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Frequency of Non-right-handedness in Bipolar Disorder and Schizophrenia

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Abstract

Increased non-right-handedness (NRH) probably reflects neurodevelopmental abnormalities in psychiatric disorders. Past studies of NRH have focused more on schizophrenia (SZ) than bipolar disorder (BPD). We report results on NRH in two large studies. In (1), NRH was compared among BPD patients with psychosis, SZ patients, and healthy controls (HC). NRH was elevated in BPD with psychosis and SZ patients relative to HC, but not SZ relative to BPD. In (2), NRH was compared between BPD patients with and without psychosis. NRH was similarly elevated in both. The findings suggest that NRH may reflect shared brain anomalies in SZ and BPD.

Keywords

lateralization; neurodevelopment; psychosis

1. Introduction

Past studies investigated NRH in psychiatric disorders, as evidence of neurodevelopmental abnormalities in lateralization of brain functions. Increased NRH in SZ seems established (Hirnsstein and Hugdahl, 2014), but research on differences between BPD and both SZ and

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Conflict of Interest

Dr. Perlis has served on scientific advisory boards or consulted to Genomind, Perfect Health, Psybrain, and RID Ventures. All other authors report no conflicts of interest.

HC, and the specificity of differences to BPD with psychotic features, is limited. Studies comparing NRH between SZ and affective psychosis often combined patients with BPD and depression, (Fleminger et al., 1977; Malesu et al., 1996), whereas studies comparing NRH between SZ and BPD did not clearly differentiate between BPD with and without psychosis (Clementz et al., 1994; Yan et al., 1985). These studies yielded inconsistent results. Some found no difference between SZ and affective psychosis using writing-focused and multiple-task-based handedness classifications (Fleminger et al., 1977; Malesu et al., 1996), and some found more self-rated left handedness (Clementz et al., 1994) and demonstration-based nondexterity (Yan et al., 1985), in SZ. One study in BPD reported increased self-identified NRH relative to controls (van Dyck et al., 2012). Others reported no significant increases relative to controls based on small samples (Nasrallah and McCalley-Whitters, 1982; Savitz et al., 2007; Yan et al., 1985) or increased NRH in the absence of controls (Fasmer et al., 2008; Nowakowska et al., 2008), using either self-rating or performance-based measures. This paper reports results from two complementary studies. Study 1 compares NRH between BPD with psychosis to both SZ and healthy controls (HC), to investigate whether increased NRH observed for SZ extends to BPD with psychosis. Study 2 compares NRH in BPD with and without psychosis, to investigate whether any NRH difference in BPD is unique to patients with psychotic features. These are the first studies comparing NRH among all these populations.

2. Method

Both studies were secondary analyses of data from clinical studies. Informed consent was obtained for all participants.

2.1 Study 1: BPD with psychosis vs. SZ and HC

The primary goal was to compare NRH between patients with BPD with psychosis, SZ patients, and HC. Odds were compared between SZ patients and HC to replicate established findings and between patients with schizoaffective disorder and other diagnostic groups in exploratory comparisons. Data were collected for investigations of genomics and brain imaging (Ongur et al., 2009). The Structured Clinical Interview for DSM-IV-TR (SCID) (First et al., 1997), administered by trained research assistants or attending psychiatrists to all subjects, was the basis for diagnosis. Data from ten patients and four HC were excluded because of incomplete demographic information, leaving data from 349 BPD with psychosis patients, 253 SZ patients, 224 schizoaffective patients, and 253 HC. Patients were asked the oral question “Do you consider yourself left or right handed?”.

2.2 Study 2: BPD with psychosis vs. BPD without psychosis

Study 2 compared NRH between BPD with and without psychosis. Data were collected during the Systematic Treatment Enhancement Program for Bipolar Disorder Study (Perlis et al., 2009). SCID-based interviews, administered by trained psychiatrists, were the basis for diagnosis. A subset of 3186 patients with BPD, consisting of 2039 Bipolar I (1003 with psychosis), 877 Bipolar II (117 with psychosis), and 270 Bipolar NOS (90 with psychosis), contributed data. Patients answered a written questionnaire item asking whether they were right, left, or mixed handed. Left and mixed handed were classified NRH.

2.3 Statistical Methods

Logistic regression compared odds of NRH among groups. Primary analyses combined males and females, but sex-stratified results are also reported due to sex differences observed in some prior studies of SZ (Hirnshtein and Hugdahl, 2014). All regression analyses controlled for sex, race (white or non-white), and age. Bonferroni multiple testing corrections were applied separately in Study 1 to account for two primary comparisons (BPD with psychosis versus SZ and HC) and three exploratory comparisons (schizoaffective versus BPD with psychosis, SZ, and HC). All tests were two-sided except the one-sided replication test comparing SZ and HC.

3. Results

3.1 Study 1: BPD with psychosis vs. SZ and HC

Patient groups were significantly older, more male, and more non-white than HC. SZ patients were significantly more male and non-white than BPD patients with psychosis and schizoaffective patients (mean ages 36.7 SZ, 35.0 BPD, 37.7 schizoaffective, 30.2 HC; female 32% SZ, 49% BPD, 47% schizoaffective, 57% HC; non-white 29% SZ, 17% BPD, 17% schizoaffective, 12% HC).

Odds of NRH were significantly higher for BPD patients with psychosis than HC; there was no significant difference between SZ and BPD (Table 1). SZ patients had higher NRH odds than HC. Schizoaffective patients had NRH odds similar to the other psychosis groups, and the OR estimate for schizoaffective vs. HC (1.71, corrected 95% CI: 0.83, 3.54) approached that for SZ vs. HC.

3.2 Study 2: BPD with vs. without psychosis

BPD patients with psychosis were significantly younger and more non-white than BPD patients without psychosis; percentage male was similar between groups (mean ages 38.7 BPD with psychosis, 40.3 BPD without psychosis; female 56% BPD with psychosis, 58% BPD without psychosis; non-white 13% BPD with psychosis, 9% BPD without psychosis). There was no significant difference in NRH odds between BPD patients with and without psychosis (Table 1). Adjusted ORs (95% CIs) by BPD diagnosis were 1.03 (0.79, 1.35) for Bipolar I, 0.77 (0.40, 1.49) for Bipolar II, and 1.27 (0.55, 2.92) for Bipolar NOS.

4. Discussion

The studies found similarly increased NRH in BPD with psychosis and SZ, relative to HC (Study 1), and no difference in NRH odds between BPD with and without psychosis (Study 2). Taken together, these findings suggest elevated but similar rates of NRH between SZ and BPD with and without psychosis. Limitations include self-report of NRH, demographic differences between diagnostic groups, and a moderate difference in NRH prevalence estimates for BPD with psychosis between Study 1 (16%) and Study 2 (12%). Despite these limitations, the findings, in substantial samples of patients, strongly suggest association of NRH not just with SZ, but with BPD as well, and are consistent with results of recent

genomic studies suggesting shared mechanisms underlying neurodevelopmental abnormalities in these serious psychiatric disorders.

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Highlights

- Non-right-handedness has not been thoroughly studied among psychiatric disorders.
- Non-right-handedness (NRH) was increased in bipolar disorder (BPD) with psychosis.
- No difference was observed between BPD with psychosis and schizophrenia (SZ).
- No difference was observed between BPD with and without psychosis.
- The findings may reflect shared neurodevelopmental anomalies in SZ and BPD.

Table 1

Unstratified and sex-stratified frequencies of self-reported NRH by diagnostic group with corresponding crude and adjusted ORs

Comparison	Frequency (%) NRH, Comparator	Frequency (%) NRH, Reference	OR _C	OR _A	95% CI	p
Study 1						
<i>BPD with Psychosis vs HC</i>						
Full Sample [†]	56/349 (16%)	22/253 (9%)	2.01	2.09	(1.14, 3.83)	0.01
Males	31/179 (17%)	11/108 (10%)	1.85	1.90	(0.91, 3.97)	
Females	25/170 (15%)	11/145 (8%)	2.10	2.10	(0.97, 4.54)	
<i>SZ vs BPD with Psychosis</i>						
Full Sample [†]	35/253 (14%)	56/349 (16%)	0.84	0.87	(0.51, 1.49)	1.0
Males	23/173 (13%)	31/179 (17%)	0.73	0.76	(0.42, 1.37)	
Females	12/80 (15%)	25/170 (15%)	1.02	1.04	(0.48, 2.25)	
<i>SZ vs HC[‡]</i>						
Full Sample	35/253 (14%)	22/253 (9%)	1.69	1.83	(1.11, ∞)	0.02
Males	23/173 (13%)	11/108 (10%)	1.35	1.44	(0.75, ∞)	
Females	12/80 (15%)	11/145 (8%)	2.15	2.18	(0.98, ∞)	
Study 2						
<i>BPD with vs without Psychosis</i>						
Full Sample	149/1210 (12%)	234/1976 (12%)	1.05	1.04	(0.83, 1.30)	0.73
Males	78/535 (15%)	115/831 (14%)	1.06	1.09	(0.80, 1.49)	
Females	71/675 (11%)	119/1145 (10%)	1.01	1.00	(0.73, 1.36)	

NRH=non-right-handedness; OR=odds ratio; OR_C=crude odds ratio; OR_A=odds ratio adjusted for age, race, and sex; CI=confidence interval; BPD=bipolar disorder; HC=healthy controls; SZ=schizophrenia.

[†] indicates 95% CI and associated p-value reflect Bonferroni adjustment accounting for two primary comparisons.

[‡] indicates replication comparison; one-sided p-value and 95% CIs reflect existing evidence of increased frequency of NRH in SZ.