

Introduction

- Patients with mood disorders have deficits in affective processing and impaired psychosocial functioning^{1,2}
- Altered **electrophysiological responses (ERPs)** to emotional arousing or negative visual stimuli are seen in patients with depression³ and anxiety⁴, who also have abnormal auditory **perceptual asymmetry (PA)** for dichotic presentations of emotional words⁵
- Both ERP and PA abnormalities are linked to **hypoactivation of right temporoparietal cortex**^{3,6}
- Emotional processing in one sensory modality can affect processing of another modality⁷

Current Study Objective: Explore how visual ERP and auditory behavioral indices of emotion processing *jointly* predict clinical diagnosis of mood disorders

Measures of Emotion Processing

VISUAL: Right Hemisphere (RH) P3 Amplitude

- **Emotional Hemifield Task**³: passive viewing task with lateralized presentations of pictures showing facial areas with dermatological disease (**Negative**) and after surgical treatment (**Neutral**)
- 72-channel ERPs for each condition transformed to reference-free scalp current source density (CSD)^{8,9}
- A temporal PCA of CSD waveforms¹⁰ extracted a prominent **right-lateralized P3 component** (385 ms peak latency) showing robust emotional effects (greater positivity to negative than neutral stimuli)
- A single **Right Hemisphere P3 (RH P3) Negative-Minus-Neutral** metric was derived by pooling across right parietooccipital sites (PO4,P6,P8,PO8,PO10,O2)

AUDITORY: Dichotic Perceptual Asymmetry (PA)

- **Emotion Recognition Task**⁵: 4 words (power, bower, dower, tower) with 4 different intonations (happy, angry, sad, neutral) simultaneously presented to each ear; subjects indicated the 2 emotions perceived
- Present analysis focused on **Sad** and **Neutral**
- Accuracy scores were obtained for each ear and each emotional intonation
- A single **Perceptual Asymmetry (PA)** metric derived from the **Left-Minus-Right ear difference of Sad-Minus-Neutral** accuracy performance to obtain a left-ear/RH advantage for emotion discrimination

➤ **RH P3** and **PA** both transformed into Z-scores to normalize metrics

Logistic Regression: Predicted Lifetime Diagnoses

Individuals participating in a longitudinal study of families at risk for depression^{11,12} were interviewed by mental health professionals to make lifetime diagnoses of **DEPRESSION**, **ANXIETY**, **COMORBID DEPRESSION AND ANXIETY** or **NO DIAGNOSIS**. From this pool, 112 individuals (52 male, age range = 13 – 59 yrs) completed both visual and auditory emotion processing tasks. **RH P3** and **PA** were entered as predictors in a multinomial logistic regression using **Lifetime History** of internalizing disorders as the outcome.

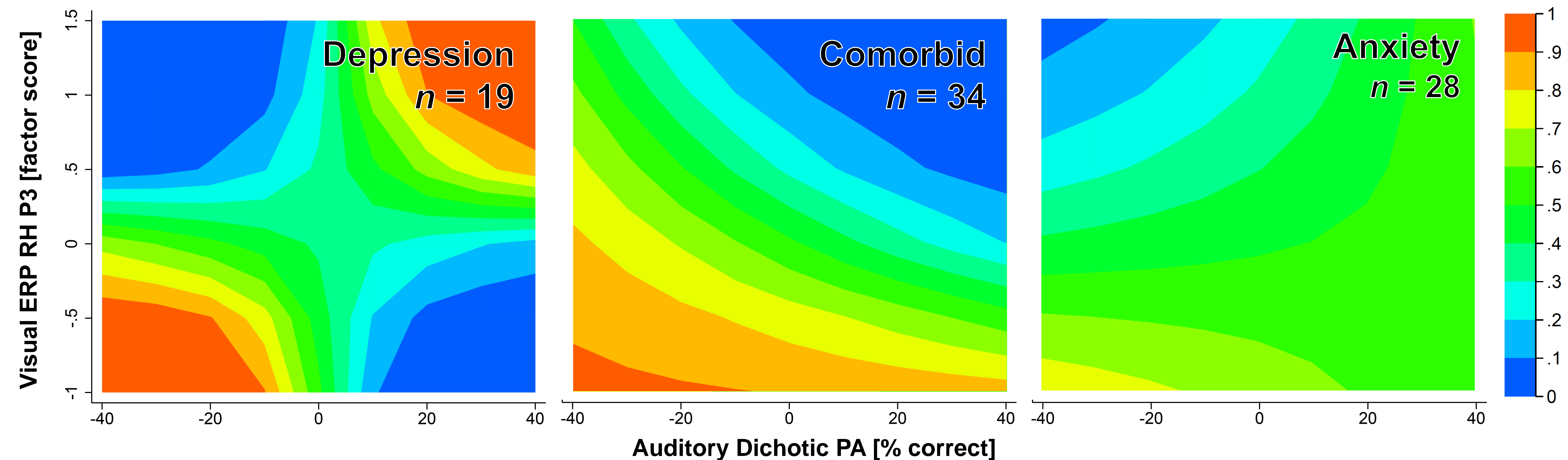


Fig 1. Heatmap representation of probability for each diagnosis at a function of both predictors compared to the baseline, **NO DIAGNOSIS** ($n = 32$). The red and blue areas respectively reflect high and low probabilities of having a particular diagnosis (color scale to the right). Heatmaps were plotted in the original units of each variable for improved interpretability. The x-axis, **Auditory Dichotic PA**, depicts the **left ear/RH advantage of discriminating between sad and neutral conditions**; the higher the % correct, the better the behavioral discrimination between emotional conditions. The y-axis, **Visual ERP RH P3**, depicts the **RH difference in P3 factor scores between negative and neutral conditions**; the greater the factor score, the stronger the electrophysiological discrimination between emotional conditions.

Logistic Regression: Odds Ratios

Omnibus model was statistically significant, $\chi^2(9) = 21.84$, Nagelkerke $R^2 = .19$, $p = .009$. In predicting:

DEPRESSION

- Interaction **RH P3** × **PA**, $p = .011$, Odds Ratio (OR) = 2.50
- High and low emotional discrimination in both metrics predicted increased probability of a depression diagnosis

COMORBIDITY

- Main effect of **RH P3**, $p = .013$, OR = 0.46
- Main effect of **PA**, $p = .042$, OR = 0.53
- Low emotional discrimination in either metric separately predicted increased probability for a comorbid diagnosis

ANXIETY

- No main or interaction effects
- Emotion processing similar to subjects with no history of diagnosis

CONCLUSIONS

- ❖ Association between visual ERP and auditory behavioral measures of emotion processing in predicting lifetime history of internalizing disorders
- ❖ Relationship is different for depression, anxiety, and comorbidity
- ❖ A lifetime history of depression or comorbidity was associated with reduced discrimination of negative vs neutral emotions
- ❖ A lifetime history of depression only was also associated with heightened reactivity to negative emotions
- ❖ A lifetime history of anxiety only did not reveal differences in emotion processing compared to healthy individuals

References

- This work was supported by a grant from the **National Institute of Mental Health** (MH36197)
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