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Neural correlates of conflict adaptation predict daily stress reactivity

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Abstract

Chronic exposure to daily stress can be harmful to mental health especially when individuals lack adaptive adjustment mechanisms. The present study aimed to investigate how the adaptive capacities in cognition and emotion as well as their neural signatures could moderate the stress reactivity in daily life. Seventy-five healthy participants aged 18–24 years participated in this study. We recorded brain activity using electroencephalography while participants were performing a conflict task and an emotion regulation task in the laboratory. Using the experience sampling method, participants were subsequently instructed to report their daily stress and daily affect on 14 consecutive days. Our results revealed that a larger adaptation effect in reaction times of the conflict task predicted a stronger negative affect in response to the stress of the same day. The adaptation effect in the N2 and P3 components elicited by the conflict task predicted a weaker influence of today's stress level on the next day's stress level, pointing to a better stress adaptation. However, emotion regulation capacities did not predict daily stress reactivity. Our data indicate that conflict adaption predicts two aspects of stress reactivity in daily life: how stress influences the negative affect that day, and how stress that day is related to stress the next day. These findings point to new avenues for early screening of stress-vulnerable populations, with implications for the prevention and intervention of stress-related mental disorders.

KEYWORDS
conflict adaptation, daily affect, daily stress, emotion regulation, event-related potentials (ERPs)

1 | INTRODUCTION

Chronic stress is often reported to precede mental disorders, such as major depression and anxiety disorders (Hammen et al., 2009; Holahan et al., 2005; Schneiderman et al., 2005). There are, however, considerable individual differences in responses to stressful situations, and stress-related disorders are more likely to occur in individuals who lack adaptive coping mechanisms. The present study was interested in how the adaptive capacities in cognition and emotion could moderate the stress reactivity in daily life.

The adjustment of cognitive control is context-sensitive and allows for flexible and dynamic regulation of control processes (Braem et al., 2019). Cognitive control refers to the ability to employ internal goals to deal with the conflict between competing representations and task demands, which is perhaps the most distinguished difference between humans and other species (Egner, 2017). More importantly, it has been suggested that cognitive control is

not a static process. Instead, as the engagement of control is resource-intensive and costly, it should only be imposed when necessary (Shenhav et al., 2013). This dynamic regulation of the control process is captured by the concept of adaptive control in response to changing environments (Braem et al., 2019).

One measure of adaptive control is the conflict adaptation effect, also referred to as congruency sequence effect, that is, the congruency effect of current trials is influenced by the previous-trial congruency (Botvinick et al., 2001). In conflict tasks, the trial congruency means whether task-relevant and task-irrelevant information are congruent in a particular trial. Conflict adaption suggests that the level of control is up-regulated during trials that follow an incongruent trial, that is, a conflict. This conflict adaptation effect is reflected in how the reaction time of the current incongruent trial is reduced following previous incongruent trials compared to previous congruent trials (Clayson & Larson, 2011b). The faster reaction time for iI trials (previous incongruent, current incongruent) than for cI trials (previous congruent, current incongruent) shows larger reduced interference from incongruent distractors, indicating larger adaptation of control following a conflict (Egner, 2007). Since the need to adapt to changing environments is also crucial for dealing with stressors in daily life, this conflict adaptation capacity could be closely related to daily stress reactivity.

Two electrophysiological indices associated with cognitive control are the event-related potential (ERP) components N2 and P3 (Clayson & Larson, 2011a). The N2 is a negative component that peaks around 250–350 ms after stimulus onset and distributes over fronto-central sites (Clayson & Larson, 2011a; Larson et al., 2014; van Veen & Carter, 2002). N2 has been suggested to play a role in conflict detection and to reflect conflict monitoring (Forster et al., 2011; Yeung et al., 2004). It is thought to be generated from the anterior cingulate cortex (ACC; Ladouceur et al., 2007; Yeung et al., 2004). ACC is involved in the evaluative component of cognitive control mechanisms and is responsible for monitoring the amount of conflict (van Veen & Carter, 2006). Altogether, the N2 is considered a neural signature associated with the evaluative process of ACC on conflicts (Clayson & Larson, 2011a). In addition to the N2, the P3 component is also modulated by conflicts, which is a positive waveform observed over centro-parietal areas during 350–600 ms window following the presentation of stimuli (Clayson & Larson, 2011a). The P3 has been suggested to reflect response inhibition (Albert et al., 2013; Clayson & Larson, 2011a) and allocation of attentional recourses (Polich, 2007). Therefore, P3 might be more related to the executive process of control rather than the evaluative process.

In addition to cognitive adjustment, emotion regulation represents a fundamental mechanism of adaptation. According to Gross (1998), there are two major classes of emotion regulation: one is antecedent-focused (e.g., reappraisal); the other is response-focused (e.g., suppression). Reappraisal was defined as the interpretation of the emotional stimuli in an unemotional manner (Gross, 1998; Speisman et al., 1964). Suppression was defined as the inhibition of emotion-expressive behaviors (Gross, 1998; Gross & Levenson, 1993). While reappraisal has been found to lower disgust experience, suppression is more likely to increase the activation of the sympathetic system. Thus, reappraisal tends to be more beneficial to health than suppression (Gross, 1998). The evidence from neuroimaging studies has shown that reappraisal is related to the frontoparietal executive network. However, for inhibition of fear, neural activation is found in the ventral ACC (vACC) and the ventromedial PFC (vmPFC; Etkin et al., 2015).

Late positive potentials (LPP) are a neural signature sensitive to emotional stimuli, as larger LPP amplitude is observed for emotional compared to neutral stimuli (Cuthbert et al., 2000; Schupp et al., 2004). The LPP is a slow wave dominant over centro-parietal areas that lasts for a long period following the presentation of stimuli (Cuthbert et al., 2000; Keil et al., 2002). Importantly, previous studies have shown that LPP is ideal for investigating emotion regulation: the LPP amplitude has been reduced by strategies of both reappraisal (Hajcak & Nieuwenhuis, 2006; Thiruchselvam et al., 2011) and suppression (Moser et al., 2006). Thus, the reduced LPP by reappraisal and suppression may serve as neural markers of the magnitude of emotion regulation.

Previous findings based on self-report questionnaires have already suggested a link between emotion regulation habits (reappraisal and suppression) and daily well-being or daily stress response (Katana et al., 2019; Richardson, 2017). Katana et al. (2019) using a daily diary study showed that reappraisal was positively associated with subjective well-being and negatively associated with perceived stress; in contrast, suppression was negatively related to subjective well-being. Richardson (2017) also found that individuals with higher suppression reported less positive affect under high daily stress.

On the other hand, some previous behavioral studies have also suggested a moderating effect of cognitive functions on daily stress reactivity. For example, Stawski et al. (2010) found that higher levels of fluid cognitive ability (measured with a telephone-based battery of tests) are associated with a reduced increase in negative mood towards a stressor for adults across a large age range (aged 33–84 years old). Furthermore, Stawski et al. (2019) also showed that in older adults the greater negative affect

reactivity to daily stress is related to greater response time inconsistency (RTI) between-persons and increased RTI within persons.

Beyond this behavioral evidence, there are also neurocognitive findings suggesting associations between cognitive control and stress reactivity in daily life. Preliminary ERP data suggested that the error-related negativity (ERN) may be predictive of the anxiety response to daily stressors (Compton et al., 2008). In addition, a subsequent study reported that the error positivity (Pe) component, an index for correct-error differentiation, predicted the relationship between daily stress and negative affect (Compton et al., 2011). Moreover, accumulating research from cognitive neuroscience has suggested that the adaptation processes in conflict tasks might in turn predict stress responses in daily life (van Steenbergen et al., 2021). For example, fMRI findings showed that neural responsivity of the noradrenergic locus coeruleus (LC-NE) reflecting conflict adaptation in an emotional-conflict task was associated with real-life stress resilience (Grueschow et al., 2021).

The above literature has provided initial evidence for using cognitive or emotional functions to predict daily stress responses. However, the neural mechanisms underlying these effects remain largely unknown. Thus, apart from the behavioral indexes, we also recorded electroencephalography (EEG) during the tasks. Moreover, the daily stress reactivity examined by previous studies mainly focused on the same-day affect response to stress. However, we are also interested in the dynamic stress change process, that is, how the previous day's stress continues to influence the next day's stress. This process is of great interest because the continuation of stress across 2 days may reflect the adaptation capacity in real life. Short-term stressors typically do not impair people's mental or physical health if they are only transient. However, if they accumulate, then small stressors such as missing an important deadline or making errors in tasks can result in pronounced stress, which may be harmful. In this case, a smaller correlation between stress of day N and stress of day $N+1$ would be more adaptive since fewer stressors on day N may be prolonged to be stressors on day $N+1$. Therefore, we focus on two measures of daily stress reactivity in our study: (1) the association between stress and the same-day negative affect; (2) the association between current-day stress and next-day stress.

The present study adopted a widely used Simon task (Hommel, 2011) to measure conflict adaptation and a classic picture-viewing task to assess emotional regulation while EEG signals were recorded during the tasks. Healthy participants reported their stressors and negative affect for 14 consecutive days after laboratory assessment. We intuitively hypothesized that higher conflict adaptation/emotion regulation would be related to less negative affect in response to daily stress. Alternatively, the negative affect could also serve as an adaptive signal to trigger immediate actions to deal with stress (Barish, 2009; Fredrickson, 2004). From this perspective, higher negative affect would be more beneficial and adaptive than remaining indifferent to the stress. In this case, the better adjustment capacity, as reflected by higher conflict adaptation/emotion regulation, should predict higher same-day negative affect. In addition, we hypothesized that individuals with higher conflict adaptation/emotion regulation would be more likely to adapt to or solve the stressors, so their stress of the next day would be more independent from the previous day.

2 | METHOD

2.1 | Participants

Seventy-five participants were recruited through online advertisement from universities in Beijing. Given the multimethod approach of the present study, which was a combination of lab-based assessments (both behavioral and psychophysiological) and real-world longitudinal data collection, we drew on previous classical work with similar design when deciding on the sample size (Compton et al., 2008, 2011). All participants completed both a conflict task and an emotion regulation task (as described in Sections 2.2 and 2.3) as well as a subsequent two-week daily self-report on stressful events and affect. The final sample consisted of 73 participants (Gender: 37 females and 36 males; Mean age: 20.41 years old; Range of age: 18 to 24 years old) since two participants were excluded due to poor cooperation and experimenter error during the laboratory assessments. All participants reported normal or corrected-to-normal vision and were right-handed. They provided written informed consent before the study and received monetary compensation afterward. The study was approved by the Ethics Committee of Human Experimentation at the Institute of Psychology, Chinese Academy of Sciences.

2.2 | Conflict task

The Simon task was used to measure the conflict adaptation (see Figure 1a). In this task, one out of eight white digits (1 to 9, except 5) was presented on the left- or right-hand side on a black computer screen. We adapted this task from a recent study that also used EEG during this task (Fischer et al., 2018). Participants
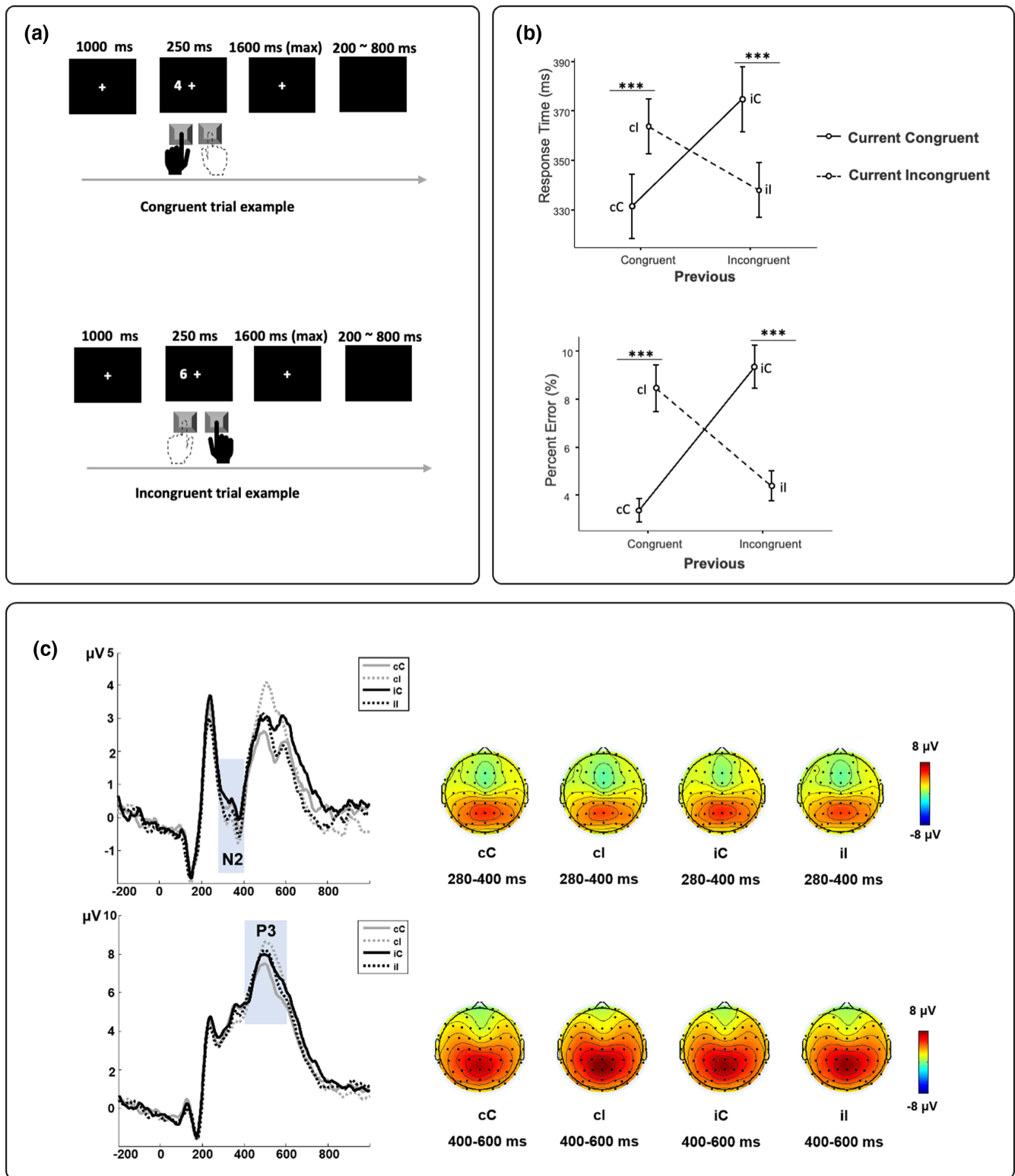
FIGURE 1 Overview of the conflict task and results. (a) Illustration of Simon task procedure. Digital number 1~9 (except 5) was presented on the right/left side of the screen. Participants pressed the left key (if the number <5) or the right key (if the number >5). In the congruent trial example (top panel), the presentation location of stimuli and required response were both on the left side. In the incongruent trial example (bottom panel), the presentation location of stimuli was on the left side, while the required response was on the right side, then a conflict occurred. (b) Behavioral performance of cognitive control. The Previous-trial Congruency × Current-trial Congruency interaction effect indicated conflict adaptation. Error bars show standard error. (c) Grand average ERPs in the cC, cI, iC, and iI conditions (cC = previous congruent preceded by current congruent; cI = previous congruent preceded by current incongruent; iC = previous incongruent preceded by current congruent; iI = previous incongruent preceded by current incongruent.) The N2 was averaged across the centro-frontal electrodes (F1, Fz, F2, FC1, FCz, FC2) in a time window of 280–400 ms The P3 was averaged across the centro-parietal electrodes (CP1, CPz, CP2, P1, Pz, P2) in a time window of 400–600 ms. ***$p<.001$.

were instructed to press the left key if the stimulus was smaller than 5 and the right key if larger than 5. The conflict occurred when a number <5 was presented on the right position on the screen or when a number >5 was presented on the left. Incongruent trials accounted for 50% of the total number of trials. The task consisted of three blocks, and each block consisted of 65 trials. The first trial in each block was excluded from analysis, which resulted in 64 valid trials in each block. To reduce the potential influence of low-level feature repetition (Egner, 2017), the identical number was programmed to not appear in two consecutive trials. In addition, we strictly controlled the combination of numbers and positions, so that all combinations had an equal chance in each block.

For each trial, a fixation was firstly presented for 1000 ms, followed by a numerical stimulus of 250 ms. The participants had a maximum of 1600 ms to respond before a randomized blank interval of 200 to 800 ms. At the viewing distance of 60 cm, the numerical stimulus had a visual angle of 0.67° × 0.95° on a 17-inch screen. Participants completed a 20-trial practice block before the formal experiment. The task was programmed with E-Prime 2.0 (Schneider et al., 2002).

2.3 | Emotion regulation task

The emotion regulation task was a picture-viewing task (Thiruchselvam et al., 2011) that consisted of four blocks: *neutral (passive viewing)*, *negative (passive viewing)*, *reappraisal*, and *suppression* (see Figure 2a). The *neutral (passive viewing)* block was set as the first block for all participants to prevent the influence of emotional conditions (Gross, 2002; Moser et al., 2006), while the sequence of the other three blocks was counterbalanced. Between blocks, participants had a 2-min rest period.

In the two *passive viewing* blocks, participants were instructed to carefully watch the neutral/negative pictures and to allow their natural emotional reactions. In the *reappraisal* block, participants were asked to reinterpret the picture positively or to view it as fake photoshop artwork, in order to be emotionally neutral while viewing the pictures. In the *suppression* block, participants were required to consciously control their emotional reactions, so that people cannot perceive their emotions from their expression. The *reappraisal* and *suppression* blocks contained only negative pictures.

The stimulus material included 120 pictures (30 neutral; 90 negative) from the International Affective
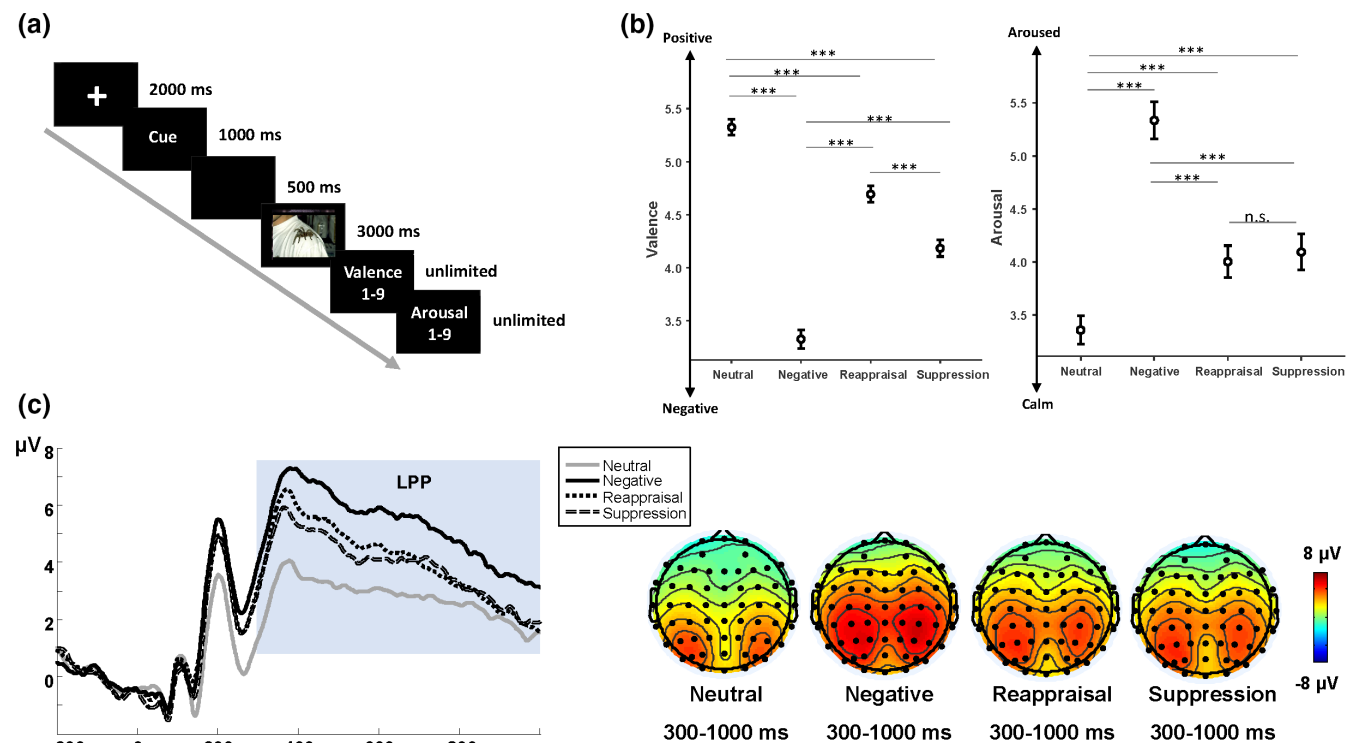

FIGURE 2 Overview of the emotion regulation task and results. (a) Illustration of emotion regulation task procedure. The cue reminded participants of the condition of each block ("View" in *neutral* and *negative passive viewing* blocks; "Reappraisal" and "Suppression" in emotion regulation blocks). (b) Subjective ratings of valence and arousal. Both reappraisal and suppression increased valence (higher score indicates more positive emotion) and reduced arousal (higher score indicates more aroused state). Error bars show standard error. (c) Grand average ERPs in the *Neutral (passive viewing)*, *Negative (passive viewing)*, *Reappraisal*, and *Suppression* conditions. The LPP was averaged across the centro-parietal sites (CP1, CPz, CP2, P1, Pz, P2, PO3, POz, PO4) in a time window of 300–1000 ms. ***$p < .001$. n.s., not significant.

Picture System (IAPS; Lang et al., 2008). According to the IAPS report (Lang et al., 2008), the valence (neutral: M = 5.13, SD = 0.51; negative: M = 2.37, SD = 0.63) and arousal (neutral: M = 3.23, SD = 0.69; negative: M = 5.97, SD = 0.77) of the pictures differed significantly between the neutral and negative, which were similar to previous studies on the neural mechanisms of emotion (e.g., Hajcak & Nieuwenhuis, 2006; Thiruchselvam et al., 2011). The three sets of 30 negative pictures were comparable in valance and arousal, and were randomly assigned to the three conditions (*negative*, *reappraisal*, and *suppression*) varied across participants. Stimuli were presented on a 17-inch monitor with a black background, at a viewing distance of 60 cm.

Each trial started with a fixation of 2000 ms, followed by a cue of 1000 ms (view, reappraisal, suppression), a blank screen of 500 ms, and a stimulus picture of 3000 ms. Afterwards, participants rated their valence (1 = negative; 9 = positive) and arousal (1 = calm; 9 = extremely aroused) using the Self-Assessment Manikin (SAM) scale (Bradley & Lang, 1994). The task was programmed with E-Prime 2.0 (Schneider et al., 2002).

2.4 | Electrophysiological recording

The EEG was recorded with 64 Ag/AgCl electrodes embedded in a cap (Neuroscan Inc., USA) that was placed according to the international 10–20 system and referenced to the left mastoid. The vertical electro-oculograms (VEOG) were recorded with electrodes placed above and below the left eye. The horizontal electro-oculograms (HEOG) were recorded with electrodes placed 1 cm from the outer canthus of each eye. All impedances were maintained below 5 kΩ. The EEG was amplified by SynAmps2 with a 0.05 to 100 Hz bandpass filter and digitized at a sampling rate of 1000 Hz.

The offline processing was conducted using Scan 4.3 (Neuroscan Inc., USA). The EEG data were re-referenced to mean to the left and right mastoids. The Ocular Artifact Reduction (OAR) transform algorithm built in the Neuroscan software was used to identify and correct EOG artifacts. The EEG was then lowpass-filtered at 30 Hz (FIR filter, half-amplitude cut-off) and epochs were extracted for a period of 1200 ms time-locked to the onset of the stimuli, including 200 ms prior to the stimulus onset (as baseline) and 1000 ms after the stimulus onset. Trials with artifacts that exceeded ±100 μV were discarded. The EEG epochs were then averaged to ERPs. EEGLAB was used to generate scalp topography.

In the conflict task, only correct trials were included in the analysis to avoid the contamination of error-related negativity (Miller et al., 2012). After the exclusion of trials

described in the data pre-analysis (see Section 3.1) and the artifacts (13.7% in total of all eliminations), the mean of accepted trials across conditions was 41.45, with a range from 41.33 to 41.53 trials. According to the previous studies (Clayson & Larson, 2011a; Larson et al., 2014; van Veen & Carter, 2006) and visual inspection, the amplitude of N2 was defined as the average value over the centro-frontal electrodes (F1, Fz, F2, FC1, FCz, FC2) in a time window that lasted from 280 to 400 ms after stimulus onset; the amplitude of P3 was defined as the average value over the centro-parietal electrodes (CP1, CPz, CP2, P1, Pz, P2) in a time window from 400–600 ms.

In the emotion regulation task, after the exclusion of artifacts (1.7%), the average of accepted trials across conditions was 29.48, ranging from 29.41 to 29.55. Referring to the previous studies (Hajcak & Nieuwenhuis, 2006; Moser et al., 2014) as well as observation, the amplitude of LPP was defined as the average over centro-parietal sites (CP1, CPz, CP2, P1, Pz, P2, PO3, POz, PO4) in a time window of 300–1000 ms.

2.5 | Measurement of daily stress and affect

After the cognitive control and emotion regulation measurements, participants were instructed to report continuously for 14 days on their daily stress and affect. Every evening, participants received a scheduled email with an online questionnaire link. They were asked to complete the questionnaire before they went to sleep.

2.5.1 | Daily stress

Daily stress was assessed using an adapted version of the Daily Inventory of Stressful Events (DISE; Almeida et al., 2002). This inventory included seven questions about the occurrences of stressful events: (1) you had an *argument* or *disagreement* with someone; (2) you *could have argued* about something but you decided to avoid a disagreement; (3) you encountered a stressful situation at *work or school* (apart from the mentioned events, the same as below); (4) you encountered a stressful situation at *home*; (5) you experienced *discrimination*; (6) your *families, relatives or close friends* encountered something bad; (7) you encountered *anything else* bad or stressful things. Participants were instructed to firstly state whether those things happened to them within the past 24 hours. If participants stated "yes", then they were asked to rate the severity of the event from 1 to 4 (1 = *not at all*; 4 = *very much*). The sum of the scores denoted the magnitudes of daily stress.

2.5.2 | Daily negative affect

The daily negative affect was measured through the 9-item Positive Affect and Negative Affect Scale (PANAS) proposed by Diener and Emmons (1984), which was also used in their daily study. This short scale consisted of four positive items (*happy*, *joyful*, *pleased*, and *enjoyment/fun*) and five negative items (*depressed/blue*, *unhappy*, *frustrated*, *angry/hostile*, and *worries/anxious*), rated on a scale from 1 to 7 (1 = *not at all*; 7 = *very much*). Since the positive affect was not the interest of the present study, we only calculated the daily negative affect score by averaging across the five negative items.

2.6 | Statistical analysis

To investigate the main hypotheses, we implemented hierarchical linear modeling (HLM) using the *GAMLj* module (Gallucci, 2019) of the *jamovi* (Version 1.6, 2021). HLM, also known as multilevel modeling, is a suitable approach for nested data structure (Raudenbush & Bryk, 2002). In our case, the data had two levels: the stress and affect reported daily (Level 1) nested within persons (Level 2). The Level 1 continuous predictor (daily stress) was group mean centered. The Level 2 continuous predictors (cognitive control/emotion regulation variables) were z-scored. Specifically, the four cognitive control variables are the adaptation effect (AE = cI - iI) scores of reaction time (RT), percent error (PE), N2 amplitudes, and P3 amplitudes. The six emotion regulation variables are the difference scores in valence, arousal, and LPP amplitudes between reappraisal and negative condition, and between suppression and negative condition. Dichotomous predictor (gender) was dummy coded (*male* vs. *female*) with *male* as the reference group.

The main goal of this study was to investigate whether the conflict adaptation or emotion regulation variables measured in the laboratory could predict daily stress reactivity. The daily stress reactivity included two aspects in the present study: (1) the influence of stress on the same-day negative affect response; (2) the influence of current-day stress on the next-day stress. We estimated the *cognitive/emotional variables$_j$ × Stress$_{ij}$* interaction term predicting (1) *same-day negative affect* and (2) *next-day daily stress* with separate random slope models. All cognitive control variables were entered into one HLM model together, as were the emotion regulation variables. All analyses were performed without and with controlling for gender.

Significance level was set at .05. For all ANOVA tests, Greenhouse–Geisser correction was used when sphericity hypothesis was violated. All *p* values for pairwise comparisons were corrected with Bonferroni adjustment. Effect sizes were denoted by partial eta-squared (η_p^2).

3 | RESULTS

3.1 | Performance and neural signature of conflict adaptation

The following steps in data pre-processing for the conflict adaptation analysis (Fischer et al., 2018) were performed in sequence for all data (including EEG): (1) delete first trials; (2) delete post-error trials (6.3%); (3) for RT analysis only, delete trials that deviated more than 2.5 standard deviations from the individual condition mean (2.2%); (4) for RT and EEG analysis only, delete error trials (5.6%) [note some error trials have already been incidentally deleted in the step (2)].

3.1.1 | Behavioral performance

The response time (RT) and percent error (PE) were analyzed as indicators of behavioral performance (see Figure 1b). The performance of the Simon task averaged 352 ms (*SD* = 102 ms) RT and 6.39% PE (*SD* = 5%). Based on the Previous-trial Congruency (c = previous congruent; i = previous incongruent) and Current-trial Congruency (C = current congruent; I = current incongruent), the data were divided into four sets: cC, cI, iC, and iI.

Repeated measures ANOVA on RT revealed a significant interaction effect between Previous-trial Congruency and Current-trial Congruency, $F(1, 72) = 235.69$, $p < .001$, $\eta_p^2 = 0.77$. Post Hoc Tests showed that following previously congruent trials, the responses for current incongruent trials were slower than current congruent trials (cI > cC, $t(72) = 8.43$, $p < .001$); in contrast, following previous incongruent trials (i.e., post-conflicts), the responses for current incongruent trials were faster than current congruent trials (iI < iC, $t(72) = -8.59$, $p < .001$). This congruency sequence effect reflects the conflict adaptation. The PE analysis also showed a similar pattern that the interference effect was reduced following conflicts: while the error rate was higher in incongruent trials than congruent trials (cI > cC, $t(72) = 5.35$, $p < .001$) following congruent trials, it was smaller in incongruent trials (iI < iC, $t(72) = -5.68$, $p < .001$) following conflicts.

3.1.2 | Neural signature

The grand average waveforms for N2 and P3 were shown in Figure 1c. Repeated measures ANOVA on the

N2 suggested a significant main effect of Current-trial Congruency: $F(1, 72) = 5.13$, $p = .026$, $\eta_p^2 = 0.07$, the current incongruent trial elicited a larger N2 than current congruent trials. No significant interaction effect was detected for the N2 ($p = .739$). For the P3, the main effect of Current-trial Congruency was also detected, $F(1, 72) = 10.09$, $p = .002$, $\eta_p^2 = 0.12$, indicating a larger P3 in current incongruent trials. In addition, we found a significant Previous-trial Congruency × Current-trial Congruency interaction effect, $F(1, 72) = 8.44$, $p = .005$, $\eta_p^2 = 0.10$, which suggested that the difference between current congruent and incongruent trials was reduced when the previous trial was incongruent.

According to Clayson and Larson (2011b), the larger difference between iI and cI trials indicated heightened cognitive control following high-conflict trials. We calculated this difference score for both behavioral indices (RT, PE) and neural indices (N2, P3) in our study to index the adaptation effect (AE = cI − iI; Liu et al., 2018).

3.2 | Ratings and neural signature of the emotion regulation task

3.2.1 | Valence and arousal ratings

Participants rated the valence and arousal of each picture on a 1–9 scale after each trial. The results of repeated measures ANOVA on valence and arousal ratings are shown in Figure 2b. The difference in valence ratings among different Conditions was significant: $F(3, 216) = 128.31$, $p < .001$, $\eta_p^2 = 0.64$. Post Hoc Tests revealed significant differences among all pair-comparisons ($ps < .001$): *negative (passive viewing)* condition resulted in most negative affect and *neutral (passive viewing)* condition most positive; *suppression* and *reappraisal* conditions were in between, with *reappraisal* resulting in less negative ratings than *suppression*.

Conditions also had a significant effect on arousal ratings: $F(3, 216) = 63.70$, $p < .001$, $\eta_p^2 = 0.47$. As expected, participants were more aroused in *negative (passive viewing)* than all other conditions, $ps < .001$, and less aroused in *neutral (passive viewing)* than other conditions, $ps < .001$. However, there was no significant difference between *suppression* and *reappraisal* conditions regarding arousal ratings, $p > .9$.

3.2.2 | Neural signature

Figure 2c shows the LPP waveforms elicited in the emotion regulation task. Repeated measures ANOVA revealed a significant effect of Conditions: $F(3, 216) = 18.96$,

$p < .001$, $\eta_p^2 = 0.21$. Post hoc analysis showed that the LPP in *negative (passive viewing)* was significantly stronger than LPP in *neutral (passive viewing)* ($p < .001$), *reappraisal* ($p = .002$), and *suppression* ($p < .001$). The LPP in *neutral (passive viewing)* condition was smaller than LPP in both reappraisal and suppression ($ps < .001$). No significant difference in LPP between *reappraisal* and *suppression* was observed.

The difference scores in valence, arousal, and LPP between *reappraisal* and *negative (passive viewing)*, *suppression* and *negative (passive viewing)* were calculated and denoted as reappraisal and suppression effects, respectively.

3.3 | Daily stress and negative affect

A total of 968 daily reports were available for subsequent analysis (94.7% response rate out of the potential 1022 reports). The mean of daily reports completed by participants was 13.2 ($SD = 1.30$), with a minimum of 8 days. The average daily stress among participants was 2.71 ($SD = 3.44$), ranging from 0 to 20. For comparison, the average daily stress reported from a previous large-scale national study with the same stress measuring instrument was 1.47 (SD = 2.35), ranging from 0 to 18 (Mroczek & Almeida, 2004). For daily negative affect, the participants reported an average of 2.10 ($SD = 1.15$), with a range from 1 to 7. Daily stress and negative affect were significantly correlated both in case of single reports ($r = .562$, $p < .001$, $N = 968$) and person-centered mean values ($r = .590$, $p < .001$, $N = 73$). We calculated the intraclass correlations (ICC) in the null models for daily stress (ICC = 0.58) and daily negative affect (ICC = 0.37), indicative of large variance in daily stress and negative affect among individuals. For reference, the ICC represents the variance contributed to the between-cluster difference (in our case, the cluster was person), which ranges from 0 (no variance among clusters) to 1 (variance among clusters but no within-cluster variance). As the ICC increases, there is more need to use multilevel modeling (Finch et al., 2019). In the initial model with only daily stress and daily negative affect, we found that the daily negative affect increased with daily stress, $B = 0.22$ (95% CI: 0.20, 0.24), $t = 20.51$, $p < .001$.

3.4 | Predicting daily stress reactivity from conflict adaptation

To investigate whether conflict adaptation predicts daily negative affect in response to stressors, we estimated a random slope model with daily negative affect as the

outcome variable and entered person-centered daily stress, mean daily stress, person-centered negative affect of previous day, conflict adaptation variables, and conflict adaptation variables × daily stress interaction as predictors (see Table S1). Results revealed that the adaptation effect of RT predicted the negative affect reactivity to daily stress, as suggested by the significant AE_RT × daily stress interaction, $B = 0.07$ (95% CI: 0.02, 0.12), $t = 2.62$, $p = .011$. Specifically, the direction of the interaction effect showed that a higher AE_RT score (namely more adaptation effect in reaction time) predicted stronger negative affect reactivity to daily stress. As depicted in Figure 3, the slope between daily stress and negative affect was larger for persons higher in AE_RT score ($Mean + 1SD$) than those lower in AE_RT score ($Mean - 1SD$). In other words, those with greater adaptation effects in RT showed steeper increases in negative affect as stress levels increased. However, the neural activity scores did not predict the slope of the association between daily stress and negative affect ($p > .2$). The pattern remained the same after controlling for gender.

To further investigate how conflict adaptation moderated the relationship between the stress of day$_N$ and stress of day$_{N+1}$, we estimated a random slope model with daily stress-day$_{N+1}$ as the outcome variable and entered person-centered daily stress-day$_N$, conflict adaptation variables, and conflict adaptation variables × daily stress-day$_N$ interaction as predictors (see Table S2). Results revealed that larger adaptation effect of N2 component predicted smaller association between stress-day$_{N+1}$ and stress-day$_N$, as indicated by the significant interaction of

AE_N2 × daily stress-day$_N$, $B = 0.16$ (95% CI: 0.06, 0.26), $t = 3.05$, $p = .004$ (Note that N2 is a negative component, so greater negativity of AE score indicates a larger effect), see Figure 4 left panel. This pattern showed that for individuals with greater adaptation effects in N2 amplitudes (the blue line on the left panel, again note that N2 is a negative component), the stress levels of the next day were not affected by the stress levels of the current day; whereas for individuals with smaller adaptation effects in N2 amplitudes (the yellow line on the left panel), the stress levels of the next day increased steeply as the stress levels of the current day increased. The same pattern was also found for the P3 component, as shown in the significant interaction of AE_P3 × daily stress-day$_N$, $B = -0.16$ (95% CI: -0.27, -0.06), $t = -3.06$, $p = .003$, see Figure 4 right panel. Namely, for those with greater adaptation effects in P3 amplitudes (the yellow line on the right panel), their stress levels the next day were less likely to increase in line with the current day's stress levels. Please note that since the N2 is a negative component while P3 is a positive component, their patterns were exactly the same though the values showed opposite directions.

3.5 | Predicting daily stress reactivity from emotion regulation

Identical analyses as described in Section 3.4 were conducted while using emotion regulation variables instead of conflict adaptation. Model estimates are provided in the Supplemental Material (Tables S3 and S4). Results
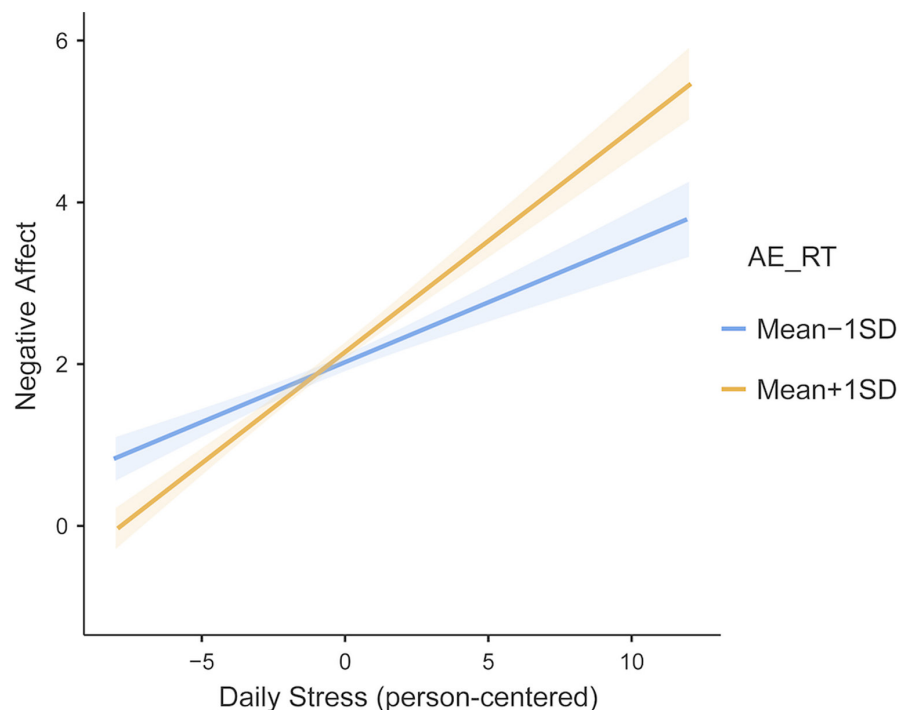

FIGURE 3 Adaptation effect (AE) of reaction time (RT) moderated the association between daily stress and negative affect. Participants with greater adaptation effect of RT showed larger increases in negative affect as daily stress increased. Daily stress value was person-centered. Error range used standard error.
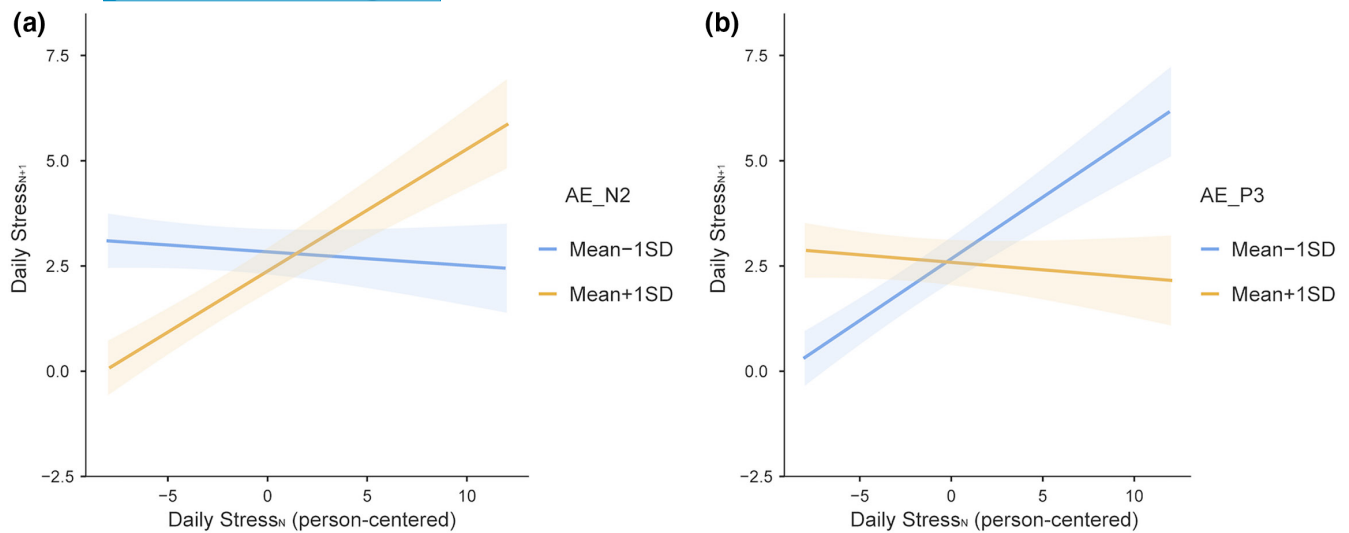
FIGURE 4 Adaptation effect (AE) of N2 and P3 components moderated the association between the current day's stress and the next day's stress. Participants with a greater adaptation effect of N2 (note that N2 is a negative component, so smaller AE value means larger effect) and P3 components showed independent next-day stress from the current day, which indicates that they are less likely to be exposed to prolonged stress. Daily stress value was person-centered. Error range used standard error.
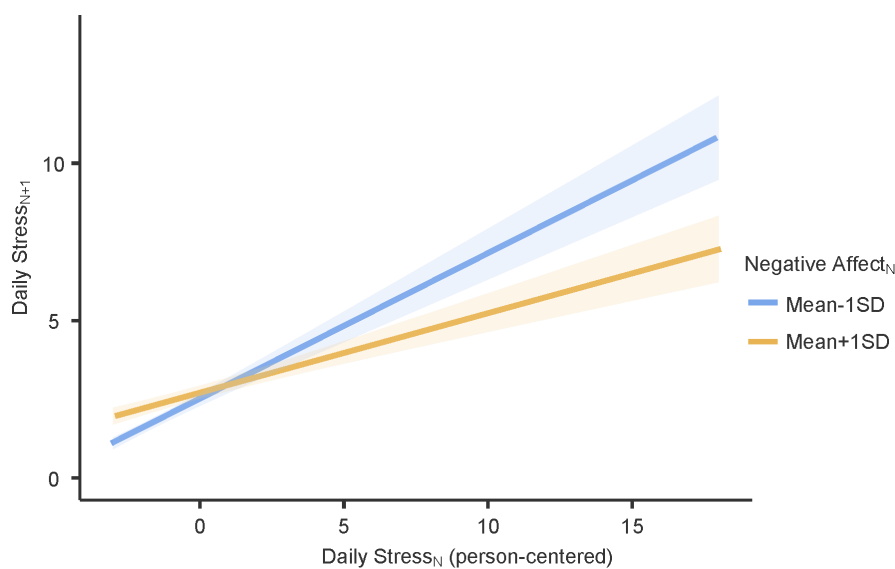

FIGURE 5 Negative affect at day N moderated the association between stress at day N and stress at day $N+1$. For individuals who showed a stronger negative affect at day N, the relationship between stress at day N and stress at day $N+1$ was attenuated. Daily stress and negative affect were person-centered. Error range used standard error.

showed that the emotion regulation variables predicted neither the relationship between negative affect and daily stress ($ps > .09$) nor the association between stress-day$_{N+1}$ and stress-day$_N$ ($ps > .1$).

3.6 | Negative affect moderating stress of next day

Because the above results showed that individuals with higher conflict adaptation effect in reaction time elicited larger negative affect to stress, we further exploratorily tested whether this negative affect response was adaptive as our alternative hypothesis proposed. Interestingly, we

found that the negative affect at day N actually moderated the association between stress at day N and stress at day $N+1$, $B = -0.09$ (95% CI: -0.14, -0.05), $t = -3.89$, $p < .001$ (see Table S5). In other words, the higher negative affect to stress on day N predicted the attenuated the association between stress levels at day N and stress levels at day $N+1$ (see Figure 5), which indicates the potential adaptive effect of negative affect to stress.

4 | DISCUSSION

The present study aimed to investigate whether the behavioral and psychophysiological signatures of conflict

adaptation and emotion regulation can predict real-life stress reactivity. Stress reactivity included two phases: phase one is the same-day negative affect in response to stress; phase two is the next-day stress progress. The main finding of this study was that the RT performance in the conflict task predicted the negative affect response to daily stress. Individuals who showed a larger adaptation effect in RT reported more negative affect in response to daily stress. In addition, a greater neural adaptation effect reflected in N2 and P3 activity predicted less prolonged stress effect. Our results point to a specific predictive effect of conflict adaptation as emotion regulation performance and its neural basis did not predict stress responses in everyday life.

The outcome of this study revealed that a larger adaptation effect of RT was associated with more negative affect in response to daily stressful events. This outcome is against the intuitive hypothesis that a higher cognitive adaptation effect would predict less negative affect in response to stress. However, this outcome aligned with the *affective-signaling hypothesis* proposed recently (Dignath et al., 2020), suggesting a potential signaling function of affect. Accordingly, the negative affect reaction elicited by conflicts may be detected by a monitoring system and then drive the conflict adaptation. This signaling function of the affective reaction is also in line with previous ideas suggesting that the affective reaction to aversive conflicts triggers the adaptation in attention and performance and modulates cognitive control (Dreisbach & Fischer, 2015; van Steenbergen, 2015). This affective modulation of cognitive control is, to some extent, consistent with the view that the negative affect is an adaptive signal to trigger immediate actions to deal with stress (Barish, 2009; Fredrickson, 2004). In other words, the enhanced negative affect in reaction to stress is not maladaptive as we intuitively expected but rather can drive individuals to take action. This idea is also supported by our further exploratory finding that the negative affect at day N attenuated the relationship between stress levels at day N and stress levels at day $N+1$.

Furthermore, we also identified that the neural signatures (N2 and P3) of conflict adaptation predicted the association between current-day stress and next-day stress. For individuals with larger adaptation effects in N2 and P3, their next-day stress was more independent of the current-day stress. According to the conflict monitoring theory, the N2 component is related to the conflict detection of the ACC (Botvinick et al., 2001, 2004; van Veen & Carter, 2002). The ACC evaluates the expected value of control (by integrating the information of payoff, investment, and cost) and then determines whether, where, and how to allocate cognitive control (Shenhav et al., 2013). In the present study, the adaptation effect of the N2 after

conflicts suggests increased recruitment of control after the detection of a conflict. In daily life, when individuals interact with various stressors, they need to integrate the contextual information and evaluate whether they would invest how much effort to change the internal and/or external states to achieve the adaptation. Our finding suggests that those with better evaluation of the context are more likely to prevent from prolonging today's stress to the next day. This result extends the findings of previous daily stress reactivity studies (e.g., Compton et al., 2008, 2011; Stawski et al., 2010, 2019) as it further examined the subsequent phase of stress reactivity. This aspect is clinically important because prolonged stress can cause structural changes in brain circuits and even severe physiological and mental problems (Dias-Ferreira et al., 2009; Hammen et al., 2009; Marin et al., 2011; Schneiderman et al., 2005).

In addition to the N2, we also examined the P3 component during the conflict task. And the P3 showed a similar predicting pattern to the N2. As we discussed above, the N2 is thought to reflect the evaluative process by ACC (Carter & van Veen, 2007; van Veen & Carter, 2002) and indexes the conflict detection as well as the signaling for the need to increase control (Clayson & Larson, 2011a). Different from the N2, the P3 is associated with the recruitment of control after the signal (Clayson & Larson, 2011a). This control recruitment is believed to solve the conflict by engaging the dorsolateral prefrontal cortex (dlPFC) area, which is signaled by the ACC (Carter & van Veen, 2007; van Veen & Carter, 2006). Therefore, the later control recruitment process could be based on the previous successful evaluative process. This might explain the high correlation between the adaptation effects of N2 and P3 in our study. Taken together, both evaluative and executive processes of cognitive control can be essential to the adaptation to stress.

In contrast to cognitive conflict adaptation, emotion regulation assessed in the laboratory did not predict daily stress reactivity in the present study. Three reasons might explain an absence of a predictive effect of emotion regulation. Firstly, what this study measured was the response of the participants when they were asked to implement a specific emotion regulation strategy, which to a certain extent reflects the effectiveness of the individual using that specific emotion regulation strategy. However, it cannot reflect an individual's habits of using these strategies in real life. If the individual does not have the awareness and habit of using these strategies in their lives, then these emotion regulation strategies may not work. In contrast, the cognitive control paradigm measured a more general ability to process conflicting information. In addition, the motives for regulating emotions are completely different between lab testing and real life. According to Tamir (2016), two

classes of motives are involved in emotion regulation. The hedonic motives focus on the immediate phenomenology of emotions, that is, to raise pleasure and reduce pain (Higgins, 2012), while the instrumental motives target further beneficial outcomes brought by emotions. In the lab, participants were instructed to use the specified strategy *to achieve a neutral emotional state*, so their goals were simply hedonic-based, that is, to reduce the negative feeling of emotion. In real life, however, their motives include also the instrumental aspect, such as to maintain a close relationship with others, to influence the impression of others on them, to perform better in a competition, or to achieve self-enhancement (Tamir, 2016). Therefore, the measurement of emotion regulation from the laboratory might lack the ecological validity to predict real-life regulation. Apart from that, we measured only two emotion regulation strategies in our lab, whereas people in real life may employ other emotion regulation approaches, such as mindfulness, problem solving, acceptance, positive thinking, distraction, denial, avoidance, and rumination (Brockman et al., 2017; Silk et al., 2003). Future research could examine a broader range of emotion regulation strategies with more ecological measurements.

The present research has some limitations that need to be addressed. The results of our sample are based on the healthy college students and may not generalize to other age groups or populations that already suffers from some mental diseases. In addition, the emotion regulation measured in the laboratory contained only two strategies and did not predict daily stress reactivity. Future work may adopt more ecologically valid measures of emotion regulation. Another limitation is that we included only the self-report measures in daily life. Using the advanced and reliable mobile wearable devices, future research should also adopt the objective physiological measures, including but not limited to everyday heart rate, heart rate variability, and blood pressure.

In conclusion, our outcomes support that laboratory-measured conflict adaptation variables are able to predict daily stress reactivities, whereas the laboratory-measured emotion regulation variables were in absence of predictability. The present study has several strengths. Theoretically, the research questions addressed not only the immediate affective response phase but also the second-day stress change. Methodologically, the study investigated the links between the laboratory-measured behavioral/neural functions and the real-life stress reactivities measured using an experience sampling method. For clinical implications, the findings suggest new possibilities for early screening of stress-vulnerable populations and provide new insights into the prevention and intervention of stress-related affective disorders.

CONFLICT OF INTEREST STATEMENT
The authors have no conflict of interest to disclose.

DATA AVAILABILITY STATEMENT
The data and codes that support the findings of this study are available from the corresponding author upon reasonable request.

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REFERENCES
Albert, J., López-Martín, S., Hinojosa, J. A., & Carretié, L. (2013). Spatiotemporal characterization of response inhibition. *NeuroImage*, *76*, 272–281. https://doi.org/10.1016/j.neuroimage.2013.03.011

Almeida, D. M., Wethington, E., & Kessler, R. C. (2002). The daily inventory of stressful events. *Assessment*, *9*(1), 41–55. https://doi.org/10.1177/1073191102091006

Barish, K. (2009). *Emotions in child psychotherapy: An integrative framework*. Oxford University Press.

Botvinick, M. M., Braver, T. S., Barch, D. M., Carter, C. S., & Cohen, J. D. (2001). Conflict monitoring and cognitive

control. *Psychological Review*, *108*(3), 624–652. https://doi.org/10.1037/0033-295X.108.3.624

Botvinick, M. M., Cohen, J. D., & Carter, C. S. (2004). Conflict monitoring and anterior cingulate cortex: An update. *Trends in Cognitive Sciences*, *8*(12), 539–546. https://doi.org/10.1016/j.tics.2004.10.003

Bradley, M. M., & Lang, P. J. (1994). Measuring emotion: The self-assessment manikin and the semantic differential. *Journal of Behavior Therapy and Experimental Psychiatry*, *25*(1), 49–59. https://doi.org/10.1016/0005-7916(94)90063-9

Braem, S., Bugg, J. M., Schmidt, J. R., Crump, M. J. C., Weissman, D. H., Notebaert, W., & Egner, T. (2019). Measuring adaptive control in conflict tasks. *Trends in Cognitive Sciences*, *23*(9), 769–783. https://doi.org/10.1016/j.tics.2019.07.002

Brockman, R., Ciarrochi, J., Parker, P., & Kashdan, T. (2017). Emotion regulation strategies in daily life: Mindfulness, cognitive reappraisal and emotion suppression. *Cognitive Behaviour Therapy*, *46*(2), 91–113. https://doi.org/10.1080/16506073.2016.1218926

Carter, C. S., & van Veen, V. (2007). Anterior cingulate cortex and conflict detection: An update of theory and data. *Cognitive, Affective, & Behavioral Neuroscience*, *7*(4), 367–379. https://doi.org/10.3758/cabn.7.4.367

Clayson, P. E., & Larson, M. J. (2011a). Conflict adaptation and sequential trial effects: Support for the conflict monitoring theory. *Neuropsychologia*, *49*(7), 1953–1961. https://doi.org/10.1016/j.neuropsychologia.2011.03.023

Clayson, P. E., & Larson, M. J. (2011b). Effects of repetition priming on electrophysiological and behavioral indices of conflict adaptation and cognitive control. *Psychophysiology*, *48*(12), 1621–1630. https://doi.org/10.1111/j.1469-8986.2011.01265.x

Compton, R. J., Arnstein, D., Freedman, G., Dainer-Best, J., Liss, A., & Robinson, M. D. (2011). Neural and behavioral measures of error-related cognitive control predict daily coping with stress. *Emotion*, *11*(2), 379–390. https://doi.org/10.1037/a0021776

Compton, R. J., Robinson, M. D., Ode, S., Quandt, L. C., Fineman, S. L., & Carp, J. (2008). Error-monitoring ability predicts daily stress regulation. *Psychological Science*, *19*(7), 702–708. https://doi.org/10.1111/j.1467-9280.2008.02145.x

Cuthbert, B. N., Schupp, H. T., Bradley, M. M., Birbaumer, N., & Lang, P. J. (2000). Brain potentials in affective picture processing: Covariation with autonomic arousal and affective report. *Biological Psychology*, *52*(2), 95–111. https://doi.org/10.1016/s0301-0511(99)00044-7

Dias-Ferreira, E., Sousa, J. C., Melo, I., Morgado, P., Mesquita, A. R., Cerqueira, J. J., Costa, R. M., & Sousa, N. (2009). Chronic stress causes frontostriatal reorganization and affects decision-making. *Science*, *325*(5940), 621–625. https://doi.org/10.1126/science.1171203

Diener, E., & Emmons, R. A. (1984). The independence of positive and negative affect. *Journal of Personality and Social Psychology*, *47*(5), 1105–1117. https://doi.org/10.1037/0022-3514.47.5.1105

Dignath, D., Eder, A. B., Steinhauser, M., & Kiesel, A. (2020). Conflict monitoring and the affective-signaling hypothesis—An integrative review. *Psychonomic Bulletin & Review*, *27*(2), 193–216. https://doi.org/10.3758/s13423-019-01668-9

Dreisbach, G., & Fischer, R. (2015). Conflicts as aversive signals for control adaptation. *Current Directions in Psychological Science*, *24*(4), 255–260. https://doi.org/10.1177/0963721415569569

Egner, T. (2007). Congruency sequence effects and cognitive control. *Cognitive, Affective, & Behavioral Neuroscience*, *7*(4), 380–390. https://doi.org/10.3758/CABN.7.4.380

Egner, T. (2017). Conflict adaptation: Past, present, and future of the congruency sequence effect as an index of cognitive control. In *The Wiley handbook of cognitive control* (pp. 64–78). Wiley Blackwell.

Etkin, A., Büchel, C., & Gross, J. J. (2015). The neural bases of emotion regulation. *Nature Reviews Neuroscience*, *16*(11), 693–700. https://doi.org/10.1038/nrn4044

Finch, W. H., Bolin, J. E., & Kelley, K. (2019). *Multilevel modeling using R*. CRC Press.

Fischer, R., Ventura-Bort, C., Hamm, A., & Weymar, M. (2018). Transcutaneous vagus nerve stimulation (tVNS) enhances conflict-triggered adjustment of cognitive control. *Cognitive, Affective, & Behavioral Neuroscience*, *18*(4), 680–693. https://doi.org/10.3758/s13415-018-0596-2

Forster, S. E., Carter, C. S., Cohen, J. D., & Cho, R. Y. (2011). Parametric manipulation of the conflict signal and control-state adaptation. *Journal of Cognitive Neuroscience*, *23*(4), 923–935. https://doi.org/10.1162/jocn.2010.21458

Fredrickson, B. L. (2004). The broaden–and–build theory of positive emotions. *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences*, *359*(1449), 1367–1377. https://doi.org/10.1098/rstb.2004.1512

Gallucci, M. (2019). *GAMLj: General analyses for linear models*. [jamovi module]. https://gamlj.github.io/

Gross, J. J. (1998). Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology*, *74*(1), 224–237. https://doi.org/10.1037//0022-3514.74.1.224

Gross, J. J. (2002). Emotion regulation: Affective, cognitive, and social consequences. *Psychophysiology*, *39*(3), 281–291. https://doi.org/10.1017/s0048577201393198

Gross, J. J., & Levenson, R. W. (1993). Emotional suppression: Physiology, self-report, and expressive behavior. *Journal of Personality and Social Psychology*, *64*(6), 970–986. https://doi.org/10.1037//0022-3514.64.6.970

Grueschow, M., Stenz, N., Thörn, H., Ehlert, U., Breckwoldt, J., Brodmann Maeder, M., Exadaktylos, A. K., Bingisser, R., Ruff, C. C., & Kleim, B. (2021). Real-world stress resilience is associated with the responsivity of the locus coeruleus. *Nature Communications*, *12*(1), 2275. https://doi.org/10.1038/s41467-021-22509-1

Hajcak, G., & Nieuwenhuis, S. (2006). Reappraisal modulates the electrocortical response to unpleasant pictures. *Cognitive, Affective, & Behavioral Neuroscience*, *6*(4), 291–297. https://doi.org/10.3758/cabn.6.4.291

Hammen, C., Kim, E. Y., Eberhart, N. K., & Brennan, P. A. (2009). Chronic and acute stress and the prediction of major depression in women. *Depression and Anxiety*, *26*(8), 718–723. https://doi.org/10.1002/da.20571

Higgins, E. T. (2012). *Beyond pleasure and pain: How motivation works*. Oxford University Press.

Holahan, C. J., Moos, R. H., Holahan, C. K., Brennan, P. L., & Schutte, K. K. (2005). Stress generation, avoidance coping, and depressive symptoms: A 10-year model. *Journal of Consulting and Clinical Psychology*, *73*(4), 658–666. https://doi.org/10.1037/0022-006X.73.4.658

Hommel, B. (2011). The Simon effect as tool and heuristic. *Acta Psychologica*, *136*(2), 189–202. https://doi.org/10.1016/j.actpsy.2010.04.011

Katana, M., Röcke, C., Spain, S. M., & Allemand, M. (2019). Emotion regulation, subjective well-being, and perceived stress in daily life of geriatric nurses. *Frontiers in Psychology*, *10*, 1097. https://doi.org/10.3389/fpsyg.2019.01097

Keil, A., Bradley, M. M., Hauk, O., Rockstroh, B., Elbert, T., & Lang, P. J. (2002). Large-scale neural correlates of affective picture processing. *Psychophysiology*, *39*(5), 641–649. https://doi.org/10.1017/S0048577202394162

Ladouceur, C. D., Dahl, R. E., & Carter, C. S. (2007). Development of action monitoring through adolescence into adulthood: ERP and source localization. *Developmental Science*, *10*(6), 874–891. https://doi.org/10.1111/j.1467-7687.2007.00639.x

Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (2008). *International affective picture system (IAPS): Affective ratings of pictures and instruction manual*. Technical Report A-8. University of Florida.

Larson, M. J., Clayson, P. E., & Clawson, A. (2014). Making sense of all the conflict: A theoretical review and critique of conflict-related ERPs. *International Journal of Psychophysiology*, *93*(3), 283–297. https://doi.org/10.1016/j.ijpsycho.2014.06.007

Liu, X., Liu, T., Shangguan, F., Sørensen, T. A., Liu, Q., & Shi, J. (2018). Neurodevelopment of conflict adaptation: Evidence from event-related potentials. *Developmental Psychology*, *54*(7), 1347–1362. https://doi.org/10.1037/dev0000524

Marin, M.-F., Lord, C., Andrews, J., Juster, R.-P., Sindi, S., Arsenault-Lapierre, G., Fiocco, A. J., & Lupien, S. J. (2011). Chronic stress, cognitive functioning and mental health. *Neurobiology of Learning and Memory*, *96*(4), 583–595. https://doi.org/10.1016/j.nlm.2011.02.016

Miller, A. E., Watson, J. M., & Strayer, D. L. (2012). Individual differences in working memory capacity predict action monitoring and the error-related negativity. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *38*(3), 757–763. https://doi.org/10.1037/a0026595

Moser, J. S., Hajcak, G., Bukay, E., & Simons, R. F. (2006). Intentional modulation of emotional responding to unpleasant pictures: An ERP study. *Psychophysiology*, *43*(3), 292–296. https://doi.org/10.1111/j.1469-8986.2006.00402.x

Moser, J. S., Hartwig, R., Moran, T. P., Jendrusina, A. A., & Kross, E. (2014). Neural markers of positive reappraisal and their associations with trait reappraisal and worry. *Journal of Abnormal Psychology*, *123*(1), 91–105. https://doi.org/10.1037/a0035817

Mroczek, D. K., & Almeida, D. M. (2004). The effect of daily stress, personality, and age on daily negative affect. *Journal of Personality*, *72*(2), 355–378. https://doi.org/10.1111/j.0022-3506.2004.00265.x

Polich, J. (2007). Updating P300: An integrative theory of P3a and P3b. *Clinical Neurophysiology*, *118*(10), 2128–2148. https://doi.org/10.1016/j.clinph.2007.04.019

Raudenbush, S. W., & Bryk, A. S. (2002). *Hierarchical linear models: Applications and data analysis methods* (Vol. *1*). sage.

Richardson, C. M. E. (2017). Emotion regulation in the context of daily stress: Impact on daily affect. *Personality and Individual Differences*, *112*, 150–156. https://doi.org/10.1016/j.paid.2017.02.058

Schneider, W., Eschman, A., & Zuccolotto, A. (2002). *E-prime user's guide*. Psychology Software Tools, Inc.

Schneiderman, N., Ironson, G., & Siegel, S. D. (2005). Stress and health: Psychological, behavioral, and biological determinants. *Annual Review of Clinical Psychology*, *1*(1), 607–628. https://doi.org/10.1146/annurev.clinpsy.1.102803.144141

Schupp, H. T., Junghöfer, M., Weike, A. I., & Hamm, A. O. (2004). The selective processing of briefly presented affective pictures: An ERP analysis. *Psychophysiology*, *41*(3), 441–449. https://doi.org/10.1111/j.1469-8986.2004.00174.x

Shenhav, A., Botvinick, M., & Cohen, D. (2013). The expected value of control: An integrative theory of anterior cingulate cortex function. *Neuron*, *79*(2), 217–240. https://doi.org/10.1016/j.neuron.2013.07.007

Silk, J. S., Steinberg, L., & Morris, A. S. (2003). Adolescents' Emotion Regulation in Daily Life: Links to Depressive Symptoms and Problem Behavior. *Child Development*, *74*(6), 1869–1880. https://doi.org/10.1046/j.1467-8624.2003.00643.x.

Speisman, J. C., Lazarus, R. S., Mordkoff, A., & Davison, L. (1964). Experimental reduction of stress based on ego-defense theory. *The Journal of Abnormal and Social Psychology*, *68*(4), 367–380. https://doi.org/10.1037/h0048936

Stawski, R. S., Almeida, D. M., Lachman, M. E., Tun, P. A., & Rosnick, C. B. (2010). Fluid cognitive ability is associated with greater exposure and smaller reactions to daily stress. *Psychology and Aging*, *25*(2), 330–342. https://doi.org/10.1037/a0018246

Stawski, R. S., Cerino, E. S., Witzel, D. D., & Macdonald, S. W. S. (2019). Daily stress processes as contributors to and targets for promoting cognitive health in later life. *Psychosomatic Medicine*, *81*(1), 81–89. https://doi.org/10.1097/psy.0000000000000643

Tamir, M. (2016). Why do people regulate their emotions? A taxonomy of motives in emotion regulation. *Personality and Social Psychology Review*, *20*(3), 199–222. https://doi.org/10.1177/1088868315586325

The jamovi project (2021). jamovi. (Version 1.6) [Computer Software] https://www.jamovi.org

Thiruchselvam, R., Blechert, J., Sheppes, G., Rydstrom, A., & Gross, J. J. (2011). The temporal dynamics of emotion regulation: An EEG study of distraction and reappraisal. *Biological Psychology*, *87*(1), 84–92. https://doi.org/10.1016/j.biopsycho.2011.02.009

van Steenbergen, H. (2015). Affective modulation of cognitive control: A biobehavioral perspective. In G. H. E. Gendolla, M. Tops, & S. L. Koole (Eds.), *Handbook of biobehavioral approaches to self-regulation* (pp. 89–107). Springer.

van Steenbergen, H., de Bruijn, E. R. A., van Duijvenvoorde, A. C. K., & van Harmelen, A.-L. (2021). How positive affect buffers stress responses. *Current Opinion in Behavioral Sciences*, *39*, 153–160. https://doi.org/10.1016/j.cobeha.2021.03.014

van Veen, V., & Carter, C. S. (2002). The anterior cingulate as a conflict monitor: fMRI and ERP studies. *Physiology & Behavior*, *77*(4–5), 477–482. https://doi.org/10.1016/S0031-9384(02)00930-7

van Veen, V., & Carter, C. S. (2006). Conflict and cognitive control in the brain. *Current Directions in Psychological Science*, *15*(5), 237–240. https://doi.org/10.1111/j.1467-8721.2006.00443.x

Yeung, N., Botvinick, M. M., & Cohen, J. D. (2004). The neural basis of error detection: Conflict monitoring and the error-related negativity. *Psychological Review*, *111*(4), 931–959. https://doi.org/10.1037/0033-295x.111.4.939

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

Table S1. Summary on conflict adaptation variables predicting negative affect.

Table S2. Summary on conflict adaptation variables predicting stress of next day.

Table S3. Summary on emotion regulation variables predicting negative affect.

Table S4. Summary on emotion regulation variables predicting stress of next day.

Table S5. Summary on negative affect moderating stress of next day.