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Trait Impulsivity and Risk Taking Behaviour in Bipolar Disorder and Epilepsy

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Abstract

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Introduction

Risk taking behavior which is frequently associated with impulsivity in Bipolar Disorder is behavior that involves possibility of reward and potential for punishment.[1,2] Impulsivity is defined as "a neurophysiologically based inability to conform behaviour to its context or consequences" and has three dimensions: motor, non-planning and cognitive impulsiveness.[3,4] Impulsivity traits were reported in 41.1% remitted Bipolar II disorder patients and were related to "excessive risky activities" and "irritable risky overactivity".[5] Epilepsy share many similarities with bipolar disorders both in terms of illness course and treatment options suggesting a common underlying pathophysiology.[6] Epilepsy patients have 12.2% bipolar symptoms.[7] Children with epilepsy have impaired impulsivity.[9,10] and an improvement in hyperactive-impulsive behaviours has been observed following control of seizures.[11] The available evidence regarding risk taking behavior and impulsivity suggests that these parameters may be representative of behavioural manifestations of same underlying biological mechanism.[2] The current study attempts to evaluate and compare the parameters of impulsivity and risk taking behaviour among euthymic bipolar disorder subjects, subjects with epilepsy and healthy controls. In addition, this study also aims to identify the predictors of association between impulsivity, violence and risk taking behaviour among the bipolar remitted patients and epileptic patients, if any.

Materials An Methods

This was a cross-sectional study done at two tertiary care centres of North India. Ethical committee approval was taken from both the centres at the outset of the study. Consecutive sampling was done. Inclusion criteria for euthymic Bipolar I disorder patients was age 18-60 years, subjects meeting Diagnostic and Statistical Manual – IV Text revised (DSM-IV TR) criteria for Bipolar I disorder, being euthymic at the time of study (scores of less than 7 on HDRS and 12 on YMRS) and maintained on steady drug dosage for at least 2 months. Inclusion criteria for patients with Epilepsy was age 18-60 years, idiopathic epilepsy with no underlying structural brain lesion or any other neurological signs/symptoms while inclusion criteria for healthy

controls was age 18-60 years and residents of nearby community and friends of patients (not relatives). Exclusion criteria for all the three groups was same and was having DSM Axis I or II disorder other than Bipolar I disorder, unwilling or unable to provide informed consent, neurological disorders which could interfere with tests, significant mental retardation, substance or alcohol dependence for last six months.

The sample size was calculated to be at least 30 subjects in each group with power 80% and type I error (5%) to find a difference with an alpha of 0.05 and a beta of 0.20 (that is, a power of 80%). The sample was calculated by using online sample size calculator (www.samplesize.sourceforge.net/iface/s2.html). These calculations are according to an estimated standard deviation of prevalence of impulsivity parameters based on previous studies.

After taking informed consent, subjects in all three groups were evaluated with the assessment instruments which included **Semi-structured proforma** - designed to collect information regarding socio-demographic and clinical variables, **Young Mania Rating Scale (YMRS)** - most frequently utilized rating scales to assess manic symptoms[12] , **Hamilton Depression Rating Scale (HDRS)**- multiple choice questionnaire used to rate the severity of a patient's major depression.[13] **Balloon Analogue Risk Task (BART)**-computerized decision-making task that provides a test of behavioural risk taking.[14] Risky behaviour on the BART (adjusted average pumps) showed acceptable test-retest reliability across days (r = +o.77, p <0.001) and **Barratt Impulsivity Scale (BIS-11)** - a self-report questionnaire. [15] Barratt (1985) provided data supporting the internal consistency with alpha coefficients ranging from .89 to .92.[4] Similar versions of the scale have shown test–retest correlations at 2 months to be above 0.8.[16]

The English version of BIS-11 was translated to Hindi and then back translated to English separately two bilingual experts. All the discrepancies were discussed and changes were incorporated which was then compared with the original English version. A pilot study (n=20) was conducted by using the sfinal translated Hindi version. The suggestions made by the subjects regarding the difficulties they faced in comprehending the items on the scale were taken into account and a final Hindi-BIS version was developed. This version was used in the current study.

Analysis

The statistical analysis was carried out by using the SPSS 17.0 version. $\chi 2$ analysis was done between bipolar remitted outpatients and epilepsy outpatients for nonparametric data. Pearson's correlation coefficient was used to assess correlation between different items of BIS. Reliability analysis was done by using Cronbach's alpha. Independent sample t-test was done to analyse differences in impulsivity between separate groups. To determine the relationships between impulsivity traits and various modifiable and non-modifiable parameters, Pearson's bivariate correlations were calculated together with Fisher Z-test to determine the significant differences in correlation coefficients between bipolar remitted outpatients and epilepsy outpatients groups.

Results

A total of 32 subjects in bipolar group, 30 in epilepsy group and 32 in control group were included in the final analysis.

Table 1: Socio demographic parameters in the study population

Parameter		Bipolar Group	Epilepsy Group	Healthy Control	Intergroup difference[#]
		N (%)	N (%)	N (%)	p value
Gender	Male	28 (87.5)	17 (56.7)	15 (46.9)	.002**
	Female	4 (12.5)	13 (43.3)	17 (53.1)	
Marital status	Unmarried	8 (25)	18 (60)	-	.000**

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	Married	24 (75)	12 (40)	32 (100)	
Religion	Hindu	27 (84.4)	13 (43.3)	32 (100)	.000**
	Muslim	5 (15.6)	16 (53.3)	-	
	Sikh	-	1 (3.3)	-	
Education	Illiterate	5 (15.6)	2 (6.7)	-	.33
	Primary	3 (9.4)	6 (20)	5 (15.6)	
	Secondary	9 (28.1)	6 (20)	8 (25)	
	Higher secondary	13 (40.6)	13 (43.3)	16 (50)	
	Graduate	2 (6.3)	2 (6.7)	3 (9.4)	
	Post-graduate	-	1 (3.3)	-	
Employment status	Unemployed	5 (15.6)	7 (23.3)	16 (50)	.001**
	Employed	25 (78.1)	14 (46.7)	16 (50)	
	Student	1 (3.1)	9 (30)	-	
	Housewife	1 (3.1)	-	-	
Family background	Urban	27 (84.4)	25 (83.3)	32 (100)	.83
	Rural	5 (15.6)	5 (16.7)	-	
Family type	Nuclear	23 (71.9)	14 (46.7)	20 (62.5)	.12
	Joint	9 (28.1)	16 (53.3)	12 (37.5)	
Socio-economic status	Lower	14 (43.8)	11 (36.7)	10 (31.3)	.57
	Middle	18 (56.3)	18 (60)	22 (68.8)	
	Upper	-	1 (3.3)	-	

*p<0.05;

**p<0.01; using analysis of variance

The mean age of subjects was 37.09 ± 10.97 years in bipolar group, 29.13 ± 10.42 years in epilepsy group and 40.41 ± 11.36 years in healthy control group. Table 1 depicts the socio-demographic profile of the three groups. There were significantly more male subjects (87.5%) in bipolar group compared to other groups. More subjects in bipolar and control group were married and Hindu by religion in comparison to subjects with epilepsy. There was no significant difference in socio-economic status among the three groups.

The mean illness duration was 10.93 ± 6.86 years in bipolar subjects and 7 ± 8.5 years in subjects having epilepsy. The mean age of onset of illness among bipolar group and epilepsy group was 26.89 ± 9.92 years and 22.13 ± 12.38 years respectively. Time since last episode of illness (either mania or depression) was 578.89 ± 499.9 days in bipolar group subjects and time since last episode of seizure was 265.30 ± 348.76 days in epilepsy group. A family history of psychiatric illness (majorly bipolar disorder) was found in 56.3% subjects with bipolar disorder while no family history of psychiatric illness or epilepsy in subjects having epilepsy.

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Table 2: Intergroup comparison on scores of BART and BIS

Parameter	Bipolar Group Mean ± SD	Epilepsy Group Mean ± SD	Control Group Mean ± SD	Intergroup difference[#] between Bipolar & Epilepsy Group		Intergroup difference[#] between Bipolar & Control Group		Intergroup difference[#] between Epilepsy & Control Group	
				T	P	t	P	t	P
BART scores									
Aapc	36.82 ± 24.43	23.86 ± 15.86	26.12 ± 11.33	2.45	0.01*	2.24	0.02*	-0.64	0.51
aAPC_10	32.69 ± 23.39	25.02 ± 14.54	23.42 ± 11.03	1.53	0.12	2.02	0.04*	0.48	0.62
aAPC _20	37.09 ± 25.37	23.70 ± 18.81	25.72 ± 11.46	2.34	0.02*	2.30	0.02*	-0.51	0.60
aAPC _30	37.41 ± 25.31	19.57 ± 16.76	30.08 ± 15.54	3.24	0.00**	1.39	0.16	-2.56	0.01*
BIS scores									
Total score	62.94 ± 8.69	66.10 ± 9.79	61.50 ± 8.03	-1.34	0.18	0.68	0.49	2.02	0.04*
Attentional subscale	15.78 ± 3.47	17.70 ± 3.07	15.34 ± 2.82	-2.29	0.02*	0.55	0.58	3.14	0.00**
Attention	10.53 ± 2.62	10.93 ± 2.22	9.59 ± 1.96	-0.64	0.52	1.61	0.11	2.51	0.01*
Cognitive Instability	5.25 ± 1.48	6.77 ± 1.69	5.75 ± 1.11	-3.75	0.00**	-1.53	0.13	2.81	0.00**
Motor subscale	21.03 ± 2.57	22.53 ± 4.49	20.03 ± 3.58	-1.62	0.10	1.28	0.20	2.43	0.01*
Motor	13.81 ± 2.84	15.70 ± 3.65	13.72 ± 3.14	-2.27	0.02*	0.12	0.90	2.29	0.02*
Perseverance	7.22 ± 1.28	6.83 ± 1.48	6.31 ± 1.03	1.09	0.27	3.10	0.00**	1.61	0.11
Nonplanning subscale	26.13 ± 4.96	25.87 ± 4.80	26.13 ± 2.67	0.70	0.83	0.00	1.00	-0.26	0.79
Self control	11.78 ± 3.71	13.43 ± 3.43	13.50 ± 2.15	-1.81	0.07	-2.26	0.02*	-0.09	0.92
Cognitive Complexity	14.34 ± 2.39	12.43 ± 1.90	12.63 ± 0.75	3.46	0.00**	3.87	0.00**	-0.52	0.60

*p<0.05; **p<0.01; [#]using Independent sample t test; BART: Balloon Analogue Risk Test scores; BIS: Barratt's Impulsiveness Scale; aAPC: adjusted average pump count; _10: First 10 balloons on BART; _20: Middle 10 balloons on BART; _30: Last 10 balloons on BART

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Table 2 shows that Bipolar group subjects had a higher mean score than epilepsy (p=0.01) and control (0.02) group for adjusted average pump count (p=0.01) (36.82 ± 24.43 and 23.86 ± 15.86 respectively). The difference was not significant for the first 10 balloons (p=0.12) but an increase in significant difference was observed over the next 20 balloons (p=0.02 for middle 10 balloons and p<0.001 for the final 10 balloons). Epilepsy group subjects had significantly lower scores than controls for adjusted average pump count but only for the last 10 balloons (p<0.001 and p=0.01 respectively).

Among the subscales of BIS-11, results showed that on comparing with epilepsy group, bipolar group had lower scores of attentional subscale (p=0.02) Epilepsy group had higher scores on attentional and motor subscale of BIS-11 than healthy controls (p<0.001 and p=0.01 respectively).

On 1st order factor analysis of BIS-11, bipolar group had lower scores on cognitive instability and motor than epilepsy group (p<0.001 and p=0.02 respectively) and higher scores on cognitive complexity (p<0.001). Bipolar group had lower scores on self control (p=0.02) and higher scores on perseverance and cognitive complexity than healthy control group (p<0.001). On comparison to control group, epilepsy group had higher scores on attention, cognitive instability and motor parameters (p=0.01, p<0.001 and 0.02 respectively).

Table 3: Group comparison of violence and other parameters between subjects with bipolar illness and epilepsy

Historical presence of parameter	Bipolar Group		Epilepsy Group		Intergroup difference	
	N	%	N	%	$\chi 2$	P#
History of violence	23	71.9	9	30	17.26	**0.00***
History of self harm	7	21.9	4	13.3	1.42	0.23
History of harm to others	20	62.5	6	20	16.45	**0.00***
History of legal issues ever	1	3.1	2	6.7	0.24	0.62
History of psychotic symptoms ever	19	59.4	-	-	31.11	**0.00***
Substance abuse	10	31.3	5	16.7	1.76	0.18
Co-morbid physical illness	3	9.4	6	20	1.38	0.23
History of previous hospital admissions	14	43.8	9	30	2.77	0.09

using Kruskal Wallis test; *p<0.001

A significantly larger proportion of subjects with bipolar illness reported a history of violence compared to subjects with epilepsy ($\chi 2$=17.26, p<0.001). Predominantly, the violence was that of causing harm to others rather than self. A history of psychotic symptoms was reported only in the group with bipolar subjects (59.4%) (Table 3).

Table4: Inter-correlations between various parameters in bipolar group subjects

No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Age	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	Sex	.24	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	Marital status	.74*	.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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4	H/o violence	.12	.14	.27	-	-	-	-	-	-	-	-	-	-	-	-	-
5	H/o self harm	-.31	.06	.11	.24	-	-	-	-	-	-	-	-	-	-	-	-
6	H/o harm to others	.08	-.06	.29	.71*	.35	-	-	-	-	-	-	-	-	-	-	-
7	H/o psychotic symptoms	.01	-.02	.23	.41**	.38**	.54*	-	-	-	-	-	-	-	-	-	-
8	Illness duration	.44**	.15	.31	.24	-.25	.23	.21	-	-	-	-	-	-	-	-	-
9	Substance abuse	.09	-.25	.23	.32	.07	.27	.16	.02	-	-	-	-	-	-	-	-
10	Aapc	.20	-.02	.26	.29	.01	.37	.21	-.10	.11	-	-	-	-	-	-	-
11	BIS-Attention	-.25	-.00	-.07	.23	.31	.11	.24	-.04	-.03	-.05	-	-	-	-	-	-
12	BIS-Cognitive Instability	-.17	.19	-.09	.31	.24	.14	.05	-.06	.11	.14	.37**	-	-	-	-	-
13	BIS-Motor	-.29	.16	-.03	-.02	.36	.13	.12	-.01	.09	.04	.33	-.39**	-	-	-	-
14	BIS-Perseverance	.36**	-.43**	-.01	-.33	-.55*	-.25	-.16	.28	-.06	-.23	-.38**	.55*	-.42**	-	-	-
15	BIS-Self control	-.32	-.18	-.29	.13	.57*	.14	.24	-.16	.13	-.13	.60*	.38**	.31	-.25	-	-
16	BIS-Cognitive Complexity	.06	.10	.20	.38**	.32	.17	-.02	.03	.21	-.03	.36**	.20	.21	-.05	.28	-
17	BIS-Total score	-.27	-.03	-.12	.22	.51*	.17	.20	-.05	.14	-.08	.77*	.55*	.62*	-.33	.81*	.60*

*P<0.01; **p<0.05; aAPC: adjusted average pump count; BIS: Barratt's Impulsiveness Scale; H/o: History of

Table 4 shows Pearson's correlation analysis in bipolar group revealed that age was positively correlated to marital status (r=0.74; p<0.01), illness duration (r=0.44; p<0.05) and perseverance subscale of BIS-11 (r=0.36;

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p<0.05). Sex was negatively correlated to perseverance subscale of BIS-11 (r=-0.43; p<0.05) i.e. females had lower scores than males. History of violence was positively correlated to history of harm to others (r=0.71; p<0.01), history of psychotic symptoms (r=0.41; p<0.05) and cognitive complexity subscale of BIS-11 (r=0.38; p<0.05). History of self harm was positively correlated to history of psychotic symptoms (r=0.38 p<0.05), self control parameter of BIS-11 (r=0.57; p<0.01), non-planning subscale of BIS-11 (r=0.58; p<0.01) and total BIS-11 scores (r=0.51; p<0.01) and was negatively correlated to perseverance subscale of BIS-11 (r=-0.55; p<0.01). History of harm to others was positively correlated to history of psychotic symptoms (r=0.54; p<0.01).

Inter-correlations between various parameters in bipolar group subjects showed that adjusted average pump count was not found to be correlated to any parameter in bipolar group. The total number of depressive episodes positively correlated to total number of manic episodes (r=0.42; p=0.02). The total number of manic episodes positively correlated to previous history of psychotic symptoms (r=0.42; p=0.02). Total number of episodes and number of manic/depressive episodes were not correlated with any other variable. A history of previous admission to hospital was positively correlated to history of violence (r=0.43; p=0.02). Age of onset of illness in bipolar group was negatively correlated to scores of motor parameter of BIS (r=-0.39, p=0.04) and was not correlated to any other BIS-11 or BART parameter. Age of onset of illness in epilepsy group did not correlate to any BIS-11 or BART parameter.

Table 5: Inter-correlations between various parameters in epilepsy group subjects

No.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Age	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	Sex	-.03	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	Marital status	.58**	-.02	-	-	-	-	-	-	-	-	-	-	-	-	-
4	H/o violence	-.10	-.13	-.08	-	-	-	-	-	-	-	-	-	-	-	-
5	H/o self harm	-.19	-.14	-.32	.59*	-	-	-	-	-	-	-	-	-	-	-
6	H/o harm to others	-.13	-.10	.10	.76*	.29	-	-	-	-	-	-	-	-	-	-
7	Illness duration	.16	.30	.14	.25	-.16	.08	-	-	-	-	-	-	-	-	-
8	Substance abuse	.30	-.39**	.00	-.09	.08	-.22	-.17	-	-	-	-	-	-	-	-
9	aAPC	-.07	-.17	.02	-.37**	-.29	-.29	-.05	.19	-	-	-	-	-	-	-
10	BIS-Attention	-.00	.08	-.03	.02	.23	.01	.23	.05	-.20	-	-	-	-	-	-

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11	BIS-Cognitive Instability	-.10	-.03	.07	-.17	.05	-.13	.00	.00	-.19	.21	-	-	-	-	-
12	BIS-Motor	-.23	-.07	-.32	.15	.30	-.02	.10	.33	.04	.51*	.34	-	-	-	-
13	BIS-Perseverance	-.07	-.08	-.18	.27	.11	.05	.33	.17	-.09	.23	-.19	.42**	-	-	-
14	BIS-Self control	.04	.08	-.06	.17	.24	.01	.27	.23	-.04	.64*	-.14	.42**	.33	-	-
15	BIS-Cognitive Complexity	.12	-.23	-.08	.27	.22	-.02	.21	.23	-.14	.32	.06	.19	.36**	.58*	-
16	BIS-Total score	-.07	-.04	-.18	.19	.32	-.02	.28	.29	-.12	.78*	.28	.79*	.51**	.79*	.61*

*P<0.01; **p<0.05; aAPC: adjusted average pump count; BIS: Barratt's Impulsiveness Scale; H/o: History of.

As shown in Table 5, among epilepsy group, history of violence was found to be negatively correlated to adjusted average pump count (r=-0.37; p<0.05) and positively correlated to history of self harm (r=-0.59; p<0.01), history of harm to others (r=-0.76; p<0.01) and history of previous admissions (r=0.36; p=0.04).

None of the subjects in control group were current user or had a history of substance dependence. Of all the bipolar subjects abusing substance (31.6%), tobacco use was reported by everybody and alcohol abuse by 3 subjects (9.4%). Among epilepsy group, out of the 16.7% current substance users, alcohol abuse was reported by 3.3% and tobacco by all. There was no significant difference among the bipolar and epilepsy group for the substance use, neither did it correlated to any parameter of BIS-11 and BART test.

Discussion

Impulsivity In Bipolar And Epilepsy

Euthymic bipolar patients have comparable generalized impulsivity to healthy controls but had lower self control and more perseverance and cognitive complexity. This signifies presence of more impulsive traits in bipolar patients than healthy population. Previous studies collaborate the same.[17,18] In the study by Dolenc et al (2010),[19] generalised and attentional impulsiveness was higher in euthymic bipolar group in comparison to healthy controls. The discrepancy from the current study could be due to different study participants with more males in our study (87.5%) and comparable gender participation in the above study. BIS-11 being self report measure could be potentially sensitive to recall bias due to the influence of mood symptoms during mania or depression. Similar to our findings, another study reported non-planning impulsivity (cognitive complexity component in our study) to be prevailing in remitted bipolar group.[2]

Highest generalised impulsivity, more lack of cognitive persistence but similar tendency to act on the spur of the moment and a lack of sense of the future was found in epilepsy patients in comparison to bipolar patients and controls. On evaluating 1st order factors, it was observed that bipolar group had lower scores on cognitive instability and motor than epilepsy group and higher scores on cognitive complexity.

It can be inferred from the present study that, there was tendency for bipolar patients to be deficit in area of planning strategies, tended to get bored with persistent life styles and enjoyed challenging task as

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compared to healthy group. When compared to epilepsy group, bipolar group tended to have better control on racing thoughts and motor acts and enjoyed challenging tasks.

The presence of more impulsiveness in stable epilepsy patients found in our study is corroborated by other such studies. One such study of stable epileptic patients found more of motor impulsivity.[20] In the current study besides motor impulsivity, high attentional impulsiveness was also noted similar to another study assessing frontal lobe lesions (which included epilepsy as one of the group).[21]

Current study establishes that impulsivity was higher in both bipolar and epileptic patients than healthy population however rates differ which raises possibility of disturbance in a self-regulation strategy due to underlying neurobiological mechanism.

Risk Taking Behaviour In Bipolar Disorder And Epilepsy

Bipolar patients had a higher risk taking behaviour (asserted by higher mean scores of adjusted average pump count) than epilepsy patients and healthy controls. The scores increased as the test progressed. This may be related to lower self control and more perseverance and cognitive complexity observed in bipolar patients compared to healthy controls. Epilepsy patients had similar risk taking behaviour as healthy controls. But the levels reached significance with task progression as patients with epilepsy showed reduced risk taking behaviour than controls on last 10 balloons. These findings are in contrast to the findings of higher impulsivity in epileptic patients' more than bipolar patients or healthy controls.

Similar disparate findings over impulsivity and risk taking have been observed in other studies too. In one study, bipolar group scored more highly on the behavioural measure of impulsivity than controls, however, there were no between groups differences on the behavioural risk taking task.[22] In another such study, euthymic bipolar subjects exhibited elevated levels of self-reported impulsivity compared to healthy subjects but performed similarly on tasks designed to assess reward valuation and risk taking propensity.[23] Such findings may indicate disparity of results obtained in subjective cognitive versus objective behavioural assessment.

In contrast, the current study found poor performance on BART indicating a difference between bipolar and control groups in baseline risk taking, with the bipolar group exploding significantly fewer balloons and having more adjusted average pump count. Previous research reports of mixed findings regarding behavioural risk taking assessment evaluations in bipolar patients. While few studies report of no differences in the average number of pumps per balloon among bipolar and control subjects,[22,24] others report of similar findings as ours.[25] Another study reported that bipolar patients and their relatives had similar and significantly lower adjustment scores (number of pumps after trials where the balloon did not pop minus the number of pumps after trials where the balloon popped) than healthy controls.[26] The disparity in findings could be due to the presence of heterogeneous bipolar group (predominantly alcohol dependence) in previous studies unlike ours wherein those with substance dependence were excluded.

The current findings suggest a mild deficit in risk taking behaviour even during remission in bipolar disorder. This difference could also be due to poor cognitive functioning in bipolar patients. Other contributing factors could be deficits in visuospatial memory and working memory, [27] or different processing of reward-related information.[28]

Holmes et.al, (2009) found that performance on BART correlated with the motor impulsivity subscale of BIS-11,[24] indicating that impulsivity and risk taking are two distinct constructs, though no such correlation was found in the current study in any of the groups. The epilepsy group also showed significantly lower scoring on BART in comparison to healthy controls. This could be due to marked cognitive disturbance in patients with epilepsy due to disease per se and the AEDs. No study has been conducted so far comparing directly the risk taking behaviour in epilepsy.

Impulsivity And Violence

Impulsivity in psychiatric disorders hasssssss been associated with suicidality, violence, substance abuse and crime.[29] The present study reported more of non-planning impulsivity in subjects with history of violence while in one study, bipolar patients reported of higher motor impulsivity.[30]

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A history of violence was positively correlated to history of harm to others, psychotic symptoms and cognitive complexity (non-planning impulsiveness). Literature has consistently shown that history of violent behaviour is the best single predictor of future violence.[31, 32]

A positive correlation between history of self harm and impulsivity (self control and generalised) was observed. This finding is supported by findings of increased suicidality to be associated with impulsivity independent of the bipolar phase.[33] But in contrast to our study, Swann et al (2008) found attentional type of impulsivity to be more prevalent in patients with history of suicidal attempts.[34] Hopelessness have been suggested to interact with impulsivity resulting in suicide in various theoretical, epidemiological and clinical studies.[33,35,36,37,38] In major depressive disorder, impulsive aggression was associated with greater risk for completed suicide.[38,39]

Association With Illness Features

On comparing the illness course (age of onset and illness duration) with impulsivity or risk taking behaviour, no correlation was found in any of the bipolar or epilepsy groups. Swann et al (2009) reported that earlier the age of onset of bipolar disorder more was the attentional impulsivity and the duration of illness was found to correlate with motor impulsivity.[40] In the above study, it was also found that age contributed to motor scores, and education to total and non-planning scores of BIS-11 without any significant gender effects.[40] In current study also, age was found to be positively correlated with motor (perseverance) impulsivity. But there was a gender difference with females having lower score than males and no correlation with education was found. No such data is available so far in epilepsy patients for comparison.

Limitations And Future Directions

The current study is limited in generalization due to a cross sectional evaluation with a small sample size and the assessment of personality profile was not undertaken that could have shed more light upon the subject. A more comprehensive assessment of cognitive parameters in the light of neuroimaging analysis is needed to evaluate in detail the linkage between epilepsy and bipolar disorder.

Conclusion

Bipolar subjects scored more on the behavioural risk taking task and epilepsy subjects had higher scores on behavioural measures of impulsivity than the rest of two groups. Trait impulsivity was found in both bipolar and epilepsy subjects being significantly more than controls. Age was found to be positively correlated with motor (perseverance) impulsivity. A history of violence was positively correlated to history of harm to others, psychotic symptoms and cognitive complexity (non-planning impulsiveness) and a positive correlation between history of self harm and impulsivity (self control and generalised) was observed.

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