**Background**

Binocular rivalry is a visual phenomenon in which conflicting images are presented to corresponding locations of the two eyes, resulting in perceptual alternation or rivalry between the two images (see Figure 1). The rate of switching between the images, or binocular rivalry rate (BRR), has been found to be slow in bipolar disorder (BD) but not in other psychiatric disorders such as schizophrenia (SZ) and major depressive disorder (MDD) (Miller et al., 2003; Nagamori et al., 2009; Pettigrew & Miller, 1998). Most recently, slow BRR was demonstrated in a sample of nearly 100 BD subjects, in which the trait was found to be unaffected by medication, depressive state at level of cognitive functioning (Vierck et al., 2013). Furthermore, a recent twin study showed that additive genetic factors account for around 50% of individual variation in BRR (Miller et al., 2010, see Figure 2). Together these findings suggest slow BRR may have clinical diagnostic and endophenotype utility in BD (Ngo et al., 2011). However, there remains insufficient data on the extent to which BRR remains stable over time in clinical subjects, or is influenced by current clinical state, specific symptomatology and medication (though a slowing effect of benzodiazepines on BRR was recently reported: van Loon et al., 2013). The aim of this study was to therefore examine the specificity of slow BRR to BD and to investigate BRR longitudinally in BD, SZ and healthy controls. Preliminary data on BD and SZ subjects are presented.

**Methods**

**Participants:** Thirty-eight patients from mental health services at the University Medical Centre of Goettingen participated in this study. Twenty-one of these individuals were diagnosed according to DSM-IV criteria with BD I or BD II and seventeen with SZ. Sixteen BD patients were in the active phase of their illness, did not have any comorbidities (i.e., substance abuse, anxiety, ADHD, and SZ), and were not on medications. All SZ patients were diagnosed by means of their first admission to a psychiatric hospital. Seventeen SZ patients were in the active phase of the illness and did not suffer from any comorbidities. The remaining SZ patients were in a stable pretreatment phase. Participants were between the ages of 18 and 60 years, and were right-handed. We did not find a significant difference in BRR between BD and SZ, in contrast to previous findings (Miller et al., 2003). However, the results presented are only preliminary and based on small sample sizes. The current findings need to be replicated with caution.

**Procedure:** Written informed consent was obtained from all subjects according to a protocol approved by the Ethics Committee of the University Medical Centre Goettingen. All procedures were in accordance with the Helsinki Declaration of 1975. Subjects were asked to abstain from ingesting tea, coffee, cocoa and alcohol for 4 hours prior to testing. The binocular rivalry stimuli were presented with a computer monitor (Figure 4A) and viewed with polarized glasses. Subjects were instructed to report their perceptions by pressing designated keys on a keyboard: one for vertical, one for horizontal and the space bar for mixed perceptions or non-responding responses (see Figure 4B for responding protocol).

**Results:** As depicted in Figure 5, preliminary BRR data collected from BD and SZ subjects suggest no significant difference between the two groups (F(1, 38) = 1.61, p = 0.205). For comparison, Figure 6 presents the BRR data in psychiatric disorders from previous studies (Miller et al., 2003). Pettigrew & Miller, 1998), in which BD subjects were found to show significantly slower BRR compared to other subject groups.

**Discussion:** We did not find a significant difference in BRR between BD and SZ, in contrast to previous findings (Miller et al., 2003). However, the results presented are only preliminary and based on small sample sizes. The current findings need to be replicated with caution. The preliminary results of this study suggest slow BRR may not be unique to BD and that the trait may also be apparent in subjects with SZ. If so, the similarity in BRR found between SZ and BD in the current study may be due to the high comorbidity of SZ and BD in general population (van Loon et al., 2013). Toward this end, replication of the current study with larger SZ samples is needed to also be investigated in these psychiatric disorders (Consortium, 2013) (Lichtenstein et al., 2010). Evidence that BRR may be present in other disorders in BD compared to controls continues to emerge (Vierck et al., 2013). However, given the discrepancy between the results of Miller et al. (2013) and those of the present study regarding BRR in BD and SZ, investigation of the slow BRR trait and its specificity to BD will require large-scale clinical and genetic studies (Law et al., in press; Ngo et al., 2011). Toward this end, larger samples of BD and SZ subjects are currently being tested along with healthy controls. In addition, longitudinal data collection involving relapsing subjects on BBR over the course of their illness is also in progress. This work will enable examination of whether BRR is stable over time in clinical subjects, and further assessment of the trait’s clinical diagnostic and endophenotypic utility in BD.

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