Supplementary Method

Internal Consistency

The ERA Toolbox calculated score dependability based on algorithms from generalizability theory and used CmdStan v 2.17.0 (Stan Development Team, 2017) to implement the analyses in Stan (Carpenter et al., 2017). Additional information on the formulas used for calculating ERP scores dependability can be found elsewhere (Baldwin, Larson, & Clayson, 2015; Clayson & Miller, 2017). To estimate variance components, the Markov chain Monte Carlo estimation procedures used 3 chains and 10,000 iterations. Overall ERP score dependability estimates and their associated 95% credible intervals are presented in Supplementary Tables 1-4. Credible intervals are the Bayesian analog to confidence intervals (Morey, Hoekstra, Rouder, Lee, & Wagenmakers, 2016). Summary statistics for the number of trials for each event type and group are also shown in Supplementary Tables 1-4.

Data Analysis

First, a 2-Group (controls, patients) x 2-Certainty Effect (certain trials, uncertain trials) repeated measures analysis of variance (ANOVA) was conducted for fRewP. For fRewP, a 2-Group x 3-Valence Effect within Certain Outcomes (certain gain cues, certain loss cues, certain even cues) ANOVA and a 2-Group x 4-Valence Effect within Uncertain Outcomes (uncertain gain cues, gain outcomes; uncertain gain cues, even outcomes; uncertain loss cues, loss outcomes; uncertain loss cues, even outcomes) ANOVA were conducted. For all ANOVAS, *partial-eta*^{2} (η_p^2) was reported as a measurement of effect size, and a Huynh-Feldt epsilon adjustment was applied to correct for possible violations of sphericity for factors with more than two levels. Significant effects were followed up with independent samples or paired samples *t* tests. Cohen's *d* was reported as a measurement of effect size for *t* tests.

A temporospatial principal components analysis (PCA) was employed to attempt to distinguish between fRewP and fP300 and followed published methods for conducting temporospatial PCA (e.g., Clawson, Clayson, Keith, Catron, & Larson, 2017; Clawson, Clayson, & Larson, 2013; Foti, Weinberg, Dien, & Hajcak, 2011; Larson, Clawson, Clayson, & Baldwin, 2013; Larson, Clayson, & Farrer, 2012; Larson et al., 2016). The two-step temporospatial PCA was implemented over alternative approaches, such as temporal PCA, spatial PCA, or a spatiotemporal PCA based on recommendations by Dien (2010b). Temporospatial PCA was conducted using the ERP PCA Toolkit v. 2.78 (Dien, 2010a; Foti et al., 2011). All single subject averages from each both groups were included in the PCA, and factors were chosen based on scree plots (Catell, 1966) using the parallel test (Horn, 1965). A temporal PCA with promax rotation using all time points from single subject averages as variables with participants, trials, and electrodes as observations was first conducted on uncertain outcome trials and yielded 29 temporal factors. A spatial PCA with infomax rotation using electrode sites as variables and participants, trials, and temporal factors as observations followed (Dien, 2010b; Dien, Khoe, & Mangun, 2007) and yielded 6 spatial factors. The factor loadings for each temporospatial factor were reconstructed and converted back into microvolts by multiplying the factor pattern matrix with the standard deviations (Dien, 2006; Dien, Tucker, Potts, & Hartry-Speiser, 1997).

Those temporospatial factors that accounted for at least 1% of the variance in ERP activity were selected for subsequent visual inspection. Those temporospatial factors that most closely matched the expected latency and scalp topography based on grand average waveforms for the fRewP and fP300 were chosen. Temporal factor 2 spatial 1 (TF2SF1) represented fP300 and showed a peak latency of 313 ms and a peak amplitude at FCz. Temporal factor 8 spatial 1 (TF8SF1) represented fRewP and showed a peak latency of 247 ms and a peak amplitude at FCz.

Amplitude was scored as the instantaneous amplitude at the peak latency at FCz for each temporospatial factor. To compare PCA derived ERP activity, ERP scores were subjected to a *z*-score transformation separately for each component using the control group as a reference. A 2-Group x 2-ERP Component (fRewP [TF8SF1], fP300 [TF2SF1]) x 4-Valence Effect within Uncertain Outcomes was conducted on *z*-score transformed temporospatial ERP scores.

Quaternary analyses were conducted to determine the test-retest reliability of ERP measurements between Sessions 1 and 2 for people with schizophrenia. Intersubject stability was examined using Pearson's *r*, and score agreement was examined using the ICC. Consistent with recommendations for reliability analyses, confidence intervals are reported in lieu of *p* values (Cicchetti, 2001). Mean differences in ERP measurements across session were also examined by including session as factor in all ANOVAs. Group was removed as a factor in the ANOVAs (retest data were only collected for patients). For all ANOVAs, only significant main effects of session and interactions with session are reported below. When interactions were significant, ERP score comparisons were only conducted to examine between-session differences. Data are missing for one patient who did not return for the second recording session.

Supplementary Results

fRewP

Summary information for fRewP amplitudes are shown in supplementary Tables 6 and 7. Grand average waveforms are shown in supplementary Figures 3 and 4. Main effects and interactions for each ANOVA on fRewP amplitude are shown in supplementary Table 8 and interpreted below.

Certainty Effect. A Group x Certainty ANOVA on fRewP amplitude yielded a main effect of certainty with larger fRewP for uncertain trials than for certain trials. The main effect of

group was not significant. The Group x Certainty interaction was significant. Both controls and patients showed larger fRewP for uncertain trials than for certain trials, $t(72) = -8.07$, $p < .001$, $d = .94$; $t(88) = -3.83$, $p < .001$, $d = .41$, respectively. Patients showed greater fRewP than controls to certain trials, $t(159) = -3.20$, $p = .002$, $d = .51$, but groups showed similar fRewP amplitudes to uncertain trials, $t(159) = 0.65$, $p = .52$, $d = .10$.

Valence Effect within Certain Trials. Consistent with this pattern of effect, the Group x Valence ANOVA indicated a main effect of group with patients showing larger fRewP for certain trials than controls. The main effect of valence was also significant. fRewP for both certain gain and certain loss trials were larger than fRewP for certain even trials, $t(160) = 5.02$, $p < .001$, $d = .40$; $t(160) = 3.65$, $p < .001$, $d = .29$, respectively. Significant differences for fRewP for certain gain and certain loss were not observed, $t(160) = 1.68$, $p = .10$, $d = .13$. The Group x Valence interaction was not significant.

Valence Effect within Uncertain Trials. A Group x Valence ANOVA indicated a main effect of valence. Follow-up *t* tests are shown in Supplementary Table 5, and the findings are summarized here. When it was possible to win money, fRewP was largest when the participant won than when the participant broke even or when it was possible to lose money (regardless of monetary outcome; ts > 4.1, ps < .001, ds > .32). fRewP was larger when the participant lost money than when the participant broke even (regardless of whether it was possible to win or lose money; ts > 3.0, ps < .01, ds > .23). fRewP amplitudes were similar when the participant broke even, regardless of whether it was possible to win or lose money, $t(160) = -1.19$, $p = .24$, $d = .09$. The main effect of group and Group x Valence interactions were not significant.

Temporospatial PCA

Summary information for PCA derived fRewP and fP300 amplitudes are shown in supplementary Table 9. Grand average waveforms of PCA derived fRewP and fP300 are shown in supplementary Figure 5. The 2-Group x 2-ERP Component x 4-Valence Effect within Uncertain Outcomes ANOVA only yielded a significant main effect of event, $F(3, 276) = 13.55$, $p < .001$, $\eta_p^2 = .13$. None of the remaining main effects or interactions were significant (Fs < 2.5, ps > .12), suggesting a similar pattern of valence effects for PCA-derived fRewP and fP300 in healthy controls and patients with schizophrenia.

Test-Retest Analyses for Patients

Summary information for ERP scores from session 2 are shown in Supplementary Tables 10 and 11. Grand average waveforms from session 2 are shown in Supplementary Figures 6 and 7. Retest reliability scores for certain trials, uncertain trials, and difference scores (uncertain minus certain) are shown in supplementary Table 12, and retest reliability scores as a function of monetary outcome are reported in Supplementary Tables 13 and 14. Although there is some discrepancy as to which values are acceptable for retest reliability scores, the following guidelines were used to allow for a qualitative summary of the obtained retest reliability indices. For Pearson's *r*, .50 is generally considered acceptable retest reliability for experimental research based on groups (Helmstadter, 1964; Segalowitz et al., 2010). For ICCs, estimates at or above .60 are generally considered acceptable (Anastasi, 1997).

Cue-related activity. For cP300, session was included as a factor in the ANOVAs examined certain v uncertain trials, monetary outcome within certain trials, and monetary outcome within uncertain trials. Although the Session x Uncertain Outcome interaction approached significance, $F(1, 68) = 3.57$, $p = .06$, $\eta_p^2 = .05$, cP300 amplitudes to uncertain gain and uncertain loss trials across session were similar, $t(68) = -.29$, $p = .77$, $d = .04$; $t(68) = 1.26$, p

= .21, *d* = .15, respectively. The other main effects and interactions were not significant (*F*s < 2.3, *p*s > .13, η_p^2s < .04).

For cP300, acceptable retest reliability for Pearson's *r* and ICC was only observed for certain trials.

Feedback-preceding activity. When examining SPN amplitude, none of the main effects of session or interactions with session was significant (*F*s < 2.2, *p*s > .14, η_p^2s < .03). Adequate retest reliability for SPN was not observed for any outcome type.

Feedback-receipt activity. For fRewP, a main effect of session was observed for the Session x Certainty and Session x Certain Outcome ANOVAs, $F(1, 77) = 5.79$, $p = .02$, $\eta_p^2 = .07$; $F(1, 74) = 7.49$, $p = .008$, $\eta_p^2 = .09$, respectively. Both main effects indicated reduced fRewP for session 2. The remaining main effect of session and interactions were not significant for fRewP (*F*s < 3.2, *p*s > .08, η_p^2s < .04).

The Session x Certainty ANOVA on fP300 amplitude yielded a significant main effect of session and a non-significant Session x Certainty interaction, $F(1, 77) = 11.96$, $p = .001$, $\eta_p^2 = .13$; $F(1, 77) = 2.02$, $p = .16$, $\eta_p^2 = .03$, respectively. fP300 amplitude was larger during the first session than during the second session. The Session x Certain Outcome ANOVA on fP300 amplitude yielded a significant main effect of session with reduced amplitude during the second session, $F(1, 77) = 11.91$, $p = .001$, $\eta_p^2 = .13$. The Session x Certain Outcome interaction was also significant, $F(2, 154) = 3.53$, $p = .03$, $\eta_p^2 = .04$. When examining fP300 between sessions, certain gain and certain loss trials were larger during session 1 than during session 2 (*t*s > 3.0, *p*s < .01, *d*s > .34). fP300 for certain even trials was similar between sessions, $t(77) = 1.63$, $p = .11$, $d = .18$. With regard to the Session x Uncertain Outcome ANOVA, the main effect of session was significant, with larger fP300 in during the first session than during the second session, *F*(1,

77) = 6.36, p = .01, η_p^2 = .08. The Session x Uncertain Outcome interaction was not significant, $F(1, 77)$ = 1.16, p = .33, η_p^2 = .02.

With regard to the retest reliability of fRewP, only the uncertain trials and the uncertain gain, gain trials showed an acceptable level of retest reliability for both Pearson's *r* and ICC. For fP300, acceptable retest reliability was observed for all uncertain trial types. Adequate retest reliability was not observed for any certain trials for either fRewP or fP300.

Supplementary Discussion

Four-week retest reliability within the schizophrenia group was variable across the different ERP scores. Regarding the certain vs. uncertain conditions, only a subset of ERP scores showed relatively good stability, including cP300 for certain trials, fRewP for uncertain trials, fP300 for uncertain trials, and fP300 difference scores (uncertain minus certain; *r*s ≥ .61, ICCs ≥ .60). fRewP difference score reliability (r = .52, ICC = .52) was lower and comparable to a prior study by our group (r = .47, ICC = .47) of factor analyzed RewP difference scores across a four-week period in schizophrenia (Llerena, Wynn, Hajcak, Green, & Horan, 2016). Notably, we found high internal consistency for certain and uncertain trials in the current study, suggesting the relatively low retest reliability for these trials is not due to low single-session internal consistency. Regarding the valence conditions, retest reliabilities were also generally low, but this is likely due, in part, to the low internal consistency of valence measurements. The ERPs examined in the current paradigm may be sensitive to state-related mood or other subtle clinical characteristics. Because we only administered follow up assessments to the schizophrenia group, we do not know whether healthy controls show similar stability levels.

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Table S1

Dependability and Trial Summary Information for cP300 as a Function of Event Type and Group

Event	Group	*n*	Trial Cutoff	Overall Dependability	Trials *M* ± *SD*	Trial Range
Certain	Controls	73	12	.92 (.89, .94)	59 ± 3	40-60
	Patients	89	16	.90 (.87, .95)	59 ± 2	44-60
Uncertain	Controls	73	16	.90 (.87, .93)	79 ± 3	60-80
	Patients	89	19	.91 (.88, .93)	78 ± 3	62-80
Certain Gain	Controls	72	12	.79 (.71, .86)	20 ± 1	17-20
	Patients	85	18	.74 (.64, .82)	20 ± 1	18-20
Certain Loss	Controls	72	15	.73 (.63, .82)	20 ± 1	18-20
	Patients	85	17	.73 (.63, .81)	20 ± 1	18-20
Certain Even	Controls	72	10	.82 (.75, .88)	20 ± 1	17-20
	Patients	85	15	.75 (.65, .82)	20 ± 1	18-20
Uncertain Gain	Controls	72	17	.83 (.76, .88)	40 ± 1	33-40
	Patients	85	17	.85 (.79, .89)	39 ± 1	36-40
Uncertain Loss	Controls	72	14	.86 (.81, .91)	40 ± 1	36-40
	Patients	85	22	.81 (.74, .87)	39 ± 1	36-40

Note. Trial cutoffs represent the number of trials needed to obtain a dependability estimate of .70. The overall dependability represents the dependability point estimates and their 95% credible intervals for data including all trials from those participants whose had an adequate number of trials. When the trial cutoff exceeded the number of trials presented in the task, the trial cutoff was ignored for that event type. cP300 = cued P300

Table S2

Dependability and Trial Summary Information for SPN as a Function of Event Type and Group

Event	Group	*n*	Trial Cutoff	Overall Dependability	Trials *M* ± *SD*	Trial Range
Certain	Controls	72	26	.84 (.78, .89)	58 ± 3	40-60
	Patients	88	19	.88 (.84, .91)	58 ± 3	43-60
Uncertain	Controls	72	22	.90 (.86, .93)	78 ± 3	59-80
	Patients	88	15	.93 (.90, .95)	77 ± 4	58-80
Certain Gain	Controls	71	23	.67 (.55, .77)	20 ± 1	14-20
	Patients	85	15	.76 (.68, .83)	19 ± 1	15-20
Certain Loss	Controls	71	23	.67 (.54, .77)	20 ± 1	11-20
	Patients	85	17	.74 (.65, .81)	20 ± 1	17-20
Certain Even	Controls	71	30	.60 (.45, .73)	19 ± 1	14-20
	Patients	85	26	.64 (.52, .74)	19 ± 1	15-20
Uncertain Gain	Controls	71	20	.82 (.76, .88)	39 ± 1	32-40
	Patients	85	14	.87 (.83, .90)	39 ± 2	28-40
Uncertain Loss	Controls	71	23	.80 (.73, .86)	39 ± 1	27-40
	Patients	85	15	.86 (.82, .90)	39 ± 2	30-40

Note. Trial cutoffs represent the number of trials needed to obtain a dependability estimate of .70. The overall dependability represents the dependability point estimates and their 95% credible intervals for data including all trials from those participants whose had an adequate number of trials. When the trial cutoff exceeded the number of trials presented in the task, the trial cutoff was ignored for that event type. SPN = stimulus-preceding negativity

Table S3

Dependability and Trial Summary Information for fRewP as a Function of Event Type and Group

Event	Group	*n*	Trial Cutoff	Overall Dependability	Trials *M* ± *SD*	Trial Range
Certain	Controls	73	27	.84 (.78, .89)	59 ± 3	40-60
	Patients	89	18	.88 (.85, .92)	59 ± 3	44-60
Uncertain	Controls	73	10	.95 (.94, .97)	79 ± 3	60-80
	Patients	89	13	.94 (.92, .95)	78 ± 4	60-80
Certain Gain	Controls	73	20	.69 (.57, .79)	20 ± 1	15-20
	Patients	88	19	.75 (.65, .82)	20 ± 1	19-20
Certain Loss	Controls	73	20	.69 (.56, .79)	20 ± 1	11-20
	Patients	88	17	.76 (.68, .84)	20 ± 1	18-20
Certain Even	Controls	73	56	.48 (.27, .65)	20 ± 1	14-20
	Patients	88	19	.70 (.59, .79)	20 ± 1	20-20
Uncertain Gain, Gain	Controls	73	8	.84 (.78, .89)	20 ± 1	15-20
	Patients	88	10	.83 (.77, .88)	20 ± 1	19-20
Uncertain Gain, Even	Controls	73	10	.82 (.75, .88)	20 ± 1	15-20
	Patients	88	12	.81 (.73, .87)	20 ± 1	19-20
Uncertain Loss, Loss	Controls	73	9	.81 (.74, .87)	20 ± 1	13-20
	Patients	88	12	.79 (.71, .85)	20 ± 1	17-20
Uncertain Loss, Even	Controls	73	10	.81 (.83, .87)	20 ± 1	15-20
	Patients	88	11	.80 (.72, .86)	20 ± 1	17-20

Note. Trial cutoffs represent the number of trials needed to obtain a dependability estimate of .70. The overall dependability represents the dependability point estimates and their 95% credible intervals for data including all trials from those participants whose had an adequate number of trials. When the trial cutoff exceeded the number of trials presented in the task, the trial cutoff was ignored for that event type. fRewP = feedback reward positivity

Table S4

Dependability and Trial Summary Information for fP300 as a Function of Event Type and Group

Event	Group	*n*	Trial Cutoff	Overall Dependability	Trials *M* ± *SD*	Trial Range
Certain	Controls	73	21	.87 (.82, .91)	59 ± 3	40-60
	Patients	89	12	.92 (.90, .94)	59 ± 3	44-60
Uncertain	Controls	73	6	.97 (.96, .98)	79 ± 3	60-80
	Patients	89	6	.97 (.96, .98)	78 ± 4	60-80
Certain Gain	Controls	72	16	.72 (.61, .81)	20 ± 1	18-20
	Patients	89	11	.82 (.76, .88)	20 ± 1	13-20
Certain Loss	Controls	72	17	.73 (.61, .82)	20 ± 1	19-20
	Patients	89	11	.82 (.76, .88)	20 ± 1	14-20
Certain Even	Controls	72	32	.57 (.38, .71)	20 ± 1	17-20
	Patients	89	14	.78 (.70, .85)	20 ± 1	14-20
Uncertain Gain, Gain	Controls	72	5	.89 (.85, .93)	20 ± 1	15-20
	Patients	89	5	.91 (.87, .94)	20 ± 1	14-20
Uncertain Gain, Even	Controls	72	6	.88 (.83, .92)	20 ± 1	18-20
	Patients	89	7	.87 (.82, .91)	20 ± 1	14-20
Uncertain Loss, Loss	Controls	72	5	.88 (.83, .92)	20 ± 1	19-20
	Patients	89	5	.90 (.86, .93)	20 ± 1	17-20
Uncertain Loss, Even	Controls	72	7	.85 (.80, .90)	20 ± 1	17-20
	Patients	89	6	.90 (.86, .93)	20 ± 1	14-20

Note. Trial cutoffs represent the number of trials needed to obtain a dependability estimate of .70. The overall dependability represents the dependability point estimates and their 95% credible intervals for data including all trials from those participants whose had an adequate number of trials. When the trial cutoff exceeded the number of trials presented in the task, the trial cutoff was ignored for that event type. fP300 = feedback P300

Table S5

Summary of Paired Samples t Tests for the Main Effect of Uncertain Event in the Group x Valence Effect ANOVAs for fRewP and fP300 Within Uncertain Trials

Component	Comparison	*t*	*p*	Cohen's *d*
fRewP	Uncertain gain, gain > Uncertain gain, even	7.46	< .001	.59
	Uncertain gain, gain > Uncertain loss, loss	4.15	< .001	.33
	Uncertain gain, gain > Uncertain loss, even	6.14	< .001	.48
	Uncertain loss, loss > Uncertain loss, even	3.05	.003	.24
	Uncertain loss, loss > Uncertain gain, even	4.36	< .001	.34
	Uncertain gain, even ~ Uncertain loss, even	-1.19	.24	.09
fP300	Uncertain gain, gain > Uncertain gain, even	11.52	<.001	.91
	Uncertain gain, gain > Uncertain loss, loss	6.89	<.001	.54
	Uncertain gain, gain > Uncertain loss, even	9.69	<.001	.76
	Uncertain loss, loss > Uncertain loss, even	4.00	<.001	.32
	Uncertain loss, loss > Uncertain gain, even	4.88	<.001	.38
	Uncertain gain, even ~ Uncertain loss, even	-1.10	.27	.09

Note. The comparison column indicates the direction of effect. For all significant comparisons, the event associated with the larger amplitude is on the left. The degrees of freedom for all comparisons was 160. fRewP = feedback reward positivity; fP300 = feedback P300; Uncertain gain, gain = participant gained money when it was possible to gain money or break even; Uncertain gain, even = participant broke even when it was possible to gain money or break even; Uncertain loss, loss = participant loss money when it was possible to lose money or break even; Uncertain loss, even = participant broke even when it was possible to lose money or break even

Table S6

Summary of Feedback Reward Positivity (fRewP) Amplitudes (μV) for Controls (n = 73) and Patients (n = 89)

Component	Group	Certain	Uncertain
		M (*SD*)	*M* (*SD*)
fRewP	Controls	2.5 (2.4)	5.2 (3.6)
	Patients	3.8 (2.9)	4.8 (3.3)

Table S7

Summary of Feedback Reward Positivity (fRewP) Amplitudes (μV) as a Function of Certain/Uncertain Outcome and Group

Component	Group		Certain Gain	Certain Loss	Certain Even	Uncertain Gain, Gain	Uncertain Gain, Even	Uncertain Loss, Loss	Uncertain Loss, Even
		n	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
fRewP	Controls	73	2.9 (3.1)	2.6 (3.0)	1.9 (2.3)	6.4 (4.1)	4.1 (3.8)	5.5 (4.0)	4.7 (3.9)
	Patients	88	4.3 (3.2)	4.0 (3.3)	3.2 (3.1)	5.7 (4.1)	4.4 (3.4)	4.9 (3.6)	4.4 (3.6)

Table S8

Analyses of Variance (ANOVAs) for feedback reward positivity (fRewP) Amplitudes

ERP	ANOVA	Effect	
fRewP	Group x Certainty Effect	Group	$F(1, 160) = 1.09$, $p = .30$, $\eta_p^2 = .01$ CI[.00, .05]
		Certainty	$F(1, 160) = 77.91$, $p < .001$, $\eta_p^2 = .33$ CI[.21, .43]
		Interaction	$F(1, 160) = 12.65$, $p < .001$, $\eta_p^2 = .07$ CI[.01, .16]
	Group x Valence Effect with Certain Condition	**Group**	$F(1, 159) = 10.23$, $p = .002$, $\eta_p^2 = .06$ CI[.01, .14]
		Certain Outcome	$F(2, 318) = 13.85$, $p < .001$, $\eta_p^2 = .08$ CI[.03, .14]
		Interaction	$F(2, 318) = 0.04$, $p = .96$, $\eta_p^2 < .001$ CI[.00, .002]
	Group x Valence Effect within Uncertain Condition	Group	$F(1, 159) = 0.42$, $p = .52$, $\eta_p^2 = .003$ CI[.00, .04]
		Uncertain Outcome	$F(3, 477) = 26.49$, $p < .001$, $\eta_p^2 = .14$ CI[.09, .20]
		Interaction	$F(3, 477) = 2.31$, $p = .08$, $\eta_p^2 = .01$ CI[.00, .03]

Note. Significant main effects and interactions (*ps* < .05) are bolded for ease of identification. Significant analyses are interpreted in the fRewP sections of the supplementary Results. CI = 95% confidence interval for η_p^2.

Table S9

Summary of feedback reward positivity (fRewP) and feedback P300 (fP300) Amplitudes (μV) Derived Using Temporospatial Principal Components Analysis

Component	Group	Uncertain Gain, Gain	Uncertain Gain, Even	Uncertain Loss, Loss	Uncertain Loss, Even
		M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
fRewP TFSF	Controls	3.4 (3.6)	2.1 (3.7)	3.0 (3.9)	2.1 (3.1)
	Patients	2.0 (3.1)	1.5 (3.3)	1.6 (3.2)	1.1 (2.8)
fP300 TFSF	Controls	9.9 (6.8)	6.3 (5.5)	7.8 (5.6)	7.5 (5.4)
	Patients	8.1 (6.7)	6.1 (4.7)	7.1 (5.8)	7.9 (6.4)

Note. TFSF = temporospatial factor

Table S10

Summary of cP300 and SPN Amplitudes (μV) for Session 2 as a Function of Event

Component	Certain Trial	Uncertain Trial	Certain Gain	Certain Loss	Certain Even	Uncertain Gain	Uncertain Loss
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
cP300	4.3 (3.8)	4.1 (3.7)	5.1 (4.4)	4.6 (4.0)	3.6 (4.2)	4.6 (4.0)	4.0 (3.9)
SPN	-.4 (1.0)	-.4 (1.0)	-.3 (1.2)	-.3 (1.1)	-.4 (1.0)	-.4 (1.0)	-.4 (0.9)

Note. Session 2 data was collected from 82 patients. cP300 = cued P300; SPN = stimulus-preceding negativity

Table S11

Summary of fRewP and fP300 Amplitudes (μV) for Session 2 as a Function of Event

Component	Certain Trial	Uncertain Trial	Certain Gain	Certain Loss	Certain Even	Uncertain Gain, Gain	Uncertain Gain, Even	Uncertain Loss, Loss	Uncertain Loss, Even
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)
fRewP	2.9 (2.5)	4.1 (3.2)	2.9 (3.1)	3.0 (3.1)	2.6 (2.8)	4.7 (3.7)	3.7 (3.4)	4.5 (3.5)	3.7 (3.4)
fP300	5.0 (3.8)	9.3 (7.0)	5.8 (4.8)	5.4 (4.0)	3.8 (3.9)	11.0 (8.5)	8.5 (6.6)	9.7 (7.8)	8.0 (6.7)

Note. fRewP = feedback reward positivity; fP300 = feedback P300

Table S12

Retest Reliability of ERP Amplitudes for Certain and Uncertain Trials for Patients

Component	Group	*r* (95% CI)	ICC (95% CI)
cP300	Certain	.61 (.44, .73)	.60 (.44, .73)
	Uncertain	.57 (.40, .71)	.58 (.41, .73)
	Difference Score	.21 (-.02, .41)	.20 (-.02, .41)
SPN	Certain	.07 (-.17, .31)	.07 (-.16, .30)
	Uncertain	.18 (-.05, .38)	.18 (-.05, .38)
	Difference Score	.18 (-.05, .39)	.18 (-.05, .38)
fRewP	Certain	.54 (.36, .68)	.52 (.33, .67)
	Uncertain	.73 (.61, .82)	.72 (.60, .81)
	Difference Score	.52 (.34, .67)	.52 (.34, .66)
fP300	Certain	.54 (.36, .68)	.50 (.29, .66)
	Uncertain	.87 (.81, .92)	.86 (.78, .91)
	Difference Score	.82 (.73, .88)	.81 (.72, .88)

Note. Difference scores were calculated by subtracting certain trials from uncertain trials. SPN scores are for right-hemisphere activity. ICC = intraclass correlation coefficient; CI = confidence interval; cP300 = cued P300; SPN = stimulus-preceding negativity; fRewP = feedback reward positivity; fP300 = feedback P300

Table S13

Retest Reliability of cP300 and SPN Amplitudes for Patients as a function of Event

Event	Group	*r* (95% CI)	ICC (95% CI)
Certain Gain	cP300	.52 (.32, .67)	.59 (.42, .73)
	SPN	.05 (-.19, .29)	.05 (-.19, .29)
Certain Loss	cP300	.45 (.24, .62)	.45 (.24, .62)
	SPN	.09 (-.16, .32)	.09 (-.16, .33)
Certain Even	cP300	.58 (.39, .71)	.57 (.39, .71)
	SPN	.09 (-.15, .33)	.09 (-.15, .32)
Uncertain Gain	cP300	.59 (.41, .73)	.59 (.42, .73)
	SPN	.12 (-.13, .35)	.12 (-.13, .35)
Uncertain Loss	cP300	.51 (.32, .67)	.51 (.32, .67)
	SPN	.17 (-.08, .39)	.16 (-.08, .39)

Note. SPN scores are for right-hemisphere activity. ICC = intraclass correlation coefficient; CI = confidence interval; cP300 = cued P300; SPN = stimulus-preceding negativity

Table S14

Retest Reliability of fRewP and fP300 Amplitudes for Patients as a function of Event

Event	Group	*r* (95% CI)	ICC (95% CI)
Certain Gain	fRewP	.51 (.32, .66)	.48 (.28, .64)
	fP300	.55 (.38, .69)	.50 (.28, .67)
Certain Loss	fRewP	.37 (.16, .55)	.36 (.16, .54)
	fP300	.48 (.29, .64)	.33 (.23, .60)
Certain Even	fRewP	.36 (.15, .55)	.36 (.15, .54)
	fP300	.37 (.17, .55)	.36 (.16, .54)
Uncertain Gain, Gain	fRewP	.61 (.45, .74)	.61 (.44, .73)
	fP300	.81 (.71, .87)	.79 (.69, .86)
Uncertain Gain, Even	fRewP	.57 (.39, .70)	.56 (.39, .70)
	fP300	.77 (.66, .85)	.77 (.66, .85)
Uncertain Loss, Loss	fRewP	.58 (.42, .72)	.58 (.41, .72)
	fP300	.81 (.72, .88)	.80 (.71, .87)
Uncertain Loss, Even	fRewP	.59 (.42, .72)	.59 (.42, .72)
	fP300	.75 (.64, .83)	.74 (.61, .83)

Note. ICC = intraclass correlation coefficient; CI = confidence interval; fRewP = feedback reward positivity; fP300 = feedback P300

Table S15

Lifetime Prevalence of Substance Use Disorders and Past Major Depressive Episodes in Healthy Participants and People with Schizophrenia

Group	Controls (*n*)	Patients (*n*)
Alcohol Abuse	5	10
Alcohol Dependence	0	21
Cannabis Abuse	1	15
Cannabis Dependence	0	15
Other Substance Abuse	0	13
Other Substance Dependence	0	30
Major Depressive Episodes	1	53

Note: Only two patients were in mood episodes long enough to qualify for a diagnosis of schizoaffective disorder.

Supplementary Figure Captions

Supplementary Figure 1. Voltage maps show average activity from 400 to 650 ms for cP300 and average activity from 1,000 to 1,500 ms for the stimulus-preceding negativity (SPN). The voltage maps show the difference activity for uncertain trials minus certain trials.

Supplementary Figure 2. Voltage maps show average activity from 225 to 300 ms for the cued reward positivity (cRewP) and average activity from 325 to 500 ms for the cP300. The voltage maps show the difference activity for uncertain trials minus certain trials.

Supplementary Figure 3. Grand average waveforms for feedback receipt (i.e., feedback reward positivity [fRewP]) for certain and uncertain trials as a function of group.

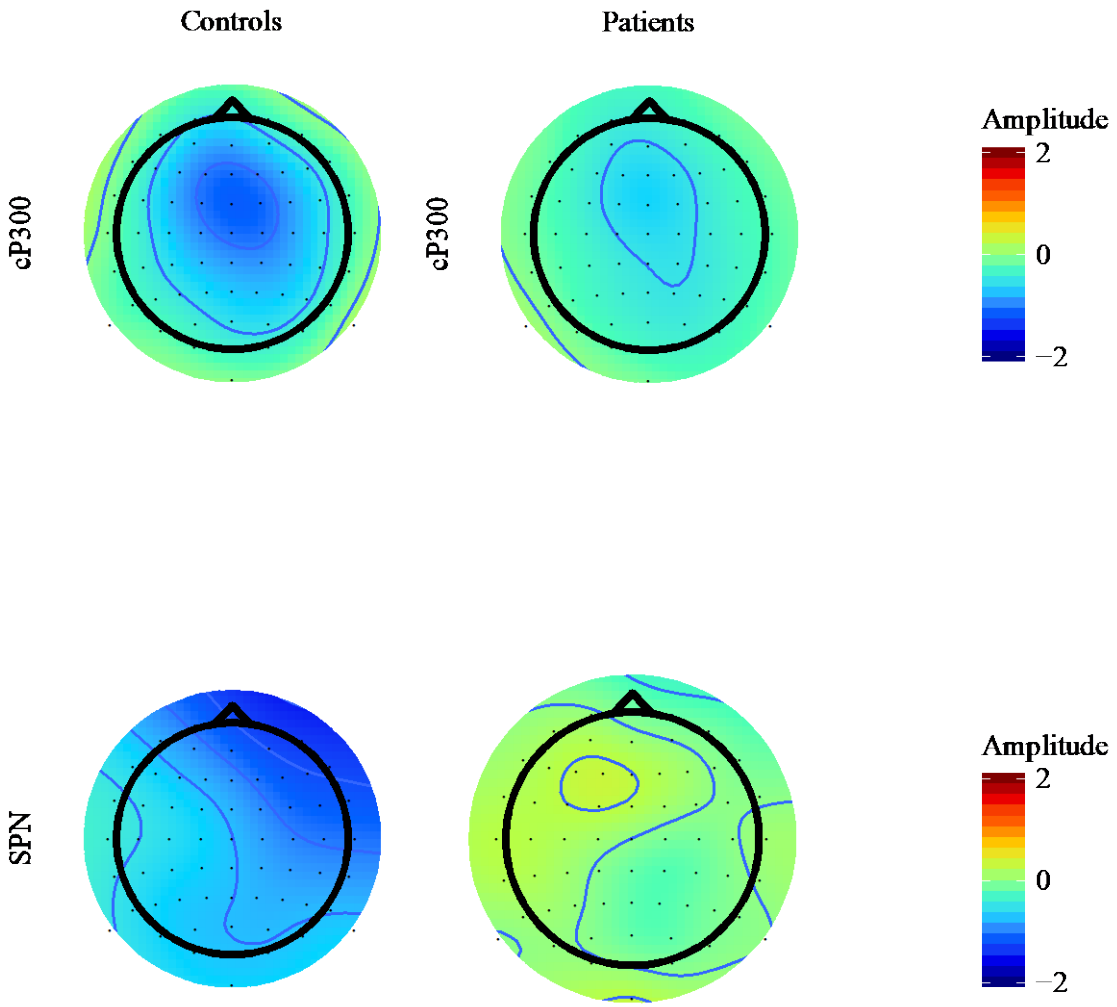
Supplementary Figure 4. Grand average waveforms for feedback receipt (i.e., feedback reward positivity [fRewP]) for certain and uncertain trials as a function of valence effect and group.

Supplementary Figure 5. Grand average waveforms for feedback reward positivity (fRewP) and feedback P300 (fP300) at FCz derived using temporospatial principal components analysis. Note different amplitude scales.

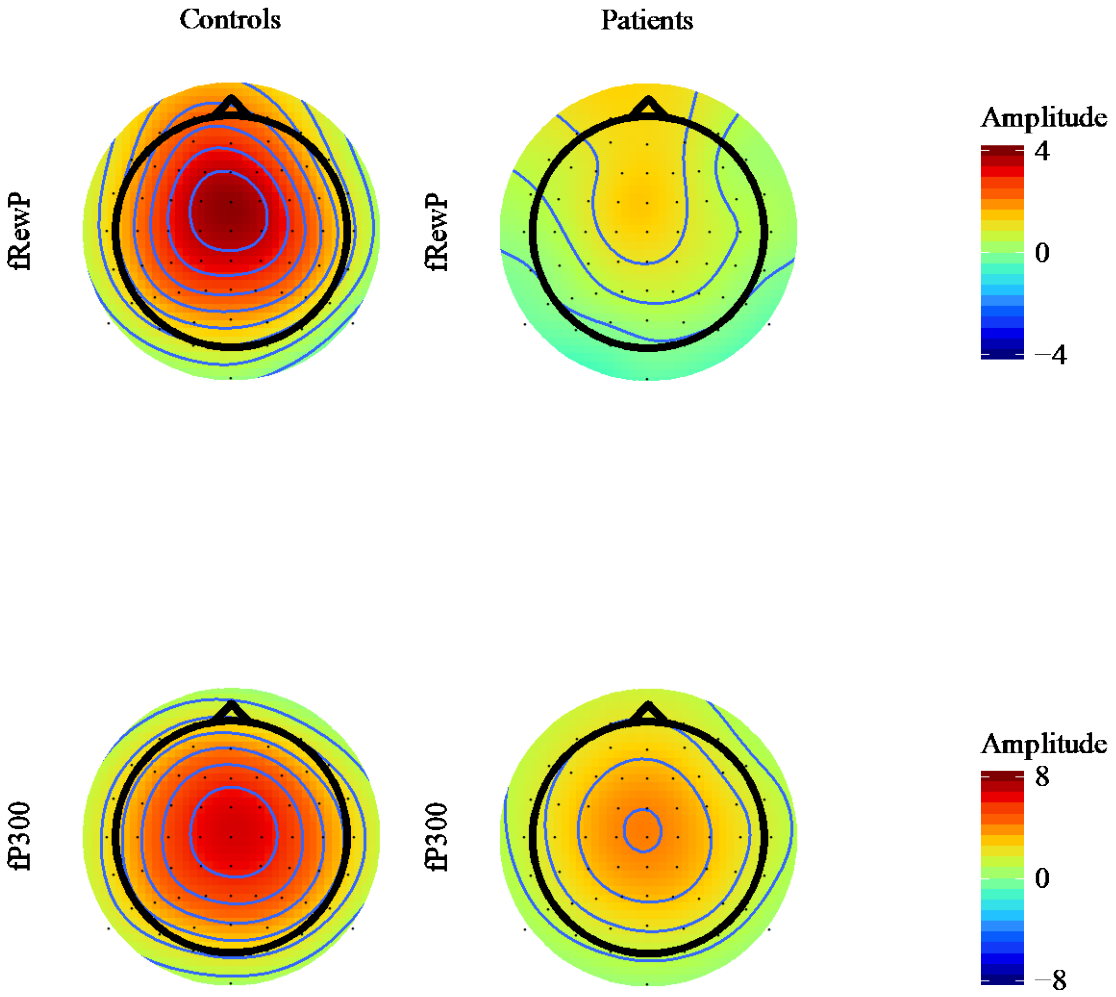
Supplementary Figure 6. Grand average waveforms from session 2 for cue-related activity (i.e., cued P300 [cP300]), feedback-preceding activity (i.e., stimulus-preceding negativity [SPN]) and feedback receipt (i.e., feedback reward positivity [fRewP] and feedback P300 [fP300]) for certain and uncertain trials for patients. Note different amplitude scales.

Supplementary Figure 7. Grand average waveforms from session 2 for cue-related activity (i.e., cued P300 [cP300]), feedback-preceding activity (i.e., stimulus-preceding negativity [SPN]) and feedback receipt (i.e., feedback reward positivity [fRewP] and feedback P300 [fP300]) for certain and uncertain trials as a function of valence. Note different amplitude scales.

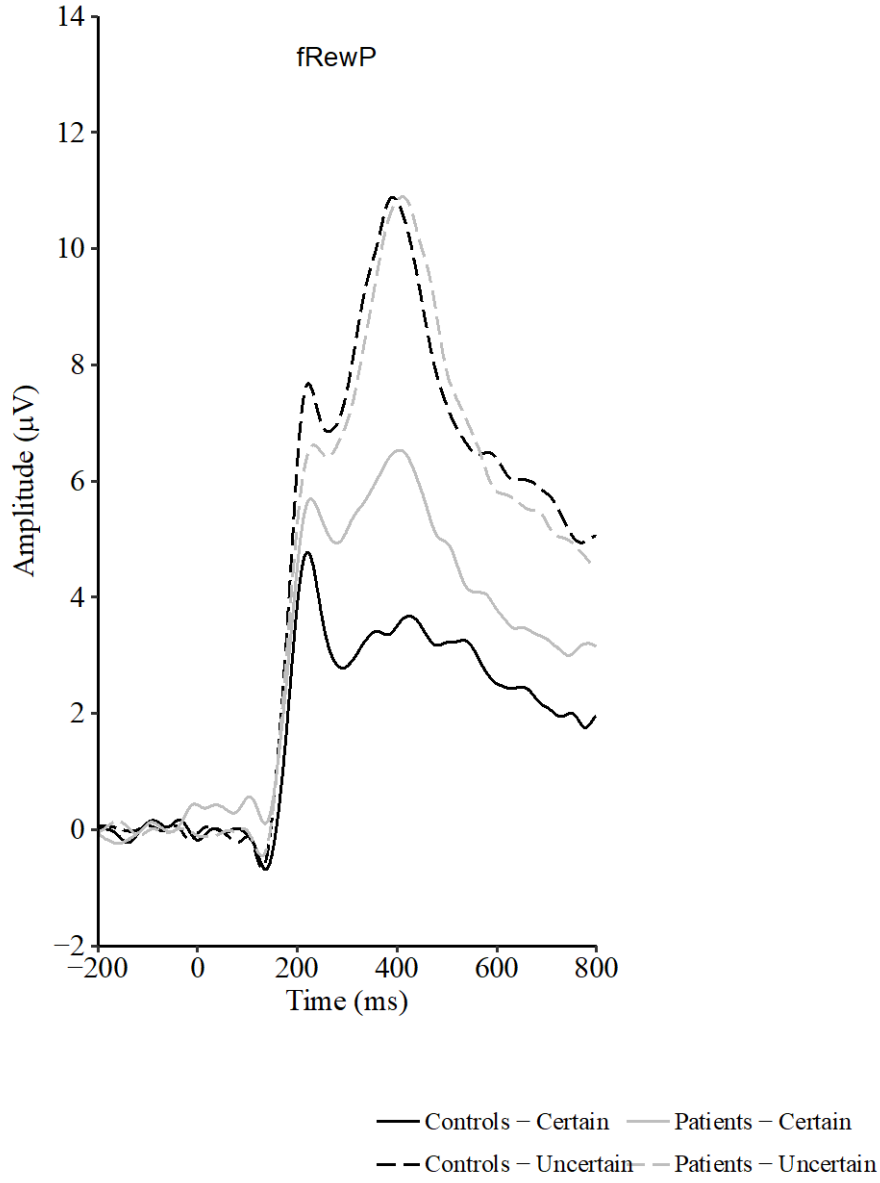
Supplementary Figure 1



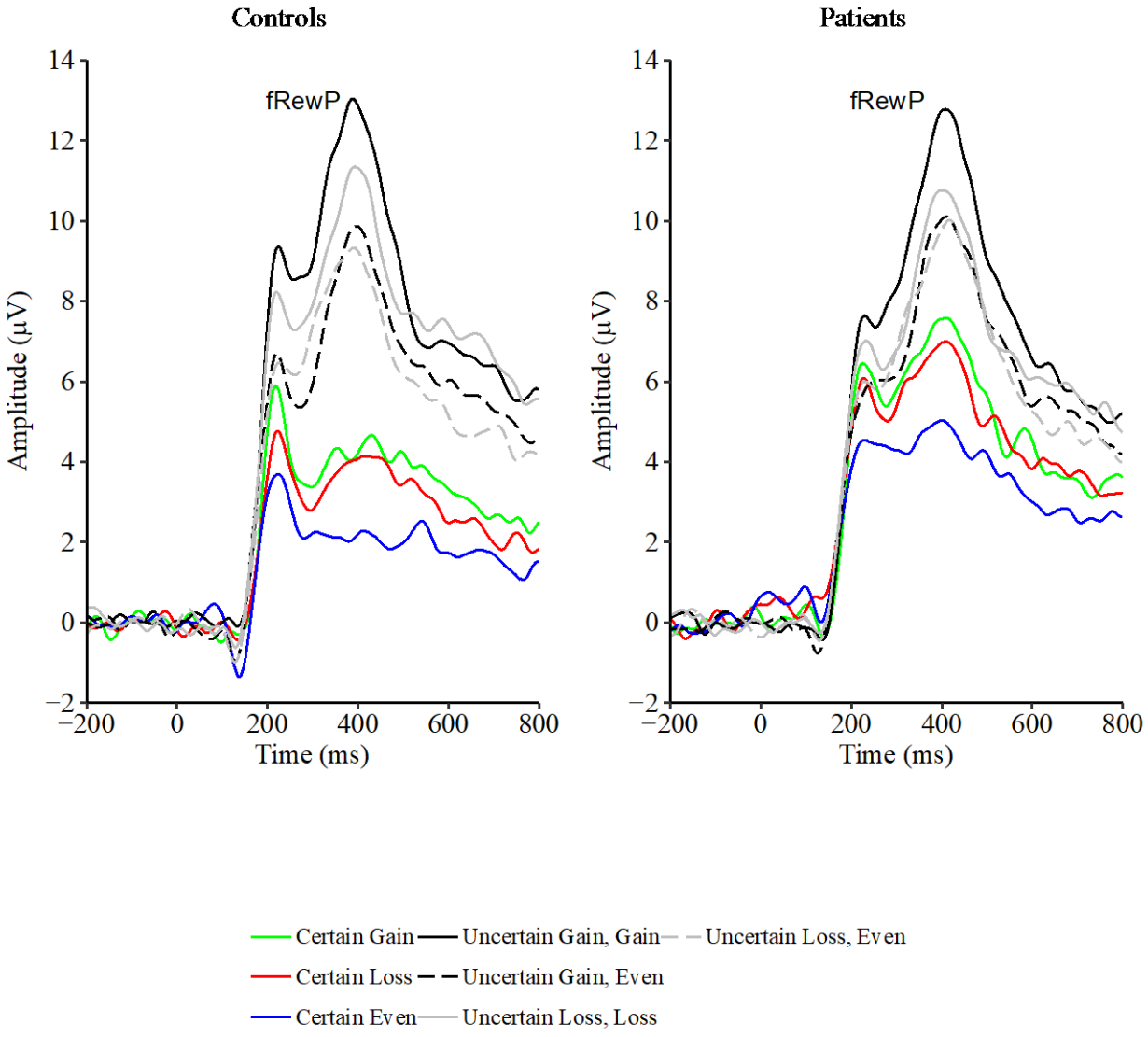
Supplementary Figure 2



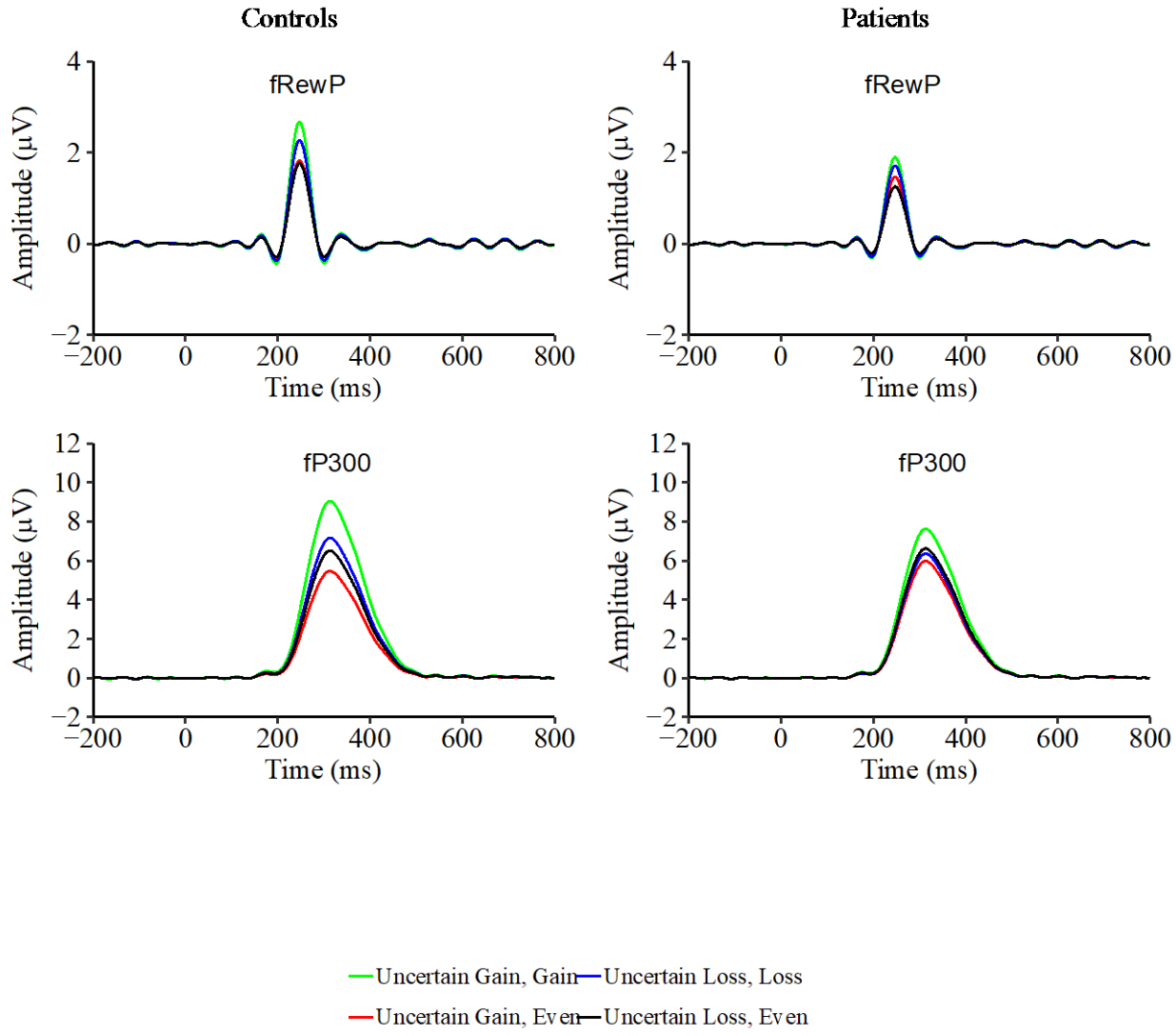
Supplementary Figure 3



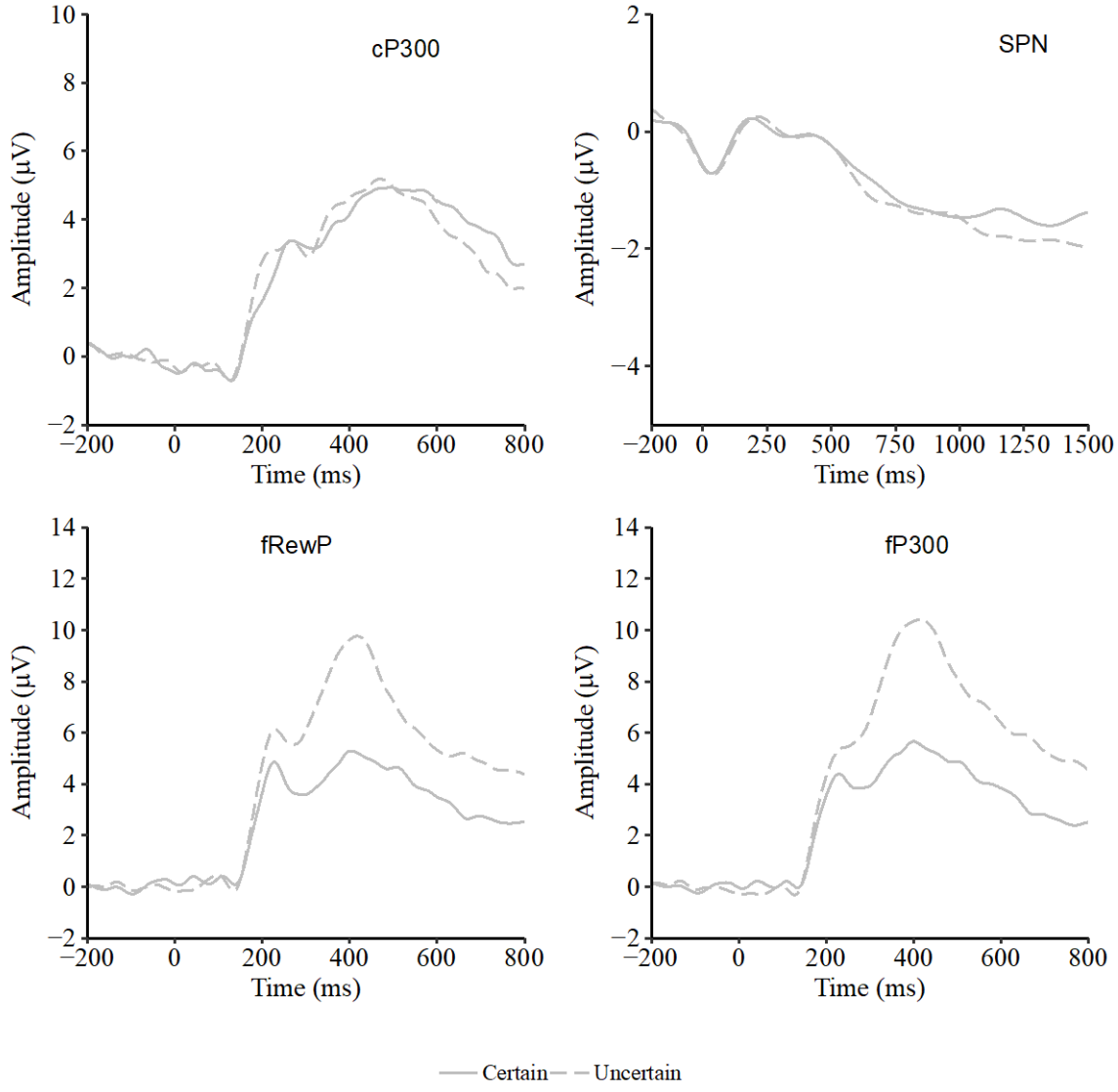
Supplementary Figure 4



Supplementary Figure 5



Supplementary Figure 6



Supplementary Figure 7