Disturbances of Visual Motion Perception in Bipolar Disorder

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INTRODUCTION
Bipolar disorder (BPD) is a psychiatric diagnosis characterized by periods of mania or hypomania and depression. Although marked alterations in mood are central to the diagnosis of BPD, many cognitive functions are also affected by the illness. In contrast, sensory and perceptual processes have been less well characterized in BPD. Such deficits would indicate that the pathophysiology of BPD may affect sensory pathways and contribute to deficits in visual cognition.

Several lines of evidence indicate that visual perception may be perturbed in BPD. Velocity discrimination, backward masking and flicker fusion studies all indicate abnormalities in temporal processing consistent with transient channel deficits (Chen et al. 2006; Green et al. 1994, McClure 1999; Peri 1966). Together, the data suggest that functions subserved by the magnocellular/dorsal visual pathways (i.e. high contrast sensitivity, high temporal resolution, low spatial resolution, motion perception and motor planning) may be affected in BPD.

The current study evaluates visual processing in BPD and investigates the relationship between visual processing, neuropsychological performance, and mood state.

METHODS
Subjects: 61 Bipolar Disorder (BPD; 40 women, mean age 40)
67 Healthy Controls (HC; 35 women, mean age 39)

Form Discrimination Task: Distinguish between shapes at different levels of noise.
Motion Discrimination Task: Determine whether the field of dots was moving to the left or right. % of dots moving at random trajectories varied.
Threshold values obtained ↑ = better performance

Static Contrast Sensitivity: determine whether low & high frequency gratings are present.
Moving Contrast Sensitivity: determine the direction of moving gratings at 2.1, 9.3, & 18.7 cycles/second.

Neuropsychological Tests
- Similarities
- Picture Completion
- Digit Span
- Digit Symbol

Symptom Characterization
YMARS > 19
MADRS > 19

RESULTS

Visual Task Performance (Figures 1-2)

Figure 1
One-way ANOVA for Form Discrimination showed no group differences (F(1,122)=0.112, p=0.739). One-way ANOVA for Motion Discrimination revealed a main effect of Group (F(1,114)=3.80, p=.054). Distinguish between shapes at different levels of noise.

Figure 2
One-way ANOVA for the Static task showed no group differences (F(1,118)=0.231, p=0.632). One-way ANOVA for the Moving tasks revealed a trend for a main effect of Group (F(1,99)=3.80, p=.054) (HC > BP, p=.04) and a main effect of Task (F(2, 190)=43.4, p<.001).

Neuropsychological & Visual Performance Correlations (Figures 4-13)

Healthy Controls
Neuropsychological Predictors of Visual Performance

Bipolar Disorder
Neuropsychological Predictors of Visual Performance

CONCLUSIONS
- BPD (across mood state) exhibited motion discrimination and moving contrast sensitivity deficits consistent with magnocellular-mediated pathway dysfunction. These deficits are similar to those found in schizophrenia.
- Neuropsychological performance on Digit Span and Digit Symbol was poorer in BPD experiencing mood symptoms.
- Correlation & regression analyses (not presented) reveal a different pattern of visual – neuropsychological relationships between HC and BPD.
  Digit Symbol predicted M-mediated tasks in HC
  Less consistent patterns in BPD

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