Cross-cultural comparisons on Wisconsin Card Sorting Test performance in euthymic patients with bipolar disorder

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Abstract

We attempted to compare executive dysfunction with Wisconsin Card Sorting Test (WCST) among distinct national and ethnic patients with bipolar disorder in euthymia. Bipolar patients, aged 16-45 years, from United States (N=25) and Taiwan (N=30) did not differ significantly on any measure. The WCST number Failure to Maintain Set was significantly positively correlated with residual affective symptoms in Taiwanese and US patients. Selective executive dysfunction in euthymia is inherent to bipolar disorder. Euthymic bipolar patients of various ethnic groups may exhibit similar executive dysfunction.

Keywords

Cross-cultural comparison; bipolar disorder; executive dysfunction

1. Introduction

Selective executive dysfunction during the acute affective episode (Yatham et al., 2010) may remain in euthymia among bipolar patients (Fleck et al., 2008; Levy and Weiss, 2010). The deficits in executive control and declarative memory may be useful endophenotypic markers of genetic vulnerability to bipolar disorder (Ferrier et al., 2004). Executive dysfunction contributes as an independent factor to poor occupational role function of bipolar patients (Altshuler et al., 2007). Considerable behavioral evidence suggests that cognitive processes differ between East Asian and Western cultures and that there is cultural invariance in basic cognitive processes including speed, working memory, binding

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operations, and categorical clustering. (Parka and Gutchess, 2002). However, little is known about differences in executive dysfunction across different national and cultural groups. No analysis of ethnicity may limit the generalization of the existing reports about neurocognitive impairment in bipolar disorder (Levy and Weiss, 2010).

The Wisconsin Card Sorting Test (WCST) is a widely used clinical test of executive functioning (Heaton et al., 1993). The aim of this study is to compare WCST performance among distinct national and ethnic groups and to clarify whether or not executive dysfunction is inherent to bipolar disorder versus occurring only in the context of certain cultural variables.

2. Methods

2.1 Subjects

Patients 16 to 45 years of age and meeting DSM-IV diagnostic criteria for bipolar I disorder were invited to participate in the study. The diagnosis was made with the Structured Clinical Interview for DSM–IV-Patient Edition (First et al., 1995). Exclusion criteria were psychiatric symptoms secondary to medical illness, comorbid any Axis I of II disorder, and history of head trauma resulting in a loss of consciousness.

2.2. Procedures

The general design is based on previously published studies (Strakowski et al., 2000; 2005). Symptom rating were then obtained with the Young Mania Rating Scale (YMRS) (Young et al., 1978), Hamilton Depression Rating Scale (HDRS) (Hamilton, 1960), and the Scale for the Assessment of Positive Symptoms (SAPS) (Andresen, 1984). After entry into the study, patients were re-evaluated at 1 month, at 4 months, and then every 4 months. The trained investigators reviewed the prior interval, week-by-week, for affective symptoms using the YMRS, HDRS, and SCID-IP to make these determinations. Both sites used identical methodology with the exception of the WCST version employed as described below. We established good inter-rater reliability for all of these measures between the two sites before the study (Strakowski et al., 2007). The study was approved by the Institutional Review Board of University of Cincinnati, USA and Taipei Medical University Hospital, Taiwan. Written informed consent was required from all subjects agreeing to participate in the study

The WCST tests were only administered on the bipolar patients who had achieved DSM-IV defined full remission, that is, those who had YMRS total scores < 5 and HDRS total scores < 7 continuously for 2 months. Upon completing the clinical assessment, the WCST manual card version was administered to the US patients and the computer-based one was administered to Taiwanese patients, both utilizing the USA norms for the manual-version (Heaton et al., 1993). We limited the analysis to variables shown in the literature to load most highly on a three-factor model of the WCST (Greve et al., 2005). These included percent perseverative errors and perseverative response (cognitive flexibility), non-perseverative errors (problem solving), and the failure to maintain set (response maintenance).

2.3. Statistical analysis

Two-group comparisons were made by using the Chi-squared test along with Yates' correction or Fisher's exact test when explanatory variables were categorical, and t test was used for continuous variables. Spearman correlations were calculated between WCST indices and demographics along with symptom measures. SPSS Version 12.0 was used for all analyses.

3. Results

There were a total of 25 US patients (14 female and 11 male) and 30 (15 female and 15 male) Taiwanese in this study. These US patients were part of a group with a mean age of 24 years at illness onset being initially recruited for the University of Cincinnati First-Episode Mania Study or the Stanley Foundation Bipolar Network (Strakowski et al., 2000; 2005). The mean age at onset of bipolar disorder in Taiwanese group was 23.2 years and comparable to that of US ones. Parts of the results emerged from the euthymic patients in Cincinnati, US have been reported in a previous article (Fleck et al., 2008).

The Table 1 shows that the two groups demonstrated similar ages, years of education, symptom-rating scale scores, and WCST performance. The US sample had significantly more children and more months since last holding a job. After transferring the WCST performance from raw scores to corresponding age- and education-corrected standard scores, the percentages of patients achieving a score indicating cognitive impairment (standard score ≤ 84) of US sample (N=7, 28%) and Taiwanese sample (N=8, 26.7%) were comparable and had no significant χ^2 test result. In terms of associations among symptom ratings and WCST performance measures, the Taiwanese sample had a significant positive relationship between WCST number Failure to Maintain Set and HDRS scores (r= 0.440, p= 0.015). In the US sample, WCST number Failure to Maintain Set was significantly positively correlated to YMRS scores and HDRS scores (HDRS: r=0.460, p=0.024; YMRS: r= 0.419, p= 0.037, respectively).

4. Discussion

With several demographic characteristics and comparable age at illness onset in Taiwan and US samples, our data indicate that there is no cross-national difference in WCST performance based on the same adult norms. Furthermore, 28% of the US sample showing cognitive impairment in WCST was close to 26.7% of the Taiwanese ones, and both rate were higher than 15% of the original normative group (Heaton et al., 1993). The relationship between the severity of certain residual symptoms and WCST measures was restricted to Failure to Maintain Set in the euthymic patients for each site. This suggests that the impact of bipolar I disorder on executive function in euthymic patients is similar across races and cultures. This fact may also indicate that response maintenance is influenced by even very marginal symptoms. The present finding may provide an additional line of evidence to explain the steady proportion, approximately one third (Tsai et al., 1997; Goodwin and Jamison, 2007), of bipolar patients from various racial and national populations having an unfavorable long-term psychosocial outcome between episodes.

The cultural differences in WCST performance may exist and may be attributed to educational factors (Shan et al., 2008). Comparable performance among Taiwanese patients and US patients in the present study supports the notion that there is no systematic cultural bias in the WCST test while evaluating bipolar patients with similar educational levels. The US patients had more children and longer duration of unemployment than Taiwan group. The phenomena reflect that the cross-national demographic characteristics may exist. It is also noted by the national surveys of the year 2006, including higher unemployment rate (4.7%) of persons aged 15 year in US and 3.98% in Taiwan; higher birthrate in US with 14.14 births per 1,000 population but 12.64 in Taiwan.

Some methodological limitations should be noted. First, the difference between the computer version WCST and manual one may exist. However, no differences between the two versions are found among normal adults in non-Western countries (Tien et al., 1996; Silva-Filho et al., 2007). Scores of Taiwanese patients obtained on the computer version

may be equivalent to those on the manual one. Second, the effects of psychotropic agents on WCST measures could not be excluded and may confound patients' performance. Third, small sample size and no other test of executive tasks may limit the generalizability of our findings. Finally, several clinical variables that have been found to impact executive function performance were not included, such as premorbid IQ, duration of illness, prior number of mood episodes, and history of psychotic symptoms. However, the present two groups may have comparable mean values of current age and age at illness onset.

In conclusion, euthymic bipolar patients in various ethnic groups may exhibit similar executive dysfunction in response maintenance even in the context of mild residual symptoms.

Acknowledgments

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Table 1

Comparisons on demographic data, psychiatric symptoms, and WCST performance in euthymic bipolar patients between the US and Taiwan

Characteristics	US ($n = 25$) Mean(SD)	Taiwan ($n = 30$) Mean (SD)	t	p
Demographic				
Age (years)	30.0(7.2)	31.7(7.8)	-.84	0.41
Education(years)	13.7(2.2)	13.6(2.6)	.23	0.82
Number of children	0.9(1.3)	0.3(0.6)	2.34	<.025
Months since last holding a job	5.2(8.8)	1.1(3.4)	2.07	<0.05
Psychiatric symptom				
YMRS(score)	3.0(3.2)	1.2(2.1)	2.40	< 0.025
HDRS(score)	3.1(3.0)	1.9(2.5)	1.52	0.14
Positive Symptom(score)	0.5(0.8)	0.0 (0.2)	3.09	<0.005
WSCT performance				
Perseverative error (%)	13.8(9.8)	16.2(13.6)	-.71	0.48
Perseverative response (n)	17.7(17.5)	19.4(20.2)	-.33	0.74
Perseverative error (n)	15.6(13.9)	17.5(18.4)	-.43	0.67
Non-perseverative error (n)	13.8(14.3)	15.9(15.9)	-.52	0.61
Failure to maintain set (n)	1.0(1.2)	0.6(0.9)	1.29	0.20

Degree of freedom= 53;