075, SRMR = 0.055; AJS: $\chi^2/df = 1.574$, CFI = 0.974, TLI = 0.966, RMSEA = 0.059, SRMR = 0.051). Consistent with our hypotheses, VJS and AJS at T1 predicted higher levels of NA at T2 while controlling for NA at T1 (a_1: $B = 0.135$, $SE = 0.043$, $p = 0.002$; a_3: $B = 0.115$, $SE = 0.052$, $p = 0.027$). Further, NA at T1 predicted higher GA at T2 while controlling for GA at T1 (b_1: $B = 0.199$, $SE = 0.071$, $p = 0.005$; b_3: $B = 0.213$, $SE = 0.070$, $p = 0.002$). The indirect effects of half-longitudinal mediation model of VJS and AJS were 0.027 and 0.024 respectively, and the 95% bootstrapped CI of the indirect effects by Monte Carlo method indicated that the indirect effects of both models were statistically significant (VJS: 95% CI [0.005, 0.057]; AJS: 95% CI [0.002, 0.056]).

The reverse mediation models both showed that GA at T1 predicted higher NA at T2 (a_2: $B = 0.252$, $SE = 0.066$, $p < 0.001$; a_4: $B = 0.247$, $SE = 0.066$, $p < 0.001$), however, NA at T1 did not significantly predict VJS or AJS at T2 (b_2: $B = 0.089$, $SE = 0.081$, $p = 0.270$; b_4: $B = -0.010$, $SE = 0.048$, $p = 0.859$). The 95% CI for the indirect effect of both reverse mediation models of VJS and AJS included zero (VJS: 95% CI [−0.016, 0.069]; AJS: 95% CI [−0.033, 0.027]), suggesting no mediating effect in the reversed mediation models.

Table 3
Longitudinal associations between VJS /AJS, NA and GA.

Paths	*B*	95% *CI*	*SE*	*t*
Half-longitudinal mediation model of VJS				
Autoregressive paths				
T1 VJS → T2 VJS	0.516	[0.369, 0.632]	0.060	8.667***
T1 NA → T2 NA	0.581	[0.460, 0.701]	0.063	9.280**
T1 GA → T2 GA	0.456	[0.281, 0.622]	0.078	5.885***
Paths for indirect effects models				
T1 VJS → T2 NA (a1)	0.135	[0.056, 0.218]	0.043	3.149**
T1 NA → T2 GA (b1)	0.199	[0.063, 0.373]	0.071	2.811**
T1 GA → T2 NA (a2)	0.252	[0.119, 0.375]	0.066	3.81***
T1 NA → T2 VJS (b2)	0.089	[−0.058, 0.263]	0.081	1.103
Half-longitudinal mediation model of AJS				
Autoregressive paths				
T1 AJS → T2 AJS	0.682	[0.565, 0.799]	0.060	11.436***
T1 NA → T2 NA	0.640	[0.537, 0.743]	0.053	12.145***
T1 GA → T2 GA	0.435	[0.285, 0.585]	0.076	5.701***
Paths for indirect effects models				
T1 AJS → T2 NA (a1)	0.115	[0.013, 0.216]	0.052	2.207*
T1 NA → T2 GA (b1)	0.213	[0.076, 0.351]	0.071	3.037**
T1 GA → T2 NA (a2)	0.247	[0.111, 0.367]	0.066	3.755***
T1 NA → T2 AJS (b2)	−0.010	[−0.141, 0.092]	0.058	−0.178

* $p < 0.050$.
** $p < 0.010$.
*** $p < 0.001$.

3.2.3. Testing the effect of PS on NA for individuals with different levels of VJS

To provide more evidence for the moderating role of PS on the relationship between VJS and NA, we tested the effect of PS level on NA for individuals with different levels of VJS by conducting the survey at different time points, during which the level of stress varies.

The independent sample *t*-test showed that the VJS score of the high VJS group was significantly higher than that of the low VJS group ($M_{high} = 4.871 \pm 0.342$, $M_{low} = 3.270 \pm 0.419$, $t_{high\text{-}low}(84) = 19.396$, $p <$

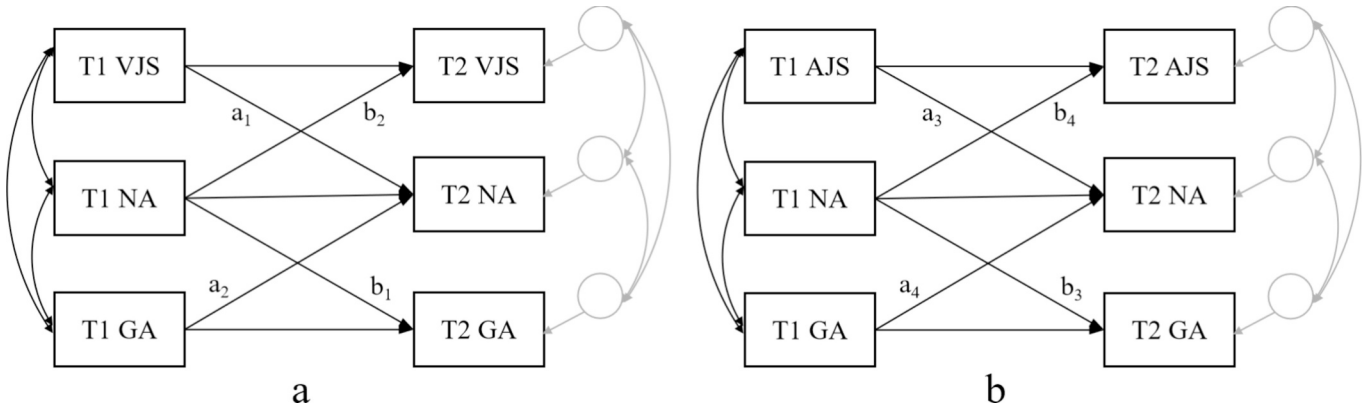

Fig. 4. Half-longitudinal mediation model of the indirect association between JS and later GA via NA (Paths a_1, b_1, a_3 and b_3). Paths a_2, b_2, a_4 and b_4 represent the indirect pathway for the alternative reverse model.
Note. Values are all unstandardized path coefficients.

0.001, Cohen's d = 4.183). Furthermore, the paired sample *t*-test revealed a significant increase in PS and NA among participants at the end of the semester (T2) compared to those at the beginning of the semester (T1) (PS: $t_{T2\text{-}T1}(163) = 26.431$, $p < 0.001$, Cohen's $d = 2.063$; NA: $t_{T2\text{-}T1}(163) = 2.331$, $p = 0.021$, Cohen's $d = 0.181$). However, neither VJS nor GA were significantly different between T1 and T2 ($t_{T2\text{-}T1}$ (163) = 0.737, $p = 0.436$; $t_{T2\text{-}T1}$ (163) = 1.537, $p = 0.118$) (see Supplementary Table S4).

The data were then subjected to two-way mixed ANOVAs of 2 (group: high VJS and low VJS) × 2 (stress level: high stress and low stress) with NA and GA as dependent variables, respectively. The results of GA showed that the main effect of group was significant ($F_{(1, 84)} = 7.302$, $p = 0.008$, $\eta^2 = 0.080$), with the NA of the high VJS group being significantly higher than that of the low VJS group; the main effect of stress level was significant ($F_{(1, 84)} = 5.013$, $p = 0.028$, $\eta^2 = 0.056$), with the NA under high stress level significantly higher than those under low stress. Most importantly, there was a significant interaction between group and stress level ($F_{(1, 84)} = 5.013$, $p = 0.028$, $\eta^2 = 0.056$). A simple effect analysis showed that for the high VJS group, the NA was significantly higher at Time 2 (2.265 ± 0.600) than Time 1 (2.042 ± 0.697, $p < 0.001$) while there were no significant differences for NA between T1 and T2 for the low VJS group (see Fig. 5a), indicating that individuals with high VJS are more likely to be negatively affected by stressful situations than individuals with low VJS. However, regarding GA, only the main effect of group was significant ($F_{(1, 84)} = 35.004$, $p < 0.001$, $\eta^2 = 0.294$; Fig. 5b). No other main effects and interactions were found (all $p > 0.05$).

3.3. Discussion

In Study 2, we conducted an investigation to reveal how JS is linked to GA through the mediator of NA using a longitudinal design. Additionally, we elucidated the effect of JS on NA for students under different stressful situations through the semester. Overall, we provided longitudinal evidence for the predictive effect of JS on GA with NA as a mediator; moreover, high VJS individuals experienced significantly more NA at the end of the semester before final examination (i.e., high PS level) than at the beginning of the semester (i.e., low PS level); however, low VJS individuals did not experience increased NA before final examination, showing emotional stability in face of daily stressors.

A half-longitudinal mediation model was used in this study to examine the relationship between JS and GA. Although longitudinal data is preferably collected at three time points, Cole and Maxwell showed that the half-longitudinal mediation model can provide estimates comparable to those obtained from a three-wave longitudinal mediation model, when making the assumption of stationarity (Cole & Maxwell, 2003). Our results revealed that the JS trait may exert an influence on GA through NA, and a reverse mediation model showed that the relationship between JS and GA is not bidirectional, suggesting that an elevated level of sensitivity to injustice may trigger significantly more negative emotional experiences, subsequently increasing vulnerability to self-reported generalized anxiety symptoms. In other words, the personality trait of JS, in particular victim justice sensitivity, acts as a risk factor for anxiety problems for college students.

We manipulated the level of stress using a natural-experiment design by collecting data at two time points throughout the semester when participants experienced relatively low and high levels of stress. The ANOVA results showed that stressful events led to an increase in NA only for high VJS individuals while this effect was not observed for low VJS individuals, thus providing more direct evidence for the moderating role of PS on the mediation model from study 1. However, it should be noted that the moderated mediation model in study 2 failed to reach significance (see Supplementary material 3, Figure S2–4 and Table S5–7), possibly due to a small sample size that led to inadequate statistical power.

4. General discussion

Understanding the relationship between personality traits and clinical issues is crucial for identifying risks and increasing well-being. JS, a trait reflecting the propensity to perceive and respond to injustice, has been linked to several mental health conditions. The current study explored the connection between JS and GA, in particular how this relationship is moderated by PS. Using a combination of cross-sectional and longitudinal data, online surveys, and natural-experiments, the study found that JS significantly predicted GA among college students through the mediator of NA. Moreover, the magnitude of the relationship was more pronounced in the victim perspective and was moderated by PS. Individuals with high VJS experienced greater negative affect than those with low VJS only when they also reported elevated levels of PS. Furthermore, findings from the natural experiment results showed that only college students with high VJS experienced elevated NA with the approach of final examination; conversely, neither NA nor GA changed significantly throughout the semester for individuals with low VJS despite variations in PS levels.

Several studies have linked JS to emotional problems like depression and anxiety in adolescents and university students (Bondü et al., 2017; Bondü & Elsner, 2015; Cui et al., 2020; Liu, Yu, Huang, et al., 2023; Yu et al., 2016). However, these findings primarily relied on cross-sectional data, leaving the causal direction unclear. Our findings not only established a concurrent association between JS and GA among college students but also demonstrated its predictive nature for GA over time. This provides more compelling evidence that JS acts as a double-edged sword by significantly increasing the risk of internalizing problems despite

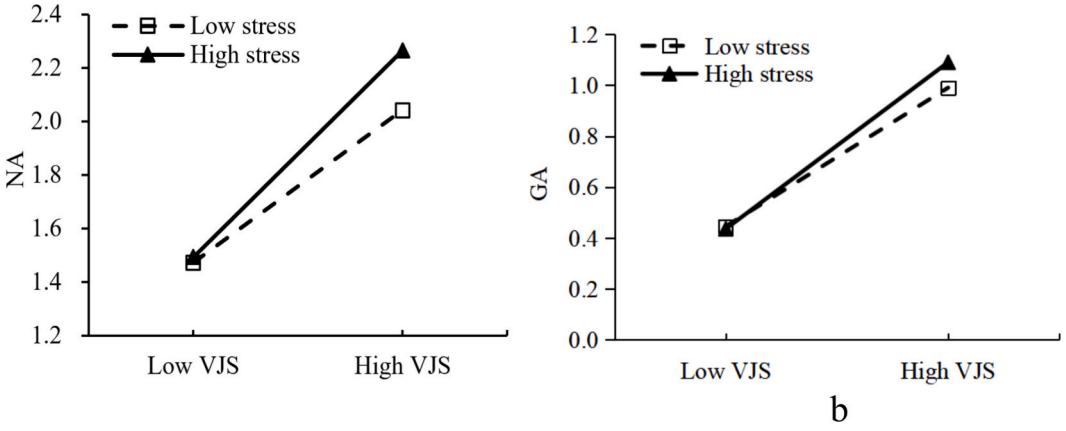

Fig. 5. Interactive effect of VJS and stress on (a) NA and (b) GA.

being closely related to prosocial behavior (Gerlach et al., 2012; Gollwitzer et al., 2009).

Contrary to many studies showing a negative link between AJS and internalizing problems (Bondü & Elsner, 2015), both of our studies revealed a positive association between GA and all types of JS. In particular, individuals with high levels of AJS also displayed an elevated inclination towards GA. These findings align with recent research showing AJS as a risk factor for GA and social phobia (Bondü & Inerle, 2020). This is likely because individuals with high JS tend to avoid injustice and remain hypervigilant to unjust information, regardless of their perspectives. In addition, both our cross-sectional and half-longitudinal mediation experiments showed a mediating role of NA in the relationship between JS (both VJS and AJS) and GA, replicating previous findings that highlight NA as a mediator in the association of JS to internalizing problems such as anxiety and depression (Bondü & Inerle, 2020; Cui et al., 2020). These results suggested that individuals with elevated JS are more vulnerable to experiencing NA, which predispose them to an increased risk for mental health problems. The scale items measured negative emotions (e.g., upset, annoyed, angry) and ruminative thinking about injustice. Therefore, high scorers may be more attentive to injustice signals and react more intensely (Dignath et al., 2020), consuming psychological resources and increasing susceptibility to fatigue and anxiety.

Notably, VJS exhibited a more pronounced predictive value for GA in comparison to AJS. VJS reflects a self-centered concern and has frequently been associated with negative mentality including paranoia, suspiciousness, beliefs in an unjust world, and vengeance (Gerlach et al., 2012; Schmitt et al., 2006). Research suggests that individuals react more intensely to personal unfair treatment than to observing others' unfair treatment (Civai et al., 2010; Gummerum et al., 2022). At the same time, evidence suggests that individuals characterized by heightened sensitivity to victimization have a propensity to experience stronger NA in response to unfair events, such as anger, resentment, and jealousy (Brock et al., 2022; Hong et al., 2021) and may be inclined towards interpreting ambiguous situations negatively (Chen et al., 2013).

Stress is a prominent contributor to mental health problems, with one recent study showing that 70% of adults experience at least moderate daily stress or anxiety, a finding also detected among college students (Beiter et al., 2015; Harvey et al., 2017). Exposure to stressful environments may amplify people's reactions to adverse life events. One of the primary purposes of this study is to uncover whether PS moderates the relationship between JS and GA. The findings from Study 1 supported our hypothesis, demonstrating that PS moderated the mediation model involving VJS, NA and GA. Specifically, VJS exhibited a heightened predictive value for NA under conditions of high PS as opposed to low stress, which was confirmed by the interaction effect between VJS and PS on NA from the natural-experiment results in Study 2. Additionally, individuals with high VJS experienced significantly greater magnitudes of NA under stress, while those with low VJS were unaffected. However, the moderating effect of PS on the link between JS and NA was limited to VJS, highlighting the special vulnerability of the victim-sensitive individuals to external stressors. One plausible explanation for this could be that acute environmental factors, such as stress, are more prone to interfere with individuals' cognitive and emotional processing of self-relevant information (Dickerson & Kemeny, 2004). Conversely, when emotional processing is unrelated to the self, the presence of stress does not seem to exert a significant influence.

The results showed that PS is an external factor for individuals to generate negative beliefs in unfair social situations, which is consistent to the Diathesis-Stress Theory (Monroe & Simons, 1991). According to the Diathesis-Stress Theory, clinical problems arise from an interplay between predispositional vulnerability (Diathesis) and external stressors. While individuals with a higher diathesis are prone to developing mental health problems, diathesis alone may not necessarily cause these problems. Rather, it is a series of stressful life events that significantly increases the likelihood of psychological disorders occurrence and accelerates their developmental trajectory (Coyne & Downey, 1991). VJS reflects individuals' propensity to perceive and respond to injustice experienced personally, and has been found to possess a genetic basis (Eftedal et al., 2020). Thus, VJS itself can be considered as a diathesis which predisposes individuals to develop internalizing problems due to their susceptibility to experiencing NA—those with high VJS report increased fear of being treated unfairly and may experience heightened levels of worry, anxious during social interactions. This propensity to negative experiences is amplified under stressful circumstances, leading to cumulative risks for emotional distress including GA. It should be noted that our analyses revealed significant NA elevations under chronic stress exposure only among individuals with the highest VJS scores in the group (top 27% VJS scores in the sample; see Supplementary Figure S5). This suggests that moderate VJS levels in the general population may not necessarily result in significant emotional disturbances within concurrent high-stress conditions. Based on these finding, future studies should examine the critical threshold of VJS that renders individuals susceptible to stressful conditions.

The findings of the current study have some significant implications for fostering positive personality qualities of students and promoting the mental well-being in young adolescents. It is crucial to assess and cultivate JS not only in terms of negative reactions to injustice but also by considering the positive aspects during the pursuit of justice. For instance, educational initiatives should encourage students to recognize and appreciate positive experiences when upholding justice both personally and by observing others (e.g., inviting students to discuss how do they feel after preventing bullying from harming themselves or friends). It is worth noting that while JS and GA remain stable over time, a notable increase in NA can be observed when individuals with heightened VJS are perceiving a great deal of stress, which subsequently predicts GA. These findings emphasize the importance of providing emotional support to alleviate the impact of enhanced stress for students hypersensitive to injustice. Additionally, it is essential to provide them training programs aimed at enhancing their stress regulating skills and resilience, thereby bolstering their personal resources and ability to effectively cope with adverse life experiences encountered in social interactions (Quiñones-Camacho & Davis, 2019).

Despite adding significantly to our understanding of the relationship between JS traits and mental health through a combination of cross-sectional and longitudinal design, several limitations of the study should be mentioned. First, we did not assess participants' depression or other comorbid emotional problems, which are highly prevalent in populations with elevated anxiety symptoms (Breteler et al., 2021). This limitation may hinder our ability to disentangle whether VJS is specifically associated with anxiety problems or if it relates more broadly to psychological distress. Future studies should incorporate related symptom assessments. Second, our categorization of participants into high and low VJS groups based on the top and bottom 27% of scores led to data loss. This dichotomization could reduce statistical power and introduce artificial categorization biases. While this approach aligns with prior group comparisons in justice sensitivity research (Chen et al., 2013; Hu et al., 2020), future studies could categorize different levels of justice sensitivity by retaining the continuum of the scale. For example, employing Latent Class Analysis (LCA) would allow for examination of group differences across the entire sample. Third, all participants were college students which limits the generalizability of the findings. Although the main findings align with those obtained from a diverse sample (Bondü & Inerle, 2020), future studies should validate these results in community and clinical populations. Fourth, the moderating effect of PS in the half-longitudinal moderated mediation model failed to reach significance, likely due to the small sample size. Replication with larger samples is necessary to confirm the robustness of these effects. Fifth, the stress induction in Study 2, though ecologically valid, represents only one situational context. The moderating role of PS should be tested across diverse stressors (e.g., social exclusion, financial pressure)

using experimental paradigms. Additionally, the two-wave longitudinal design over a limited timeframe precludes causal inference. Extended multi-wave studies are needed to track the dynamic interplay between JS and GA.

5. Conclusion

Based on cross-sectional and longitudinal data and by combining online-surveys and natural-experiment manipulations, the current study examined how justice sensitivity (JS) is linked to generalized anxiety (GA) through the mediator of negative affect (NA) and the moderating role of perceived stress (PS) among college students. Our results revealed that both victim justice sensitivity (VJS) and altruistic justice sensitivity (AJS) were positively associated with GA symptoms. Moreover, NA mediated the relationship between JS and GA. In addition, PS was found to moderate the relationship between VJS and GA by exerting an influence on the level of NA. Students with a higher level of VJS experienced enhanced NA at the end of semester under the pressure of preparing final examinations. However, those with a lower level of VJS did not experience changes in negative emotions under such pressure. Taken together, this study extends previous research by establishing a robust relationship between JS and GA and revealing the moderating role of PS. These findings can shed important insight into the development of educational initiatives aimed at fostering mental health of college students.

List of abbreviations

JS	Justice Sensitivity
VJS	Victim Justice Sensitivity
AJS	Altruistic Justice Sensitivity
PS	Perceived Stress
NA	Negative Affect
GAD	Generalized Anxiety Disorder
GA	Generalized Anxiety
ADHD	Attention Deficit Hyperactivity Disorder
HLMM	Half-Longitudinal Mediation Model
LMS	Latent Moderated Structural
CFI	Comparative Fit Index
TLI	Tucker-Lewis Index
RMSEA	Root Mean Square Error of Approximation
SRMR	Standardized Root Mean Square Residual
CI	Confidence Interval

CRediT authorship contribution statement

Xinyi Zhu: Writing – review & editing, Writing – original draft, Visualization, Validation, Methodology, Formal analysis, Data curation, Conceptualization. **Jian Fang:** Writing – original draft, Visualization, Validation, Software, Methodology, Formal analysis, Data curation, Conceptualization. **Yiming Yu:** Investigation, Conceptualization. **Morris Hoffman:** Writing – review & editing. **Eyal Aharoni:** Writing – review & editing. **Qun Yang:** Writing – review & editing, Supervision, Resources, Project administration, Funding acquisition, Conceptualization.

Ethics statement

The study was approved by the Ethics Committee of Hangzhou Normal University. All procedures performed in data collection comply with the ethical standards of the Institutional Research Board.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.paid.2025.113190.

Data availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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