Neurophysiological Responses to Interpersonal Emotional Images Prospectively Predict the Impact of COVID-19 Pandemic-Related Stress on Internalizing Symptoms

Supplemental Information

Supplemental Results

Valence and Arousal Results

Participants rated the valence and arousal for each of the images after completing the EEG tasks using the self-assessment manikin (SAM) rating scales based on the procedures for validating the IAPS (1). Valence ratings significantly differed by emotion condition, $F(1.42, 124) = 936.28$, $p < .001$, $\eta_p^2 = .88$, such that positive images were rated as more pleasant than both neutral, $F(1, 124) = 241.79$, $p < .001$, $\eta_p^2 = .66$, and threatening images, $F(1, 124) = 1085.36$, $p < .001$, $\eta_p^2 = .90$. Threatening images were also rated as less pleasant than neutral, $F(1, 124) = 1075.15$, $p < .001$, $\eta_p^2 = .90$. Similarly, there was a significant effect of condition on arousal ratings, $F(1.71, 124) = 120.52$, $p < .001$, $\eta_p^2 = .50$. Both positive, $F(1, 124) = 190.11$, $p < .001$, $\eta_p^2 = .61$, and threatening images, $F(1, 124) = 156.35$, $p < .001$, $\eta_p^2 = .56$, were rated as more arousing than neutral images. Furthermore, threatening images were rated as more arousing than positive images, $F(1, 124) = 11.76$, $p = .001$, $\eta_p^2 = .09$.

Behavioral Results

One participant's behavioral data were missing due to a technical error. The effect of emotion condition on accuracy was not significant ($p = .40$). However, there was a trend level effect of condition on reaction time (RT), $F(2, 114) = 2.52$, $p = .09$, $\eta_p^2 = .04$, such that RTs were longer following threatening images compared to neutral images, $F(1, 114) = 4.83$, $p = .03$, $\eta_p^2 = .04$, but there were no significant difference in RTs between threatening and positive images ($p = .14$) or positive and neutral images ($p = .34$).

Broader Occipitoparietal LPP Predicting Internalizing Symptom Changes

Given the considerable variability in the specific electrodes selected for analyzing the LPP across studies, exploratory analyses using a broader occipitoparietal pooling (Pz, P3, P4, POz, PO3, PO4, Oz, O1,

O2) were conducted. Multiple regression results testing the main and interactive effects of LPPs to positive and threatening images and interpersonal pandemic-related stressors in the prediction of depression and traumatic intrusion symptom changes are presented in Table S2 and S3. Consistent with the original pooling (POz, PO3, PO4; detailed in the manuscript), the main effect of interpersonal stress exposure significantly predicted depressive symptom changes (βs = 0.21-0.25, zs = 2.29-2.89, ps = .004-.02) but not change in traumatic intrusion symptoms (ps>.13). With this broader pooling, the positive LPP X interpersonal stress interaction in the prediction of depressive symptoms was trending towards but no longer significant (β = -0.17, z = -1.81, p = 0.07), but the threat LPP X interpersonal stress interaction in the prediction of traumatic intrusion symptom changes remained significant (β = 0.23, z = 2.38, p = .02). Consistent with the original interaction (detailed in the manuscript), the simple slopes revealed the association between interpersonal stress and traumatic intrusion symptom change was significant for threat LPPs one standard deviation above the mean (b=1.35, SE=0.52, t=2.62, p=0.01), but not at the mean or one standard deviation below the mean (ps>.14). The Johnson-Neyman region of significance indicates the effect of interpersonal stress on traumatic intrusions was significant for threat LPP amplitudes above 0.72 (range=-6.30-7.41).

Comparing results of repeated-measures ANOVAs, the effect sizes for both emotion conditions compared to neutral were relatively stronger for the original pooling (positive vs. neutral: $F(1, 64) = 22.32$, $p < .001$, $\eta_p^2 = .26$; threat vs. neutral: $F(1, 64) = 24.41$, $p < .001$, $\eta_p^2 = .28$) rather than this broader pooling (positive vs. neutral: $F(1, 64) = 15.03$, $p < .001$, $\eta_p^2 = .18$; threat vs. neutral: $F(1, 64) = 21.40$, $p < .001$, $\eta_p^2 = .24$), and this difference is particularly notable for the positive image condition. Thus, while these results are broadly consistent with the findings for the original pooling, the non-significance of the positive LPP X interpersonal stress interaction in the prediction of depressive symptoms for the broader pooling highlights the complexity of determining the scoring parameters for the LPP that best capture the effects of emotion.

Exploratory Analyses of Early and Late LPP Predicting Internalizing Symptom Changes

Prior evidence indicates the LPP is composed of several functionally distinct positivities (2). Specifically, we previously applied temporospatial principal component analysis (PCA) to EEG data from

an emotional interrupt task similar to the current study administered at 3 time points across development. We found that a distinct P3/early LPP component maximal over centroparietal sites and later LPP maximal over occipitoparietal sites consistently emerged from the PCA and were significantly modulated by emotional condition (2). Based on these findings, we decomposed the ERPs in the current study into early (300-400ms) and late (900-1000ms) time windows to more thoroughly examine the effects of emotional reactivity across time. The P3/early LPP was scored across a centroparietal pooling (CPz, CP1, CP2, Pz, P3, P4) while the later LPP was scored across occipitoparietal sites (POz, PO3, PO4) consistent with our previous research (2) and the maximal scalp distributions observed in our data.

Results (presented in Tables S4-S7) revealed interpersonal stress exposure significantly predicted change in depressive symptoms (β = 0.21-0.26, z = 2.08-2.86, p = .004-.04), but not traumatic intrusions (*ps* >.10), consistent with the traditional LPP (400-1000ms) analyses. Interestingly, the main effect of P3/early LPPs to positive stimuli significantly predicted depressive symptom changes (β = -0.19, z = -2.11, p = .04), such that reduced responsiveness to positive social stimuli predicted increased depressive symptoms following the start of the pandemic. For change in depressive symptoms, the positive LPP X interpersonal stress interaction was significant for the later LPP (β = -0.23, z = -2.38, p = .02) similar to the 400-1000 ms window presented in the manuscript, but was not significant for the P3/early LPP (p = .64). Simple slopes revealed the effect of interpersonal stressful events in the prediction of depressive symptom change was significant for positive later LPP amplitudes at the mean (b= 3.73, SE = 1.26, t= 2.95, p< .01) and one standard deviation below the mean (b= 7.80, SE = 2.06, t= 3.78, p< .001), but not later LPPs one standard deviation above the mean (p= .86). The Johnson-Neyman region of significance indicates the effect of interpersonal stress on depression was significant for later LPP amplitudes below 0.98 (observed amplitude range = -10.41 -7.11).

For change in traumatic intrusion symptoms, the results showed a pattern for a relatively stronger interaction effect for the P3/early LPP to threatening images (p = .07) compared with the later LPP (p = .61), though neither reached significance. Further, the interaction effect for positive later LPP X interpersonal stress interaction was significant in predicting traumatic intrusions (β = 0.23, z = 2.21, p =

.03), but the positive P3/early LPP X interpersonal stress interaction was not significant (p = .62). In contrast to the positive LPP X interpersonal stress interaction predicting depressive symptom change (described in the manuscript), simple slopes of the positive later LPP X interpersonal stress interaction for traumatic intrusions the effect was positive and significant for later LPPs one standard deviation above the mean (b= 1.19, SE = 0.47, t= 2.54, p= .01), but not for later LPP amplitudes at the mean or one standard deviation below the mean (ps>.29). The Johnson-Neyman region of significance indicates this effect was significant for later LPP amplitudes above 1.69.

These results suggest that impairments in earlier recognition of the salience of positive stimuli (as indexed by P3/early LPP) may directly confer vulnerability to depression, whereas reduced ability to sustain responses to positive stimuli (as indexed by later LPP) may increase depression risk only in combination with exposure to stress. Further, although enhanced processing of threatening stimuli appears to confer risk for traumatic intrusions in combination with higher levels of stress, this effect is most pronounced when examining the traditional 400-1000 ms time window for LPP, with a trend for a similar pattern for P3/early LPP, but not the later portion of the LPP. In addition, the effects of positive LPP in predicting changes in traumatic intrusions are relatively complex, with a significant positive LPP X interpersonal stress interaction emerging only for the later portion of the LPP, such that *greater* sustained processing of positive stimuli predicts greater traumatic intrusions in combination with high interpersonal stress. These results are somewhat surprising and warrant replication but suggest that heightened attention to both positively- and negatively-valenced interpersonal stimuli can confer risk for traumatic intrusions, although somewhat distinct stages of processing are implicated in each.

Exploratory Analyses of LPP Predicting Social Anxiety Symptom Change

Multiple regression results testing the main and interactive effects of LPPs to positive and threatening images and interpersonal pandemic-related stressors in the prediction of social anxiety symptom changes are presented in Table S8. There were no significant main effects of interpersonal stress or LPPs to threatening and positive images on social anxiety symptom changes (ps >.16). However, the interactions between threat LPPs and interpersonal stress (β = 0.26, z = 2.51, p = .01), and positive LPPs and

interpersonal stress ($\beta = 0.41$, $z = 4.03$, $p < .001$) did significantly predict social anxiety symptom changes, such that enhanced LPP reactivity to positive interpersonal images under high exposure to interpersonal stress predicted increases in social anxiety symptoms, despite overall decreases in symptoms across time, while reduced reactivity to both conditions conferred protective effects under high stress exposure. Examination of the simple slopes revealed the association between interpersonal stress and social anxiety symptom change was significant for positive LPPs one standard deviation above the mean (*b*=0.96, *SE*=0.47, *t*=2.06, *p*=.04) and below the mean (*b*=-2.02, *SE*=0.59, *t*=-3.43, *p*=.001), but not at the mean (*p*=.16; see Figure S2). The Johnson-Neyman region of significance indicates the effect of interpersonal stress on social anxiety was significant for positive LPP amplitudes above 3.18 and below -0.59 (range=-7.56-7.79). A similar pattern of results emerged for threat LPPs, however, the simple slope was significant only one standard deviation below the mean (*b*=-1.08, *SE*=0.52, *t*=-2.10, *p*=.04), but not at the mean or one standard deviation above the mean (*ps*>.17; see Figure S2). The Johnson-Neyman region of significance indicates the effect of interpersonal stress on social anxiety was significant for threat LPP amplitudes above 6.88 and below -2.84 (range=-6.98-6.39). Importantly, unlike the depression and traumatic intrusion models, baseline social anxiety symptoms did not significantly predict social anxiety symptoms at the follow-up assessment (*ps* >.31), suggesting considerable variability in the impact of the pandemic on social anxiety symptoms across individuals.

These results highlight the sensitivity of the LPP to individual differences and complex interacting factors contributing to the emergence of internalizing symptoms. In addition, these results are broadly consistent with results of the traumatic intrusions analyses in that they reveal that altered attention to both positively- and negatively-valenced interpersonal stimuli can confer risk for anxiety and related symptoms in combination with high stress exposure. Although this pattern of effects for positively-valenced symptoms is surprising, it could suggest that greater sensitivity to interpersonal emotional contexts broadly confers risk for anxiety when real world interpersonal relationships are strained.

Exploratory Analyses of Visual Processing ERPs

Per a reviewer's request, we additionally examined early visual ERP components, including the P1, N1, and N2. We first scored these components in line with prior literature and then evaluated the extent to which each of these components were modulated by emotional valence. For components that were significantly modulated by emotion, we then conducted exploratory regression analyses consistent with our primary models to test whether individual differences in these components also moderated the effect of exposure to interpersonal pandemic-related stress on symptom changes. Consistent with previous research, the P1, a very early-emerging visual processing component, was scored from 80-120ms across centroparietal sites (CPz, CP1, CP2, Pz; 3). Next, the visual N1 was scored from 120-160ms over frontocentral sites (FCz, Cz, FC1, FC2; 4). The N2 component is commonly examined in conflict monitoring tasks in response to target and non-target stimuli, but subcomponents can also be examined in emotion tasks, generally over more posterior sites, and was scored from 160-250ms across temporoparietal sites (PO7, P7, P5, TP7, PO8, P6, P8, TP8; 5-9). Scalp distributions for these time windows and each emotional condition minus responses to neutral images are presented in Figure S3.

There was a significant effect of condition on the P1, $F(2, 66) = 5.81$, $p = .004$, $\eta_p^2 = .08$, such that P1 amplitudes to both positive, $F(1, 68) = 8.50$, $p = .005$, $\eta_p^2 = .11$, and threatening images, $F(1, 68) = 6.33$, $p = .01$, $\eta_p^2 = .09$, were more positive compared to neutral. There was also a significant effect of condition on the N1, $F(2, 66) = 5.43$, $p = .005$, $\eta_p^2 = .07$, such that N1 amplitudes were more negative for threatening images compared to positive images, $F(1, 68) = 10.68$, $p = .002$, $\eta_p^2 = .14$, but not neutral, $F(1, 68) = 3.81$, $p = .06$, $\eta_p^2 = .05$. There was also a significant effect of condition on the N2, $F(2, 66) = 22.52$, $p < .001$, $\eta_p^2 = .25$, such that the N2 to both positive, $F(1, 68) = 10.42$, $p = .002$, $\eta_p^2 = .13$, and threatening images, $F(1, 68) = 45.75$, $p < .001$, $\eta_p^2 = .40$, were relatively more negative compared to neutral. Additionally, N2s were relatively more negative to threatening images compared to positive, $F(1, 68) = 12.21$, $p = .001$, $\eta_p^2 = .15$.

Multiple linear regression analyses examining the main and interactive effects of P1 residuals and interpersonal pandemic-related stress in the prediction of depressive and traumatic intrusion symptom changes revealed significant interactions between interpersonal stress and the P1 to both threatening (β =

0.34, $z = 3.94$, $p < .001$) and positive images ($\beta = 0.25$, $z = 2.65$, $p = .01$) in the prediction of traumatic intrusion changes, but not depressive symptom changes (*ps* >.15). Simple slope analyses indicated the association between interpersonal pandemic-related stress and traumatic intrusion changes were significant when P1 amplitudes were one standard deviation above the mean (threatening: b=1.29, SE=0.47, t=2.72, p=.01; positive: b=1.65, SE=0.45, t=3.69, p<.001), but not at the mean or one standard deviation below the mean (*ps* >.10). These findings are generally consistent with LPP results in that they suggest that enhanced reactivity to interpersonal emotional images may reflect a vulnerability for traumatic intrusions in combination with high exposure to interpersonal stress, but indicate that this pattern may actually emerge very early in visual processing of emotional stimuli (i.e., 80-120 ms after stimulus onset). Replication of these results is needed in future work, given that our hypotheses focused on the LPP components and prior temporospatial PCA has not consistently identified a distinct P1 component in other versions of this task (2).

Multiple regression analyses examining the main and interactive effects of N1 and N2 residual and interpersonal pandemic-related stress in the prediction of depressive and traumatic intrusion symptoms indicated no significant interaction effects (*p*s > .32), but there were significant main effects of N2 residuals to both positive and threatening images ($\beta = 0.21$, $z = 2.22$, $p = .03$; $\beta = 0.22$, $z = 2.21$, $p = .03$, respectively) predicting change in traumatic intrusions, such that more positive N2 residuals to both emotional conditions were associated with greater increases in traumatic intrusion symptoms from pre- to during the pandemic. These findings could indicate that reduced attention towards emotion as indexed by the N2 component predicts increased traumatic intrusions, but must be interpreted cautiously given potential overlap with positive-going components that also predict change in traumatic intrusions (i.e., P1, LPP), and the fact that prior temporospatial PCA work on this task did not reveal a distinct N2 component sensitive to emotional stimuli.

Table S1. Self-report ratings and behavioral performance for the interpersonal emotional interrupt task

	Threatening *M (SD)*	**Positive** *M (SD)*	**Neutral** *M (SD)*
Valence	2.41 (0.88)	7.46 (1.02)	6.11 (0.75)
Arousal	6.06 (1.34)	5.58 (1.31)	3.89 (1.37)
Reaction Time (ms)	298.82 (130.59)	295.75 (125.04)	293.57 (123.77)
Accuracy (%)	92.58 (7.56)	93.01 (7.00)	92.21 (7.69)

Note: these data are based on the full sample completing the EEG task at the initial assessment

Table S2. Multiple regression analyses testing the main and interactive effect of pandemic-related interpersonal stressful events and LPP to emotional interpersonal stimuli in the prediction of depressive symptom changes from pre- to during the pandemic.

	b(SE)	**β**		***b(SE)***	**β**
T1 General Depression	0.36 (0.10)	0.32***	T1 General Depression	0.36 (0.10)	0.32***
T2 Traumatic Intrusions	1.85 (0.37)	0.45***	T2 Traumatic Intrusions	1.86 (0.38)	0.46***
Positive LPP residuals	-0.26 (0.43)	-0.05	Threatening LPP residuals	-0.11 (0.46)	-0.02
Interpersonal PSQ Events	3.72 (1.29)	0.25**	Interpersonal PSQ Events	3.02 (1.32)	0.21*
Int. Events X Pos LPP res.	-0.82 (0.45)	-0.17*	Int. Events X Threat LPP res.	-0.67 (0.50)	-0.13
Total model R^2=0.48			Total model R^2=0.45		

*** $p<.001$, ** $p<.01$, * $p<.05$, ^ $p<.10$

Note: LPP=late-positive potential; PSQ=Pandemic Stress Questionnaire; Int. Events X Pos LPP res.=The interaction between interpersonal stressful events and LPP residuals to positive images; Int. Events X Threat LPP res.=The interaction between interpersonal stressful events and LPP residuals to threatening images.

Table S3. Multiple regression analyses testing the main and interactive effect of pandemic-related interpersonal stressful events and LPP to emotional interpersonal stimuli in the prediction of traumatic intrusion symptom changes from pre- to during the pandemic.

	b(SE)	**β**		***b(SE)***	**β**
T1 Traumatic Intrusions	0.33 (0.13)	0.24*	T1 Traumatic Intrusions	0.34 (0.13)	0.24**
T2 General Depression	0.11 (0.03)	0.45***	T2 General Depression	0.11 (0.02)	0.44***
Positive LPP residuals	0.16 (0.11)	0.14	Threatening LPP residuals	0.04 (0.12)	0.03
Interpersonal PSQ Events	0.31 (0.35)	0.09	Interpersonal PSQ Events	0.52 (0.34)	0.15
Int. Events X Pos LPP res.	0.17 (0.12)	0.14	Int. Events X Threat LPP res.	0.29 (0.12)	0.23*
Total model R^2=0.41			Total model R^2=0.42		

*** $p<.001$, ** $p<.01$, * $p<.05$, ^ $p<.10$

Note: LPP=late-positive potential; PSQ=Pandemic Stress Questionnaire; Int. Events X Pos LPP res.=The interaction between interpersonal stressful events and LPP residuals to positive images; Int. Events X Threat LPP res.=The interaction between interpersonal stressful events and LPP residuals to threatening images.

Table S4. Multiple regression analyses testing the main and interactive effect of pandemic-related interpersonal stressful events and P3/early LPPs to emotional interpersonal stimuli in the prediction of depressive symptom changes from pre- to during the pandemic.

	b(SE)	**β**		***b(SE)***	**β**
T1 General Depression	0.35 (0.10)	0.31***	T1 General Depression	0.33 (0.10)	0.29**
T2 Traumatic Intrusions	1.91 (0.37)	0.47***	T2 Traumatic Intrusions	1.78 (0.38)	0.44***
Positive P3/early LPP residuals	-0.82 (0.39)	-0.19*	Threatening P3/early LPP residuals	-0.41 (0.30)	-0.13
Interpersonal PSQ Events	3.08 (1.27)	0.22*	Interpersonal PSQ Events	3.18 (1.31)	0.22*
Int. Events X Pos P3/early LPP	-0.16 (0.35)	-0.04	Int. Events X Threat P3/early LPP	-0.13 (0.30)	-0.04
Total model $R^2 = 0.47$			Total model $R^2 = 0.45$		

*** $p < .001$, ** $p < .01$, * $p < .05$, ^ $p < .10$

Note: LPP = late-positive potential; PSQ = Pandemic Stress Questionnaire; Int. Events X Pos LPP = The interaction between interpersonal stressful events and P3/early LPP residuals to positive images; Int. Events X Threat LPP = The interaction between interpersonal stressful events and P3/early LPP residuals to threatening images.

Table S5. Multiple regression analyses testing the main and interactive effect of pandemic-related interpersonal stressful events and late LPPs to emotional interpersonal stimuli in the prediction of depressive symptom changes from pre- to during the pandemic.

	b(SE)	**β**		***b(SE)***	**β**
T1 General Depression	0.37 (0.10)	0.33***	T1 General Depression	0.36 (0.10)	0.32***
T2 Traumatic Intrusions	1.92 (0.37)	0.48***	T2 Traumatic Intrusions	1.73 (0.37)	0.43***
Positive late LPP residuals	0.24 (0.40)	0.06	Threatening late LPP residuals	0.08 (0.49)	0.02
Interpersonal PSQ Events	3.64 (1.27)	0.26**	Interpersonal PSQ Events	2.90 (1.39)	0.21*
Int. Events X Pos late LPP	-1.10 (0.46)	-0.23*	Int. Events X Threat late LPP	-0.52 (0.57)	-0.09
Total model $R^2 = 0.48$			Total model $R^2 = 0.44$		

*** $p < .001$, ** $p < .01$, * $p < .05$, ^ $p < .10$

Note: LPP = late-positive potential; PSQ = Pandemic Stress Questionnaire; Int. Events X Pos late LPP = The interaction between interpersonal stressful events and late LPP residuals to positive images; Int. Events X Threat late LPP = The interaction between interpersonal stressful events and late LPP residuals to threatening images.

Table S6. Multiple regression analyses testing the main and interactive effect of interpersonal pandemic-related stressful events and P3/early LPP to emotional interpersonal stimuli in the prediction of traumatic intrusion symptom changes from pre- to during the pandemic.

	b(SE)	**β**		***b(SE)***	**β**
T1 Traumatic Intrusions	0.38 (0.12)	0.28**	T1 Traumatic Intrusions	0.37 (0.13)	0.27**
T2 General Depression	0.12 (0.02)	0.47***	T2 General Depression	0.11 (0.03)	0.45***
Positive P3/early LPP residuals	0.29 (0.10)	0.28**	Threatening P3/early LPP residuals	0.09 (0.08)	0.11
Interpersonal PSQ Events	0.44 (0.33)	0.12	Interpersonal PSQ Events	0.54 (0.35)	0.15
Int. Events X Pos P3/early LPP	0.04 (0.09)	0.05	Int. Events X Threat P3/early LPP	0.13 (0.07)	0.18^
Total model $R^2 = 0.44$			Total model $R^2 = 0.41$		

*** $p < .001$, ** $p < .01$, * $p < .05$, ^ $p < .10$

Note: LPP = late-positive potential; PSQ = Pandemic Stress Questionnaire; Int. Events X Pos P3/early LPP = The interaction between interpersonal stressful events and P3/early LPP residuals to positive images; Int. Events X Threat P3/early LPP = The interaction between interpersonal stressful events and P3/early LPP residuals to threatening images.

Table S7. Multiple regression analyses testing the main and interactive effect of interpersonal pandemic-related stressful events and late LPP to emotional interpersonal stimuli in the prediction of traumatic intrusion symptom changes from pre- to during the pandemic.

	b(SE)	**β**		***b(SE)***	**β**
T1 Traumatic Intrusions	0.29 (0.13)	0.21*	T1 Traumatic Intrusions	0.36 (0.13)	0.26**
T2 General Depression	0.12 (0.03)	0.46***	T2 General Depression	0.11 (0.03)	0.44***
Positive late LPP residuals	0.03 (0.11)	0.03	Threatening late LPP residuals	-0.13 (0.13)	-0.11
Interpersonal PSQ Events	0.25 (0.36)	0.07	Interpersonal PSQ Events	0.61 (0.37)	0.17^
Int. Events X Pos late LPP	0.27 (0.12)	0.23*	Int. Events X Threat late LPP	0.08 (0.15)	0.05
Total model $R^2 = 0.41$			Total model $R^2 = 0.37$		

*** $p < .001$, ** $p < .01$, * $p < .05$, ^ $p < .10$

Note: LPP = late-positive potential; PSQ = Pandemic Stress Questionnaire; Int. Events X Pos late LPP = The interaction between interpersonal stressful events and late LPP residuals to positive images; Int. Events X Threat late LPP = The interaction between interpersonal stressful events and late LPP residuals to threatening images.

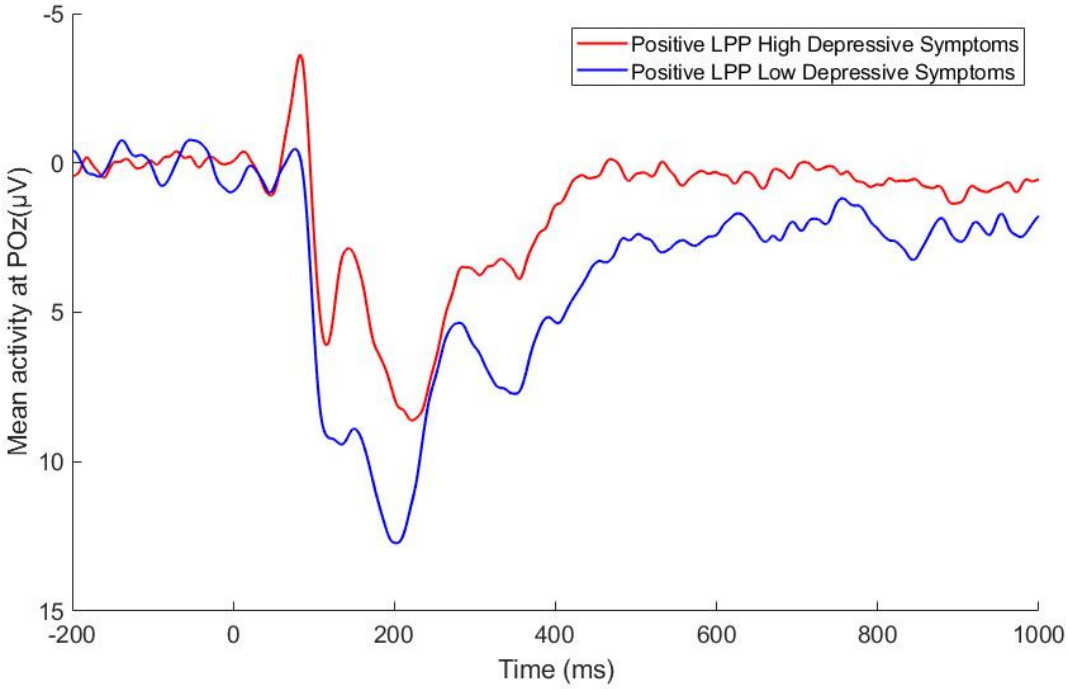
Table S8. Multiple regression analyses testing the main and interactive effect of interpersonal pandemic-related stressful events and LPP to emotional interpersonal stimuli in the prediction of social anxiety symptom changes from pre- to during the pandemic.

	b(SE)	**β**		***b(SE)***	**β**
T1 Social Anxiety	0.02 (0.08)	0.02	T1 Social Anxiety	0.09 (0.08)	0.11
T2 General Depression	0.12 (0.03)	0.47***	T2 General Depression	0.11 (0.03)	0.42***
Positive LPP residuals	0.12 (0.11)	0.11	Threatening LPP residuals	0.16 (0.12)	0.14
Interpersonal PSQ Events	-0.53 (0.38)	-0.14	Interpersonal PSQ Events	-0.14 (0.40)	-0.04
Int. Events X Pos LPP	0.46 (0.11)	0.41***	Int. Events X Threat LPP	0.29 (0.12)	0.26*
Total model $R^2 = 0.39$			Total model $R^2 = 0.49$		

*** $p < .001$, ** $p < .01$, * $p < .05$, ^ $p < .10$

Note: LPP = late-positive potential; PSQ = Pandemic Stress Questionnaire; Int. Events X Pos LPP = The interaction between interpersonal stressful events and LPP residuals to positive images; Int. Events X Threat LPP = The interaction between interpersonal stressful events and LPP residuals to threatening images.

Figure S1. ERP waveforms depicting the LPP for participants above the mean for interpersonal stress exposure with high and low levels of depressive (top) and traumatic intrusion (bottom) symptom changes (Note: median splits for interpersonal stress and high and low residualized internalizing symptom changes were used for illustrative purposes only. Statistical analyses examined stress and symptoms as continuous variables).



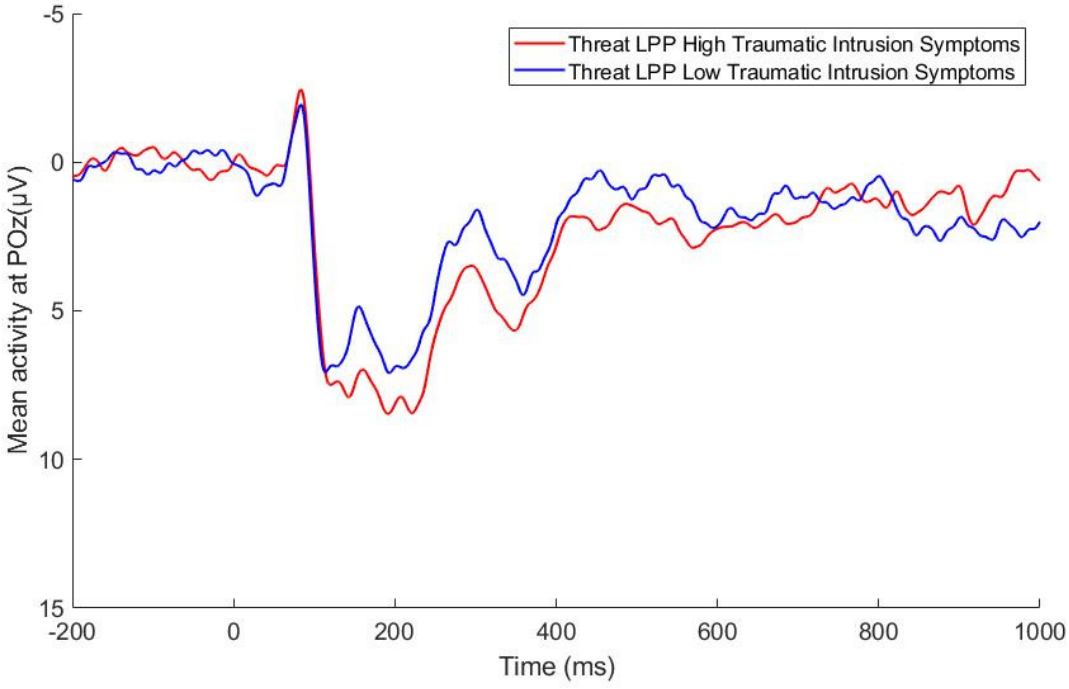


Figure S2. Plots of the simple slopes for the interaction effect between pandemic-related interpersonal events at low, average, and high levels of LPP reactivity to positive stimuli (left) and threatening stimuli (right) in the prediction of social anxiety symptom changes.

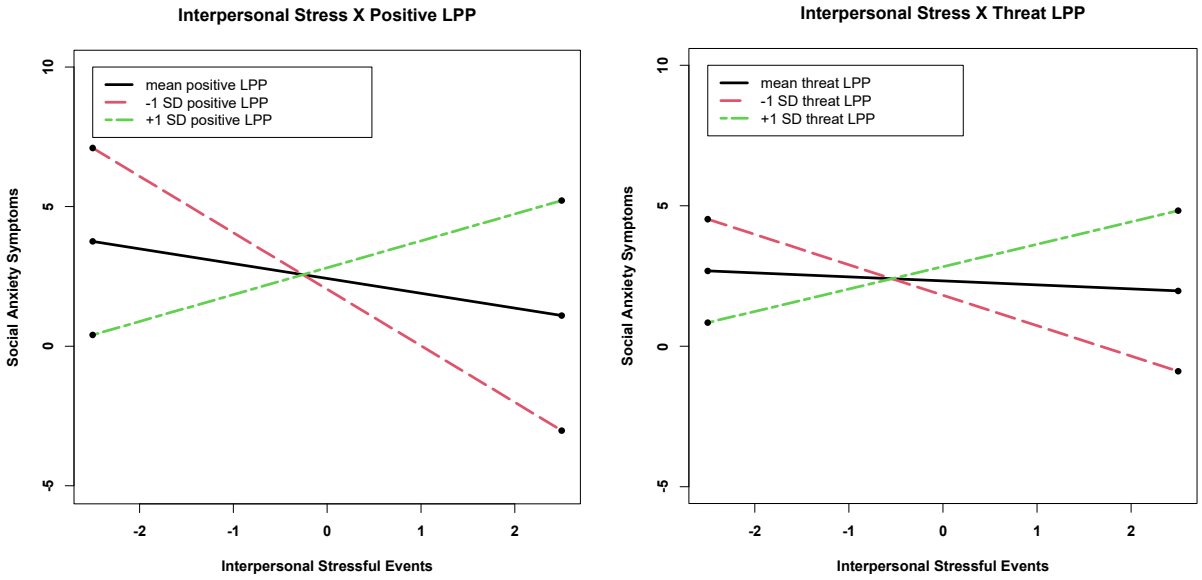
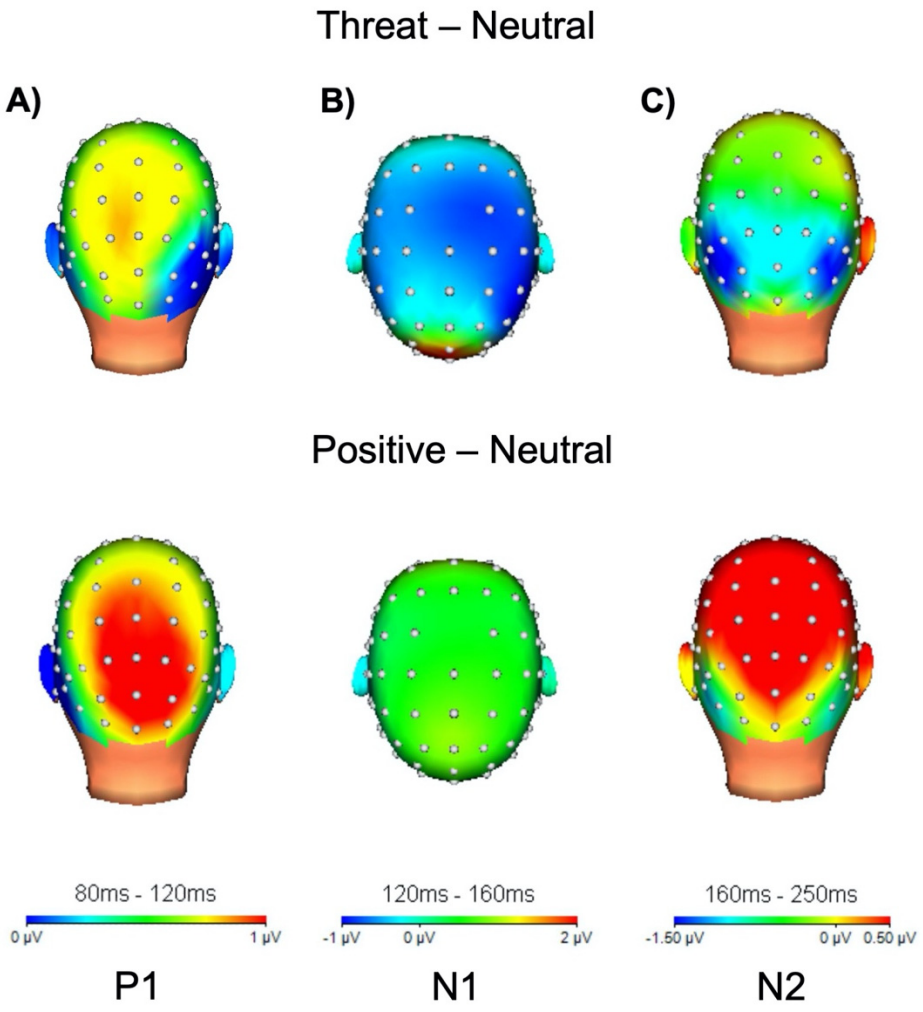


Figure S3. Scalp distributions for early visual processing ERP components A) P1 B) N1 C) N2 components for responses to threatening and positive images minus responses to neutral images.



Pandemic Stress Questionnaire (PSQ) – College Student Version

Instructions: Below is a list of events related to the pandemic that may or may not have happened to you. Please decide whether you have had each of these experiences as a result of the recent coronavirus pandemic. For each event which has happened, please decide how bad it was when it happened to you. When rating how bad each event was when it happened, please consider how much of a negative impact it had on your life, how often the event occurred, and how long it was a problem for you.

	EVENTS RELATED TO THE CORONAVIRUS PANDEMIC	**Did this happen to you?**	
1	I had difficulty obtaining basic supplies because of the coronavirus pandemic (e.g., food, medicine, toilet paper).	Yes	No
	If yes: How bad was this event? *1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad*		
2	I had to move unexpectedly because of the coronavirus pandemic.	Yes	No
	If yes: How bad was this event? *1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad*		
3	I was unexpectedly separated from friends or others close to me because of the coronavirus pandemic.	Yes	No
	If yes: How bad was this event? *1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad*		
4	I was unable to be with close family, friends, or partners because of the coronavirus pandemic.	Yes	No
	If yes: How bad was this event? *1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad*		
5	I had problems with my visa or the Student and Exchange Visitor Information System because of the coronavirus pandemic (e.g., unable to renew).	Yes	No
	If yes: How bad was this event? *1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad*		
6	I had to cancel travel or experienced a major disruption in travel plans because of the coronavirus pandemic.	Yes	No
	If yes: How bad was this event? *1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad*		
7	I had to cancel or postpone important events because of the coronavirus pandemic (e.g., events for a club, sporting events, major celebrations).	Yes	No
	If yes: How bad was this event? *1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad*		

8	I had to take on additional responsibilities caring for others (e.g., siblings, other family members) due to the coronavirus pandemic.	Yes	No
	If yes: How bad was this event? *1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad*		
9	I experienced significant financial strain due to the pandemic (e.g., due to travel, purchasing supplies, paying for housing).	Yes	No
	If yes: How bad was this event? *1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad*		
10	I temporarily or permanently lost a job or had my work hours greatly reduced due to the coronavirus pandemic.	Yes	No
	If yes: How bad was this event? *1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad*		
11	My parent(s) temporarily or permanently lost a job or had their work hours greatly reduced because of the coronavirus pandemic.	Yes	No
	If yes: How bad was this event? *1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad*		
12	I was unable to complete important requirements for my education or professional goals due to the coronavirus pandemic (e.g., coursework, taking the SAT or GRE, thesis).	Yes	No
	If yes: How bad was this event? *1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad*		
13	I had problems with online courses and/or remote work (e.g., slow connection, no computer or internet access, major differences in time zone).	Yes	No
	If yes: How bad was this event? *1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad*		
14	I had conflicts or arguments with family members due to coronavirus (e.g., conflicts about living arrangements, shared work space, schedule expectations).	Yes	No
	If yes: How bad was this event? *1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad*		
15	I experienced racism or discrimination due to the coronavirus pandemic.	Yes	No
	If yes: How bad was this event? *1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad*		
16	I had symptoms of COVID-19 (e.g., cough, fever, trouble breathing) but was unable to get tested.	Yes	No
	If yes: How bad was this event? *1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad*		

17 I was tested for COVID-19. Yes No

If yes: How bad was this event?
1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

18 I was diagnosed with COVID-19. Yes No

If yes: How bad was this event?
1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

19 I had difficulty accessing physical or mental health care and/or difficulties with health insurance due to the coronavirus pandemic. Yes No

If yes: How bad was this event?
1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

20 I was quarantined for 2 weeks or longer due to possible exposure to COVID-19 or due to international travel. Yes No

If yes: How bad was this event?
1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

21 Someone close to me had symptoms of COVID-19 (e.g., cough, fever, trouble breathing) but was unable to get tested. Yes No

If yes: How bad was this event?
1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

22 Someone close to me was diagnosed with COVID-19. Yes No

If yes: How bad was this event?
1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

23 Someone close to me was quarantined for 2 weeks or longer due to possible exposure to COVID-19 or due to international travel. Yes No

If yes: How bad was this event?
1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

24 Someone close to me died from COVID-19. Yes No

If yes: How bad was this event?
1 - not at all bad 2 - slightly bad 3 - somewhat bad 4 - very bad 5 - extremely bad

Event subscales
General life disruption (moving, travel, cancellations): 1, 2, 5, 6, 7, 8
Interpersonal: 3, 4, 14, 15, 24
Financial: 9, 10, 11
Education/professional goals: 12, 13
Health (self): 16-20
Health (others): 21-24

Supplemental References

1. Lang, P. J., Bradley, M. M., & Cuthbert, B. N. (1997). International affective picture system (IAPS): Technical manual and affective ratings. *NIMH Center for the Study of Emotion and Attention*, *1*, 39-58.
2. Pegg, S., Dickey, L., Mumper, E., Kessel, E., Klein, D. N., & Kujawa, A. (2019). Stability and change in emotional processing across development: A 6-year longitudinal investigation using event-related potentials. *Psychophysiology*. https://doi.org/10.1111/psyp.13438
3. Smith, N. K., Cacioppo, J. T., Larsen, J. T., & Chartrand, T. L. (2003). May I have your attention, please: Electrocortical responses to positive and negative stimuli. *Neuropsychologia*, *41*(2), 171–183. https://doi.org/10.1016/S0028-3932(02)00147-1
4. Keil, A., Müller, M. M., Gruber, T., Wienbruch, C., Stolarova, M., & Elbert, T. (2001). Effects of emotional arousal in the cerebral hemispheres: A study of oscillatory brain activity and event-related potentials. *Clinical Neurophysiology*, *112*(11), 2057–2068. https://doi.org/10.1016/S1388-2457(01)00654-X
5. Codispoti, M., Ferrari, V., Junghöfer, M., & Schupp, H. T. (2006). The categorization of natural scenes: Brain attention networks revealed by dense sensor ERPs. *NeuroImage*, *32*(2), 583–591. https://doi.org/10.1016/j.neuroimage.2006.04.180
6. Folstein, J. R., & Van Petten, C. (2008). Influence of cognitive control and mismatch on the N2 component of the ERP: A review. *Psychophysiology*, *45*(1), 152–170. https://doi.org/10.1111/j.1469-8986.2007.00602.x
7. Foti, D., Hajcak, G., & Dien, J. (2009). Differentiating neural responses to emotional pictures: Evidence from temporal-spatial PCA. *Psychophysiology*. https://doi.org/10.1111/j.1469-8986.2009.00796.x
8. Schupp, H. T., Flaisch, T., Stockburger, J., & Junghöfer, M. (2006). Chapter 2 Emotion and attention: event-related brain potential studies. *Progress in Brain Research*, *156*, 31–51. https://doi.org/10.1016/S0079-6123(06)56002-9
9. Schupp, H. T., Junghöfer, M., Weike, A. I., & Hamm, A. O. (2003). Attention and emotion: An ERP analysis of facilitated emotional stimulus processing. *NeuroReport*, *14*(8), 1107–1110. https://doi.org/10.1097/00001756-200306110-00002