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Impulsivity: Differential relationship to depression and mania in bipolar disorder

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Abstract

Introduction—Impulsivity, a component of the initiation of action, may have a central role in the clinical biology of affective disorders. Impulsivity appears clearly to be related to mania. Despite its relationship to suicidal behavior, relationships between impulsivity and depression have been studied less than those with mania. Impulsivity is a complex construct, and it may be related differently to depression and to mania.

Methods—In subjects with bipolar disorder, we investigated impulsivity in relationship to affective symptoms. Trait-like impulsivity was assessed with the Barratt Impulsiveness Scale (BIS-11). Affective symptoms were measured using the Change version of the Schedule for Affective Disorders and Schizophrenia (SADS-C). Measures were compared using analysis of variance, multiple regression and factor analysis.

Results—Impulsivity, as measured by the BIS, was related differentially to measures of depression and mania. Total and attentional impulsivity correlated independently with depression and mania scores. Motor impulsivity correlated with mania scores, while nonplanning impulsivity correlated with depression scores. These relationships were strongest in subjects who had never met criteria for a substance use disorder. Among manic symptoms, visible hyperactivity correlated most strongly with BIS scores, regardless of clinical state. Among depressive symptoms, hopelessness, anhedonia, and suicidality correlated most strongly with BIS scores.

Conclusions—Depression and mania are differentially related to impulsivity. Impulsivity is related more strongly to measures of activity or motivation than to depressive or manic affect. The relationship between impulsivity and hopelessness may be an important factor in risk for suicide.

Keywords

bipolar disorder; impulsivity; depression; mania

Introduction

Impulsivity is related to mechanisms and consequences of affective symptoms. Its relationship to mechanism stems from its role in the initiation of action (Barratt and Patton, 1983;Moeller et al., 2001). Impulsivity can be regarded as a predisposition to action without reflection or

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regard for consequences (Moeller et al., 2001). Consequences of impulsivity include substance abuse (Moeller et al., 2002;Swann et al., 2004), suicidal behavior (Maser et al., 2002;Simon et al., 2001;Swann et al., 2005), and other serious behavioral problems (Stanford and Barratt, 1992).

There is little information about impulsivity and specific affective symptoms. Impulsivity is considered to be inherent in mania and is a prominent part of its diagnostic criteria (First et al., 1996;Swann et al., 2001b). Impulsivity is complex, however, and specific relationships between manic symptoms and specific aspects of impulsivity have not been investigated.

In the case of depression, there is even less information. At first glance, depression may appear less strongly related to impulsivity than mania is. Combinations of depression and impulsivity are important in suicidal behavior (Soloff et al., 2000), but impulsivity in this situation may be related to manic symptoms (Swann et al., 2007). Interestingly, an epidemiological study found impulsive suicide attempts to be associated with high Beck Hopelessness Scale scores but with low depression scores (Simon et al., 2001). One aspect of impulsivity, as measured by the Barratt Impulsiveness Scale, is nonplanning impulsivity, or lack of sense of the future (Patton et al., 1995). This aspect of impulsivity may be related to hopelessness and depression.

We have investigated relationships between specific aspects of impulsivity and affective symptoms in subjects with bipolar disorder who were depressed, manic, or not experiencing a current episode. The self-rated Barratt Impulsiveness Scale has been extensively validated and provides an integrated measure of impulsivity. Its three subscales measure cognitive, behavioral, and adaptive aspects of impulsivity (Patton et al., 1995). Our hypotheses were that depression and mania would be differentially related to impulsivity, and that the strongest relationships would involve symptoms related to activation, rather than mood.

Methods

Subjects

Potential subjects, who were referred to the study by clinicians or who responded to advertisements that had been approved by the Institutional Review Board, were fully informed of the procedures, risks, and benefits of the study, and signed informed consent documents, before any study-related procedures took place. The study was approved by the Committee for the Protection of Human Subjects, the Institutional Review Board (IRB) for the University of Texas Health Science Center at Houston. All subjects had bipolar I disorder according to DSM-IV. Of 83 subjects eligible for the study, only data from the 74 subjects for whom the definite presence or absence of a history of a substance or alcohol abuse disorder were used. Seventeen met DSM-IV criteria for depression, 16 for mania, and 17 for a mixed state. Twenty-four subjects were defined as interepisode, meaning that they did not meet criteria for a depressive or manic episode and had not met criteria for an episode for at least three months. Forty-seven subjects had met DSM-IV criteria for a substance or alcohol-use disorder in the past; no subjects met criteria currently. Subjects were required to have negative breathalyzer® and urine screens for drugs of abuse when they were tested. Presence of a substance/alcohol abuse history was not related to clinical state at the time of the study (X^2 (df=3) = 0.33, $p > 0.9$).

Diagnostic and symptom measures

Diagnoses, including substance abuse or dependence, were rendered by the Structured Clinical Interview for DSM-IV (SCID) (First et al., 1996). Symptoms were rated using the Change version of the Schedule for Affective Disorders and Schizophrenia (SADS-C), which is designed to measure depressive, manic, anxious, and psychotic symptoms concomitantly (Spitzer and Endicott, 1978b). The augmented version of the SADS-C used in this and our

previous work (Bowden et al., 1994) had all ten mania rating scale items used in the full SADS (Endicott and Spitzer, 1978;Spitzer and Endicott, 1978a), rather than the subset of five items in the conventional SADS-C (Spitzer and Endicott, 1978b). Raters were trained in these instruments, using standard rating tapes and materials. Diagnoses were confirmed in consensus diagnostic meetings that included co-authors A.C.S, F.G.M., and J.L.S.

Impulsivity

Impulsivity was assessed using the Barratt Impulsiveness Scale (BIS-11) (Barratt and Patton, 1983). This 30-item self-rated scale has three oblique factors: attentional/cognitive, which measures toleration for cognitive complexity and persistence; motor, which measures the tendency to act on the spur of the moment; and nonplanning impulsivity, which measures the lack of sense of the future (Patton et al., 1995). Items are rated from 1 (absent) to 4 (most extreme). Non-psychiatric controls generally score in the range of 50–60 (Swann et al., 2002).

Statistical methods

For normally distributed variables, we used analysis of variance or multiple linear regression analyses. If criteria for normality were not met (Kolmogorov-Smirnov test) we used appropriate nonparametric statistics. Post-hoc comparisons, when appropriate analysis of variance interactions were significant, used the Duncan multiple range test. Comparisons of interest were based on main effects of mania or depression. For example, a main effect of mania would imply that manic subjects would differ from interepisode subjects and depressed subjects would differ from mixed (depression + mania) subjects.

Results

Impulsivity and affective state

Interepisode subjects had mean SADS-C mania rating scale (MRS) score of 5.7 ± 4.6 (SD) and depression score of 7.9 ± 4.8; for manic subjects, MRS was 18.9 ± 6.7 and depression 8.7 ± 4.9; for depressed subjects, MRS was 4.6 ± 4.9 and depression 24.6 ± 4.9, and for mixed states, MRS was 17.9 ± 7.9 and depression score was 22.4 ± 7.3. Depression and mania scores did not correlate significantly ($r = -0.09$, $p > 0.4$). As shown in Table 1, BIS scores were increased in depressed, manic, and mixed, compared to interepisode, subjects, but the specific BIS-11 scores that were increased depended on affective state. Motor impulsivity appeared to be selectively related to mania, nonplanning impulsivity more strongly related to depression, and attentional impulsivity similarly, and additively, related to both. No interactions between depressive and manic states approached significance. Post hoc analysis showed that elevations in motor, attentional, and total impulsivity scores were associated with the manic state, being higher in manic than in interepisode subjects and higher in mixed than in depressed subjects. Nonplanning impulsivity was higher in depressed or mixed than in interepisode subjects.

Substance abuse can have prominent effects on impulsivity and its relationship to bipolar disorder (Swann et al., 2004). The 27 subjects who had never met criteria for a substance use disorder resembled the entire group, with noninteracting main effects of depression and mania for total ($F(\text{mania}) = 11.9$, $p = 0.0022$); $F(\text{depression})=6$, $p = 0.022$; $F(\text{interaction}) =0$)), attentional ($F(\text{mania}) =6.9$, $p=0.015$; $F(\text{depression})=5.6$, $p = 0.026$); $F(\text{interaction})=0$) and nonplanning impulsivity ($F(\text{mania})=5.6$, $p = 0.027$; $F(\text{depression})=8.1$, $p = 0.009$; $F(\text{interaction})=0.9$). Motor impulsivity was significantly increased in mania ($F(\text{mania})=15$, $p = 0.0008$), without a main effect of depression ($F(\text{depression})=1.1$). Unlike the case with all subjects, both mania and depression had significant main effects on nonplanning impulsivity in subjects without histories of substance use disorders. Results of post hoc analyses in subjects without histories of a substance use disorder were essentially identical to the case for the entire

group, except that the difference in Motor impulsivity between manic and interepisode subjects was significant rather than being a trend.

Among subjects who had definitely met criteria for a substance use disorder, there were no significant effects of affective state on BIS scores (for main effects, $F < 1.8$, for interactions, $F < 0.8$). Among all subjects, with substance use disorder added to the ANOVA model, there were significant interactions between mania and substance abuse history for BIS total ($F(1,63) = 4.6$, $p = 0.035$) and motor score ($F(1,63) = 5.7$, $p = 0.02$), reflecting a higher BIS score in interepisode subjects, and a smaller difference between manic and interepisode subjects, with a history of a substance use disorder (for BIS total score in subjects without histories of a substance use disorder, interepisode 62.1 ± 13 vs manic 75.0 ± 9.1; for those with definite substance use disorder history, interepisode 81.1 ± 13.4 vs manic 84.3 ± 11.8). MRS in interepisode subjects did not differ between those without (6.7 ± 4.8) and with (5.1 ± 4.4) histories of a substance use disorder (t (df=21) = 0.5), so the higher BIS scores in interepisode subjects with histories of substance use disorders were not due to higher residual mania scores.

Differential relationships between impulsivity and depression or mania

Multiple regression analysis, with BIS scores as dependent variables and depression and mania scores as independent variables, showed that both depression and mania scores contributed significantly to BIS total and attentional scores. Mania, but not depression, contributed to BIS motor scores, while depression, but not mania, contributed to BIS nonplanning scores. Table 2 summarizes the data for the 27 subjects who had never met criteria for a substance use disorder. The entire group of 74 subjects, including the 47 with a substance use disorder, had exactly the same pattern of significant relationships. When age of onset, substance use history, and treatment with antipsychotic medicines, lithium, anticonvulsants, and antidepressants were taken into account, the same relationships as those in Table 2 persisted.

Impulsivity and affective symptoms

In order to investigate relationships between individual depressive or manic symptoms and impulsivity, we conducted a principal components analysis of SADS-C items to determine which symptoms contributed most to depression and mania in these subjects. After varimax rotation, four factors accounted for over half the variance. The factors were 1) Depression, consisting, in order of strength of loading, subjective depression, anhedonia, hopelessness, negative self-evaluation, worry, fatigue, somatic anxiety, self-reproach, and suicidality (eigenvalue 5.2, 20.2% of variance); 2) Mania, consisting of increased energy, elevated mood, visible hyperactivity, accelerated speech, grandiosity, increased goal-directed activity, decreased need for sleep, and racing thoughts (eigenvalue 5.9, 18.9% of variance); 3) Psychosis, consisting of delusions, hallucinations, and paranoia (eigenvalue 2.3, 8.8% of variance); and 4) Hostility, consisting of overt irritability, overt anger, and subjective irritability (eigenvalue 2.2, 8.4% of variance).

For all subjects (n=74), attentional impulsivity correlated significantly with depression ($r=0.28$, $p = 0.015$) and mania factor ($r = 0.25$, $p = 0.03$) scores, motor impulsivity correlated with mania factor scores ($r = 0.24$, $p = 0.04$) and nonplanning impulsivity correlated with depression factor scores ($r = 0.24$, $p = 0.04$). There were no significant correlations between BIS scores and hostility or psychosis factor scores. For subjects without history of a substance use disorder (n=27), attentional impulsivity correlated significantly with depression ($r = 0.42$, $p = 0.03$) scores, motor impulsivity correlated with mania scores ($r = 0.39$, $p = 0.04$), and nonplanning impulsivity correlated with depression scores ($r = 0.44$, $p = 0.02$). The pattern of multiple regression correlation coefficients for the mania and depression factors was exactly the same as that shown in Table 2 for mania and depression subscale scores.

We then investigated relationships between BIS scores and the rating scores for the symptoms loading most strongly to depression or mania, in all subjects having an episode, depressed subjects, and manic subjects. Table 3 shows that, among manic symptoms in all subjects having episodes, visible hyperactivity correlated most strongly with BIS scores. There were significant but more modest correlations with increased energy and accelerated speech. In manic episodes, visible hyperactivity correlated significantly with attentional (Kendall tau = 0.306) and motor (Kendall tau = 0.265) scores; no other symptoms correlated with BIS scores. Visible hyperactivity was also the only manic symptom correlating with BIS scores among depressed subjects, where it correlated significantly with total (Kendall tau = 0.424), attentional (Kendall tau = 0.408) and motor scores (Kendall tau = 0.408).

As was the case with mania, subjective depressive mood itself did not correlate with BIS scores. Hopelessness and anhedonia correlated significantly with BIS attentional scores in all subjects and in subjects experiencing manic episodes. Suicidality also correlated modestly but significantly with BIS attention scores for subjects in depressive or manic episodes (Kendall tau = 0.175, p = 0.03) and in all subjects (Kendall tau = 0.192, p = 0.02).

Discussion

Definitions and components of impulsivity

Impulsivity defines behavior that occurs without the opportunity for reflection and is therefore not consistent with its context (Moeller et al., 2001). The BIS-11 identifies three components of impulsivity. Attentional/cognitive impulsivity is a lack of cognitive persistence with inability to tolerate cognitive complexity; motor impulsivity is a tendency to act on the spur of the moment; and nonplanning impulsivity refers to a lack of sense of the future (Patton et al., 1995).

The data in this paper show that the three components of impulsivity as measured by the BIS (Patton et al., 1995) were related differentially to affective state. Attentional impulsivity was related to either depression or mania, motor impulsivity to mania, and nonplanning impulsivity to depression. Previous reports have suggested that attentional impulsivity was increased in individuals with an Axis I psychiatric disorder (Swann et al., 2002), motor impulsivity was increased in subjects with bipolar disorder who also had impulse control disorders (Lejoyeux et al., 2002), and nonplanning impulsivity was increased in subjects (generally not having bipolar disorder) with personality disorders (Dougherty et al., 2000).

BIS subscales are also related differentially to other measures of impulsivity. In a sample of non-impulsive controls, motor impulsivity correlated with performance on a stop-signal task, consistent with impaired motor inhibition, nonplanning impulsiveness correlated with complex reaction time, taken as impaired response organization, and cognitive impulsivity correlated somewhat more weakly with errors in time production, consistent with impaired temporal regulation (Gorlyn et al., 2005). Among a group of subjects ranging more widely in impulsivity, we found BIS nonplanning and motor impulsivity to correlate with performance on tests of ability to delay reward and nonplanning impulsivity to correlate with increased commission errors on a continuous performance task (Swann et al., 2002).

Impulsivity and mania

Impulsivity is a consistent, central feature of otherwise heterogeneous manic episodes (Swann et al., 2001b). As shown in Table 3, the aspect of mania that appeared the most strongly related to BIS scores was hyperactivity, rather than subjective mood symptoms. Total, attentional and motor BIS scores are increased in subjects with bipolar disorder, regardless of affective state (Swann et al., 2001a), though the data in this paper suggest that even in interepisode bipolar

disorder increased BIS scores are due, at least in part, to subsyndromal symptoms of depression or mania (Table 1 and related results). Further, total BIS scores appear to be increased additively by the presence of bipolar disorder and a substance use disorder (Swann et al., 2004), and the data in this paper shows that history of a substance use disorder contributes to impulsivity in interepisode subjects independent of residual manic symptoms (see Table 1 and related results).

All three BIS scores were increased in mania, but increased motor impulsivity appeared specific to mania. The increased motor impulsivity in mania is consistent with the association between motor impulsivity and both impetuousness and venturesomeness (Miller et al., 2004). We reported motor impulsivity to be related to inability to delay a reward-related response (Swann et al., 2002), and Gorlyn et al showed it to be related to impaired stop-signal reaction time (Gorlyn et al., 2005), consistent with inability to withhold or to modify motor responses.

The BIS is intended to measure impulsivity as a stable trait, but has been reported to be influenced by clinical state as well (Corruble et al., 2003) (Table 1). There is inadequate longitudinal data to differentiate the relative roles of true state-dependence as opposed to differences among patients with bipolar disorder predisposed to having more severe or recurrent illness and therefore more likely to be symptomatic when they were studied. For example, elevated impulsivity scores could reflect neurotoxicity resulting from previous drug exposure (Moeller et al., 2005) or from multiple episodes of illness (Post et al., 1986). In the multiple regression analysis in Table 2, the extrapolated y-intercept for total BIS (ie, MRS and depression scores = 0) was 60.9 ± 14.7 for subjects without substance use disorder history and 73.9 ± 13.0 for subjects with histories of a substance use disorder, similar to values we have previously reported for comparable subjects without bipolar disorder (Swann et al., 2004).

Many potential mechanisms underlie impulsivity (Evenden, 1999). Attention deficit disorder, like bipolar disorder, is associated with impulsivity and increased motor activity, but their mechanisms and psychopharmacology differ (Evenden, 1999;Faraone et al., 2000). These differences reveal the importance in understanding the neurobiology of symptoms in different clinical contexts in order to develop rational treatments (Moeller et al., 2001).

Impulsivity and depression

There is evidence supporting a relationship between impulsivity and depression, as well as mania. Impulsivity in depressed patients could be a result of co-existing manic symptoms (Swann et al., 2007). Kraepelin defined “excited depression” as a mixed state where excitability and hyperactivity, rather than elevated mood, were prominent, consistent with mixed depressive subjects described by Akiskal et al (Akiskal et al., 2005) and with the results in Table 3.

Impulsivity could also be a component of the depressive state itself. Corruble et al, for example, have characterized impulsivity in nonbipolar subjects with major depressive episodes (Corruble et al., 2003). Using the BIS and other questionnaires, this group described increased attentional, behavioral, and nonplanning impulsivity in subjects experiencing depressive episodes (Corruble et al., 2003). Among non-bipolar subjects with methamphetamine abuse, Beck depression scale scores were increased in the subjects with high impulsivity (Semple et al., 2005). In the current study, Table 3 shows that, among depressed subjects, BIS scores correlated most strongly with hopelessness and anhedonia, rather than subjective depression.

Nonplanning impulsivity was related more strongly to depression than to mania. Patton et al formulated nonplanning impulsivity as lack of a sense of the future (Patton et al., 1995). The relationship that we reported between nonplanning impulsivity and inability to delay reward-related responses is consistent with this lack of future sense (Swann et al., 2002), as is the correlation between nonplanning impulsivity and hopelessness or anhedonia (Table 3).

These data raise the question of the extent to which impulsivity in depressed subjects is related to the presence of subtle manic symptoms in mixed depressive states (Akiskal et al., 2005). The multiple regression analyses in Table 2 show that BIS scores correlated independently with depression and mania scores. Therefore, beyond the increased impulsivity associated with manic symptoms in mixed depressive states (Swann et al., 2007), a component of impulsivity appears intrinsic to the depressive state itself.

Impulsivity and depression: relationship to suicidality

Theoretical (Fawcett, 2001;Mann et al., 1999), epidemiological (Simon et al., 2001), and clinical (Dumais et al., 2005;Swann et al., 2005) studies suggest that depression or hopelessness can interact with impulsivity to result in risk for suicide. A fourteen-year prospective study found that nearly lethal suicide attempts and completed suicide were associated with impulsivity, substance abuse, previous attempts, and a cycling/mixed clinical presentation, with trait impulsivity predicting suicide even more than twelve months later (Maser et al., 2002). In major depressive disorder, impulsive aggression was associated with greater risk for completed suicide (Conner et al., 2001;Dumais et al., 2005).

Hopelessness or anhedonia may be more directly related to suicidality than depressed mood is. Reduced P300 amplitude, a neurophysiologic parameter associated with impulsivity and behavioral disinhibition (Iacono et al., 2003), correlated with suicidality and hopelessness but not with depressed mood (Hansenne et al., 1996). A case-control study of medically severe suicide attempts found that attempters with predominately impulsive attempts (more likely to be violent) had elevated Beck Hopelessness Scale scores comparable to subjects with planned attempts but did not have elevated depression (CES-D) scores compared to controls (Simon et al., 2001). In the current study, suicidality (SADS-C) correlated with attentional impulsivity. Attentional impulsivity represents intolerance for complexity, characterized by impatience and lack of flexibility (Patton et al., 1995). This is consistent with reports that suicide attempts with a large impulsive component were characterized by seemingly minor precipitants, and relatively low expectation of death despite use of violent methods (Peterson et al., 1985;Simon et al., 2001).

A few studies have investigated BIS scores in depressed patients in relationship to suicidal behavior. Corruble et al described increased cognitive, behavioral, and nonplanning impulsivity in patients with major depressive episodes, but only cognitive (attentional) impulsivity was associated with history of suicide attempts (Corruble et al., 2003), consistent with our results. In subjects with bipolar disorder, increased BIS scores were associated with symptoms of cluster B personality disorders, suicidal behavior, and early-life stressors (Garno et al., 2005).

Limitations

This was a cross-sectional study and there are no measurements of duration, or order of appearance, of symptoms, or of temporal stability of BIS scores. The small sample size limited some analyses. While demographically similar to other populations with bipolar disorder, the subjects may have differed from individuals in the community who did not volunteer.

Conclusions

Impulsivity appears differentially related to depressive and manic symptoms. Attentional-cognitive impulsivity is increased with either depression or mania; motor impulsivity correlates with mania, and nonplanning impulsivity with depression. Impulsivity correlated most strongly with hyperactivity in mania and with hopelessness or anhedonia in depression, reflecting the possibility of a stronger relationship to motivation or activity than to subjective affect.

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Table 1

BIS scores and affective state

State (n)	Manic	Depr.	Total	Attentional	Motor	Nonplanning
Interepisode (24)	−	−	74.5 ± 15.2	20.0 ± 4.3	27.7 ± 6.5	27.0 ± 6.6
Depressed (17)	−	+	80.1 ± 10.1	21.6 ± 3.7	27.5 ± 5.2	31.0 ± 4.1
Manic (16)	+	−	82.4 ± 14.5	21.6 ± 4.6	30.9 ± 6.5	29.9 ± 6.5
Mixed (17)	+	+	88.7 ± 13.0	24.8 ± 4.0	31.3 ± 5.3	32.6 ± 4.8
2-way ANOVA F (1,70) (p)	Mania		6.8 (0.011)	6.2 (0.015)	6.4 (0.014)	2.9 (0.1)
	Depression		3.5 (0.07)	6.0 (0.017)	0	6.0 (0.017)
	Mania × depression		0.0	0.7	0	0.2
F (df=3, 70) 1-way ANOVA (p)			4.1 (0.01)	4.88 (0.004)	2.51 (0.06)	3.31 (0.025)
Post hoc (Duncan multiple range), $p < 0.05$			I < manic I < mixed D < mixed	I < mixed M < mixed D < mixed	I < manic (0.08) I < mixed D < mixed	I < depressed I < mixed

The “Manic” and “Depr.” columns show whether subjects met DSM-IV criteria for a manic or depressive episode.

Post-hoc shows comparisons for which $p < 0.05$. Comparisons of interest were I (interepisode) vs manic, depressed, or mixed; Manic (M) vs mixed, and depressed (D) vs mixed.

Table 2

Multiple linear regression analyses of BIS, depression, and mania subscale scores in subjects with bipolar disorder but without substance use disorders

Score	Overall F (2,24)	Multiple R^2	MRS (p)		Depression (p)	
			Beta	Partial R	Beta	Partial R
Total	4.8 (0.018)	0.270	0.415 (0.02)	0.432	0.386 (0.03)	0.407
Attentional	4.6 (0.021)	0.261	0.387 (0.04)	0.406	0.401 (0.03)	0.418
Motor	4.3 (0.03)	0.247	0.473 (0.02)	0.474	0.243 (0.2)	0.266
Nonplanning	3.5 (0.044)	0.212	0.275 (0.2)	0.293	0.416 (0.026)	0.420

Statistical significances of F ratios or beta coefficients are in parentheses. MRS is the Mania Rating Scale score derived from the SADS-C. “Depression” is the depression factor score derived from the SADS-C.

Table 3

Correlations between manic or depressive symptoms and BIS scores

Score	BIS Total	BIS Attentional	BIS Motor	BIS Nonplanning
Mania items				
Increased energy	0.188*	0.181*	0.196*	0.096
Elevated mood	0.017	−0.006	0.096	−0.096
Visible hyperactivity	0.297**	0.326**	0.313**	−0.085
Accelerated speech	0.148	0.169*	0.174*	0.085
Grandiosity	−0.083	−0.085	0.031	−0.159*
Depression items				
Subjective depression	0.087	0.121	−0.025	0.139
Anhedonia	0.114	0.221**	−0.026	0.134
Hopelessness	0.226**	0.238**	0.146	0.236**
Negative eval. of self	0.081	0.018	0.083	0.141
Worry	0.003	0.112	−0.075	0.030

Symptoms are those loading most strongly on the mania or depression factors in factor analysis of the SADS-C (see text).

Kendall tau:

*P < 0.05;

**P < 0.01