The Oft-Neglected Role of Parietal EEG Asymmetry and Risk for Major Depressive Disorder
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Abstract
Relatively less right parietal activity may reflect reduced arousal and signify risk for major depressive disorder (MDD). Inconsistent findings with parietal electroencephalographic (EEG) asymmetry, however, suggest issues such as anxiety comorbidity and sex differences have yet to be resolved.

Resting parietal EEG asymmetry was assessed in 306 individuals (31% male) with (n = 143) and without (n = 163) a DSM-IV diagnosis of lifetime MDD and no comorbid anxiety disorders.

Contrary to prediction, lifetime MDD+ men displayed relatively greater right parietal activity than lifetime MDD- men, whereas lifetime MDD+ and MDD- women did not differ.

To examine parietal asymmetry as a function of current depression status, the lifetime MDD+ group was then divided into current MDD+ versus past MDD+ groups. Past MDD+ women displayed relatively less right parietal activity than current MDD+ and MDD- women, replicating prior work and providing an explanation for the null lifetime MDD findings.

In addition, recent caffeine intake, an index of arousal, moderated the relationship between depression and EEG asymmetry in men and women. Current MDD+ and past MDD+ men exhibited relatively greater right parietal activity than MDD- men at high but not low levels of caffeine intake. Moreover, caffeine intake moderated asymmetry for current MDD+ men such that higher caffeine intake was linked to higher relative right parietal activity.

Findings suggest that sex differences and arousal should be examined in studies of depression and regional brain activity.

Introduction

- Lower right relative than left resting parietal electroencephalographic (EEG) activity may be a psychophysiological indicator for depression risk because it
  1. Distinguishes symptomatic and remitted depressed individuals from non-depressed individuals (e.g., Bruder et al., 1997; Kentgen et al., 2000)
  2. Is prominent in family members of depressed patients (Bruder et al., 2005; Bruder et al., 2007)
  3. Is linked with other indices of depression risk such as low positive emotionality (Shankman et al., 2005)

- Several resting EEG studies, however, have failed to confirm this association (e.g., Debener et al., 2000; Nitschke et al., 1999).

- Inconsistent results may be due to:
  1. Small patient samples
  2. Diagnostic heterogeneity (anxiety comorbidity)
  3. Depression recruitment strategies (i.e., on the basis of a DSM-IV diagnoses versus questionnaires)
  4. Sex differences in depression and/or EEG asymmetry (e.g., Miller et al., 2002; Stewart et al., 2010).

- Questions
  - Does relatively lower right parietal activity at rest characterize both women and men with depression (MDD) who are free of comorbid anxiety disorders?
  - Are lifetime MDD results due to a diagnosis of current MDD versus past MDD?
  - Since parietal EEG asymmetry is thought to reflect arousal-related processes, does an index of arousal (recent caffeine intake) moderate the relationship between parietal EEG asymmetry and depression in men and women?

- Methods
  - N = 306 strongly right-handed participants (73% Caucasian), age range 17 to 34 years (M = 19.1, SE = 0.1).
  - Lifetime MDD+ group did not meet criteria for any DSM-IV Axis I disorder other than lifetime MDD and comorbid current dystymia.
  - Lifetime MDD- group did not meet criteria for any DSM-IV Axis I disorder.
  - Recency of caffeine intake measured by question: “When was the last time you consumed caffeine? 0 = I have not used any since my last visit, 1 = earlier this week, but not yesterday, 2 = yesterday before 5pm, 3 = yesterday evening after 5pm, 4 = today.”

- Results
  - Parietal alpha asymmetry scores (with SE bars) as a function of lifetime MDD status and sex collapsed across channel and reference. Although women do not differ by MDD status, lifetime MDD+ men exhibit relatively greater right parietal activity than MDD- men.

- Discussion
  - Past MDD+ women displayed relatively less right parietal activity than MDD- women consistent with other parietal EEG studies of depression (e.g., Bruder et al., 1997; Kentgen et al., 2000).
  - Although current MDD+ women exhibited higher relative right parietal activity than past MDD+ women, this effect was partially moderated by arousal (caffeine intake), such that this effect was larger at high than low levels of recent caffeine intake.
  - Caffeine may affect arousal processes differently as a function of current MDD status to obfuscate the underlying risk pattern for MDD. Future work might utilize multiple measures of arousal sensitivity (such as anxiety arousal) to explore this possibility.

- References

- Mixed Model Analysis (SAS) Dependent Variable = Parietal Asymmetry score

- Between-Subjects: Group, Sex
- Within-Subjects: Channel (P2-P1, P4-P3, P6-P5, P8-P7), Reference (AVG, CSD, Cz, LM)


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