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ASSESSING THE EFFECT OF PARENTAL PSYCHIATRIC DISORDER ON ADOLESCENTS USING BRIEF PSYCHIATRIC RATING SCALE – A CASE STUDY

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Abstract

To study various aspects of psychological vulnerabilities among adolescent children of psychologically ill parents, having psychological disturbances due to primary-malfunction or drug addiction. In this case–control study throughBrief Psychiatric Rating Scale (BPRS), 116 parents with children aged 15–18 years were included that 58 of them with psychiatric health problems were selected and 58 of them were from healthy. Data reliability was tested using Cronbach α and permutation test was used to compare case and control group to find the effect of parental psychiatric illness on adolescents through BPRS. The datareliability using Cronbach α was found to be 0.94, indicating and the fraction of a test score attributable to error was less. The correlation between excitement and anxietywasmaximum and was minimum between uncooperativeness' and guilt feelings; the values being 0.696,and 0.155 respectively. The case and control groups were significantly different, as test statistic, -9.266 with, *p*- value< 0.001. Also, there was significant difference between each item of two groups e.g. test statistic corresponding to anxiety, depression and excitement-7.922, -7.426, -7.729 respectively with *p*-value < 0.001. The study concluded that the psychiatric disorders were found to be more than a two to three fold in offspring of psychiatric ill compared with healthy parents.

Keywords:
Brief Psychiatric Rating Scale;
Cronbach α ;
Permutation test

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1. Introduction

Psychiatric disorders have a major impact on overall health and are associated with suffering, functional impairment, morbidity and early mortality. Mental disorders account for a large proportion of the disease burden in young people in all societies and generally begin between 12–24 years of age [7]. Mental illness includes a wide variety of disorders that exist on a severity continuum. Some can be temporary responses to crisis, while others are chronic conditions. Also,it is associated with a significant burden of morbidity and disability. Mental illnesses have various causes and triggers e.g., parental psychiatric disorder affects the several aspects of children's development, including their physical, cognitive, social, emotional, and behavioral development [4].These offspring problems often begin before puberty, continue into adolescence and adulthood, and their effect can be transmitted to the next generation [5]. Taylor, D. C. (1985) study suggested that experts should be more concerned about the context and background of patients' sickness to avoid misdiagnosis of childhood maladjustment and disorders.

Soroor Arman et al. (2018) study aimed to evaluate relationship with psychiatric disorders in children of parents with bipolar disorder (PBD) compared with control. They conducted case–control study, parents with children aged 6–17 years were included, 250 with bipolar disorder were selected as the case group and 250 were healthy as control group. The parents were selected according to the Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5) by an expert. Psychiatric disorders in children were assessed by The Kiddie Schedule for Affective Disorders and Schizophrenia for school-age children (KSADS). According to their study with tool KSADS, two groups of children were significantly different in depression, mania, attention-deficit hyperactivity disorder, and post-traumatic stress disorder. The chance of psychiatric disorder's incidence in children of PBD was higher than children of healthy parents.A 4-year prospective study was undertaken by Rutter, M., & Quinton, D. (1984)on 157 families with newly diagnosed psychiatric patients with children under age 15 years living in inner London. The study suggested that the children of psychiatric patients had an increased rate of persistent emotional/behavioraldisturbance, and personality disorders associated with high levels of hostile behavior.

Brief Psychiatric Rating Scale (BPRS) is a test used to assess the positive, negative and affective symptoms of individuals with psychiatric disorders [1]. This instrument is

particularly useful for assessing the efficacy of treatment in case of patients with moderate to severe disorder. Initially it was developed by Dr. John Overall and Dr. Donald Gorham (1962) and contained 16 questions and two more items were included in it (1967) [2]. In its present form it consists of 18 questions which measure an array of traits viz. Somatic Concern, Anxiety, Emotional Withdrawal, Conceptual disorganization, Guilt Feelings, Tension, Mannerisms and Posturing, Grandiosity, Depressive Mood, Hostility, Suspiciousness, Hallucinatory Behavior, Motor Retardation, Uncooperativeness, Unusual Thought Content, Blunted Affect, Excitement and Disorientation [2].Each item is rated on a scale of 0-7, where 0 measures 'not assessed', 1 measures 'not present' and 7 measures 'extremely severe' [3].

Gale, J. et al. (1986) study was conducted on forty-eight children and adolescents with widely varied presenting problems were interviewed by clinician-raters to evaluate the reliability of the BPRS for Children (BPRS-C) (Overall &Pfefferbaum, 1982). Their study concluded that all seven composite factor scores proved reliable suggested the advantage of using composite scores for the evaluation of treatment effects in the child and adolescent patient populations. McIlhaney, K et al. (2008) conducted prospective study with BPRS-C for the age group between 4 to 18 years to determine the usability of the tool. Their research indicated that the BPRS-C to be effective for evaluating significant improvement in the three different settings.

The present study is aimed at assessing the impact of parental mental illness on the psychiatric health of the adolescent children using BPRS. The BPRS is one of the most frequently used instruments for evaluating psychopathology in terms of reliability, validity and sensitivity. In this case–control study, 116 parents with children aged 15–18 years were included that 58 of them with psychiatric health problems were selected as the case group and 58 of them were healthy as control group. The parents were selected according to the Diagnostic and Statistical Manual of Mental Disorders-IV (DSM-IV) by an expert. Psychiatric disorders in children were assessed by Brief Psychiatric Rating Scale. This paper focuses on the internal consistency, which refers to whether participants are responding to the 18 items of a BPRS questionnaire in a consistent manner in a single trial. Internal consistency is examined by Cronbach alpha and Guttman's lambda 6 as no single reliability index can be considered a perfect assessment tool for any study [12]. The seven composite factor scores are used here to categorize psychiatric disorder from moderate to severe level. The two groups are compared with permutation test (nonparametric test) to

find the chance of psychiatric disorder's incidence in children of psychiatric ill parents as compared to children of healthy parents. Section 1 includes introduction and aim of the study. Section 2 deals with the materials and methods, results are presented in section 3 followed by discussions in section 4.

1.1. Aim of the study

To study various aspects of psychological vulnerabilities with BPRS among adolescent children of psychologically ill parents, having psychological disturbances due to primary-malfunction or drug addiction for likely mitigation through early detection and expert intervention.

2. Materials and Methods

2.1 Material

Case Group:

Subjects included in the study were the adolescents of age group between 15 to18 years of psychiatrically ill parents utilizing the services of the Department of Psychiatry and Drug De- addiction Center, Lady Hardinge Medical College, New Delhi between the periods October 2015-September 2015.

Control Group:

Subjects included were the adolescents of age group between 15 to 18 years of healthy (without any psychiatric problem) parents who were selected from a New Delhi Municipal Corporation (NDMC) School, New Delhi. The adolescents were matched on the basis of socio-economic status, age, gender and educational level.

Inclusion Criteria for *case group and control group*

Case group

1. Adolescents of age group between 15 to 18 years with at least one parent having diagnosis of psychiatric illness as per ICT-10.

2. Subjects willing to participate in the study with written informed consent.

Control group

1. Subjects of age group between 15 to 18 years with none of parents having diagnosis of psychiatric illness.

2. Subjects willing to participate in the study with written informed consent.

Exclusion Criteria:

1. Subjects with history of head injury with neuro-organic consequences.
2. Subjects or parents suffering from any medical or surgical disease.
3. Subjects not willing to participate in the due to any reason.

This study is a cross-sectional in which 116 adolescents in the age group of 15 to 18 yearswere included and categorized in two groups each of size 58, in accordance with the inclusion and exclusion criteria for the present study. A written consent was obtained for each subject. The method of sampling for the case group was purposive because the subjects were the offspring of mentally ill parents who were available when they used to visit the said department for their parent's treatment.

2.2 Methods:

2.2.1 Cronbach's alpha (Data reliability test) : It is a measure used in order to measure the reliability of data especially psychiatric data. Mathematically, Cronbach's alpha is defined as

$$\alpha = \frac{N.\bar{c}}{\bar{v} + (N-1).\bar{c}}$$

where, N is the number of items, $\bar{c}$ is the mean inter-item covariance among the items and $\bar{v}$ is the mean variance.A high value of Cronbach's alpha indicates the high internal consistency of the data, i.e. how closely related are the items of the data as a group.

2.2.2 Permutation test: (To comparing two independent groups)

The objective is to compare the two populations when a parametric form of underlying distribution is not specified. The permutation test, also known as **randomization test** is widely used in practice in nonparametric statistics because of minimal assumptions and flexibility of the test statistic. Permutation methods can still be applied even when a parametric statistical method fails. The permutation test can be used to test the null hypothesis

H_0: There is no significant difference between the psychological disorders in two different groups of adolescents

H_1: There is significant difference between the psychological disorders in two different groups of adolescents

The mathematical formula for computing the *p*-value is

.
$$p = \frac{Number\ of\ D's \geq D_{score}}{\binom{n_1 + n_2}{n_1}}$$

where D_{score} is difference between the means of the observed data corresponding to two groups.

3. Results and Discussions

3.1 Results

3.1.1 Data Description

The 116 respondents were categorized according to whether they belong to the 'Case' group or the 'Control' group and in each group 58 respondents were there. Each group was then further categorized according to gender, age and the income of the family. Income classes were determined according to the Kuppuswamy scale. The following table represents the number of respondents in each category.

Table 1: Number of adolescents categorized according to 'gender', 'age' and 'family income' for the 'Case and the 'Control' groups

Group	Gender		Age		Income	
	Male	Female	<=16	>16	Lower	Upper
Control	46	12	24	34	31	27
Case	45	13	21	37	30	28

The BPRS instrument was administered to total of both the 'Control' and the 'Case' groups. Following results were obtained (Table 2).Here, 'Score' are denoting the total score obtained by the respondents in the specified class intervals. All but one of the respondents in 'Control' group is having a score in class 18-36, i.e., approximately 98% respondents are under 'very mild' category and one respondent is under 'mild' category. On the other hand the respondents of the 'Case' group are largely in 'moderate' and 'severe' categories, i.e., approximately 81% and only 11 out of 58, i.e., 19% are in 'very mild' and 'mild' categories. The bar charts of the two groups are given below in Figure (1).

Table 2: BPRS- Frequency Table for the 'Control' and the 'Case' groups

Score	18-36	36-54	54-72	72-90	90-108
Control-Total	57	1	0	0	0
Case- Total	1	10	25	19	3

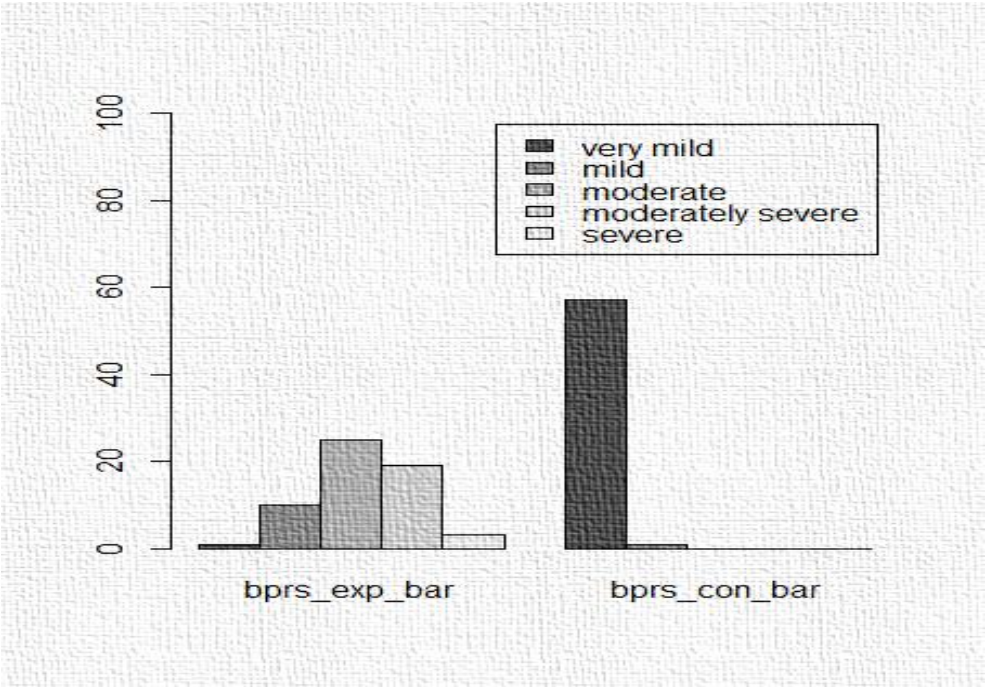


Figure 1- The bar charts representing the frequency distributions of the 'Case-total' and the 'Control-total' groups of BPRS

The two sets of bars are representing the frequencies of score categories of the ‘Case’ group and the ‘Control’ group. Although in the ‘Case’ group, the distribution is spread over a large range of scores, most of the valuesare concentrated in the ‘moderate’ to ‘moderately severe’ categories. For the ‘Control’ group, the distribution is concentrated in the ‘very mild’ category.

The Table3 below shows item-wise mean and standard deviation of respondents of both the groups. The means of item Q1, i.e. ‘Somatic concern’ corresponding to ‘Control’ group, ‘Case’ group and the ‘Combined’ group (116 respondents have been considered together), are 2.31, 3.09 and 2.4 respectively. The standard deviations of item 1 corresponding to ‘Control’ group, ‘Case’ group and the ‘Combined’ group are 1.453, 1.792 and 1.5 respectively. Similar descriptive statistics are computed for other items and are summarized in Table 3.Whereas the means of all the 18 traits are low for the ‘Control’ group, for the ‘Case’ group, means varied vividly for different traits. The higher mean values are observed for ‘Anxiety’, ‘Excitement’, ‘Tension’, and ‘Depressive mood’. All these high means are associated with high standard deviations also. High means indicate that these aspects of BPRS are particularly associated with the mental illness/ wellness of

parents and the high standard deviations indicate at the variability associated with these means further implying that some of the scores are very high. For all the 18 items, means in the 'Case' group are higher than the corresponding means in the 'Control' group.The graph given in Figure (2) shows these findings where mean scores for both the groups have been plotted for every item. In the 'Control' groups, all the traits are having similar means but the difference is clearly visible for these traits in the 'Case' group.

Table 3: Item-wise- Descriptive Statistics (N = 116) for 'Control', 'Case' and the Combined groups

Attribute	Item	Mean			Standard Deviation		
		Control	Case	Comb	Control	Case	Comb
Somatic concern	Q1	2.31	3.09	2.4	1.453	1.792	1.5
Anxiety	Q2	2.24	**4.80**	3.3	1.647	1.986	1.8
Emotional Withdrawal	Q3	1.95	3.45	2.4	1.456	1.848	1.7
Conceptual Disorganization	Q4	2.09	**4.11**	2.9	1.302	1.970	1.9
Guilt feelings	Q5	1.93	3.21	2.4	1.183	1.796	1.6
Tension	Q6	2.21	**4.18**	3.0	1.321	1.936	1.9
Mannerism and Posturing	Q7	1.98	3.68	2.6	1.304	1.738	1.7
Grandiosity	Q8	2.12	3.39	2.5	1.272	1.691	1.5
Depressive mood	Q9	2.05	**4.09**	2.8	1.456	1.890	1.9
Hostility	Q10	2.02	3.66	2.7	1.000	1.871	1.7
Suspiciousness	Q11	2.07	3.73	2.7	1.375	2.093	1.9
Hallucinatory Behavior	Q12	2.05	3.32	2.5	1.191	1.749	1.6
Motor retardation	Q15	1.91	3.20	2.4	1.115	1.872	1.6
Uncooperativeness	Q14	2.03	3.16	2.4	.917	1.886	1.5
Unusual thought Content	Q15	2.24	3.15	2.5	1.247	1.936	1.6
Blunted effect	Q16	2.00	3.86	2.8	.973	1.958	1.9
Excitement	Q17	2.21	**4.75**	3.2	1.620	2.108	2.3
Disorientation	Q18	2.17	**4.00**	2.8	1.286	2.089	1.9

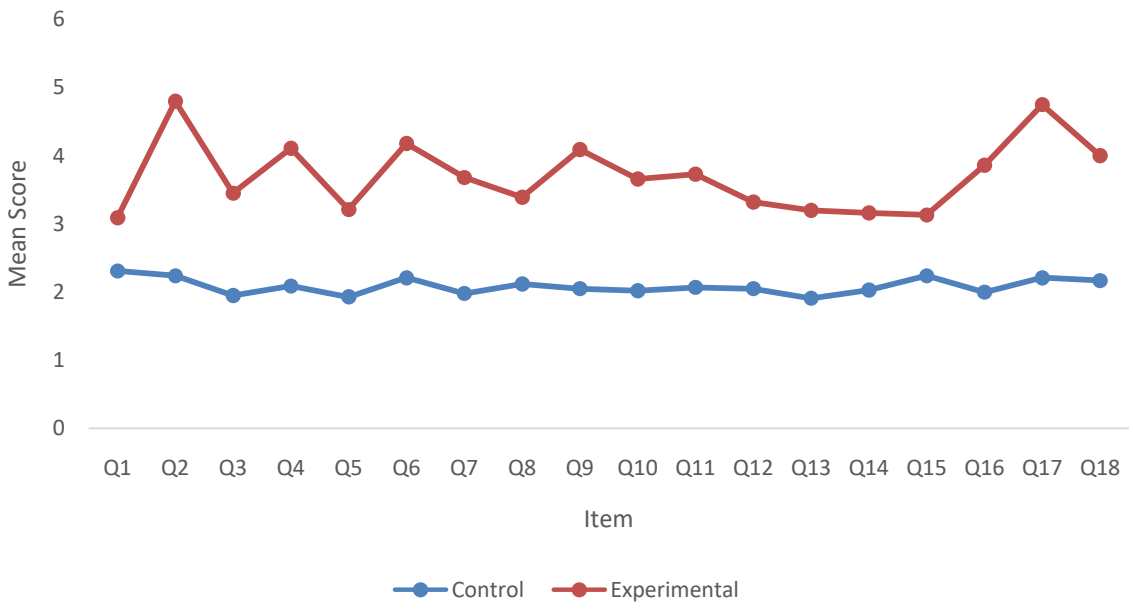
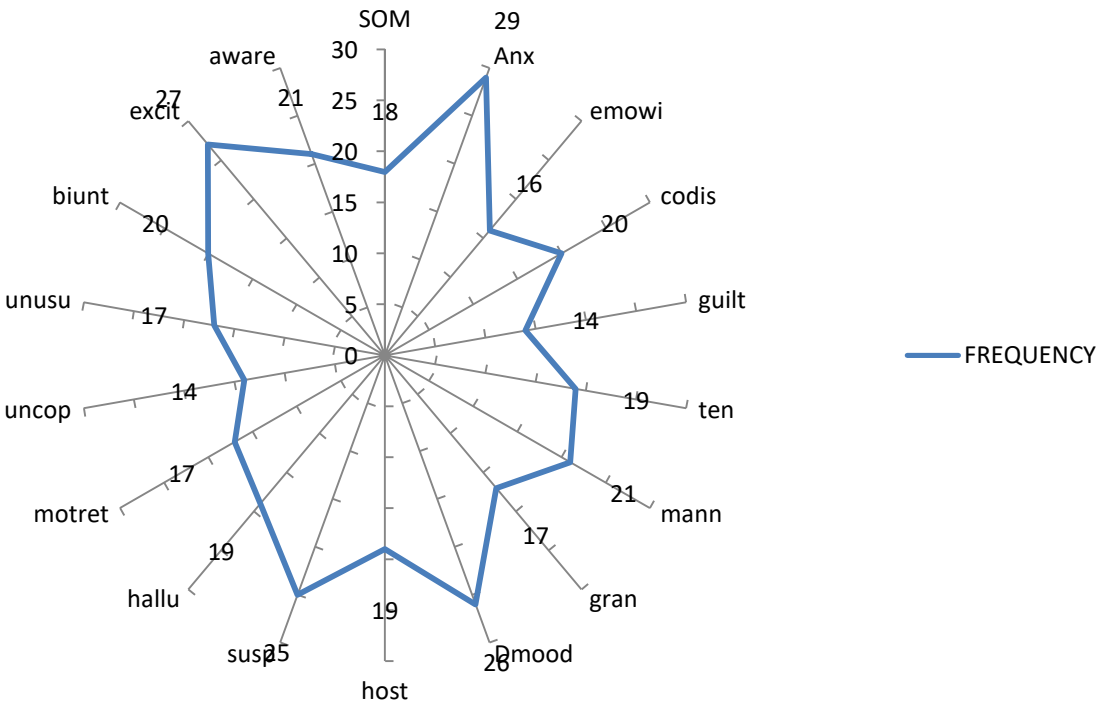


Figure 2- The lines representing the mean score of the 'Control' and the 'Case' groups of BPRS

*Experiment - case

The 'Radar chart' below represents the frequency distribution for the 18 traits of BPRS of 45 out of 58 adolescents form the 'Case' group, after eliminating the respondents who fall in 'Very mild' and 'Mild' categories. The largest number of respondents is with the trait 'Anxiety' which is 29, followed by 'Excitement', which is 28 and 'Depressive Mood' which is 26. This means that the number of respondents who scored high in respect of these traits is high. This further implies that the averages obtained above are not high due to high scores of some respondents only but due to high scores of a large number of respondents.



3.1.2 Reliability Analysis

The reliability of data is tested using Cronbach's α. The overall Cronbach's α is 0.94 which indicates at a very high level of data reliability/ consistency. Guttman's lambda 6 is 0.95 which confirms the results of Cronbach'sα. This reliability estimates show the amount of measurement error in a test. Squaring this correlation (Cronbach's α) and subtracting from 1.00 produces the index of measurement error. As the test has a reliability of 0.94, there is an error variance(random error) of magnitude 0.116 in the scores (0.94×0.94 = 0.8836; 1.00 – 0.8836 = 0.116). This reliability of a test reveals the effect of measurement error on the observed score of a cohort rather than on an individual respondent.

Table 4: Reliability test on sampled data collected through BPRS

raw alpha	std.alpha	G6(smc)	Mean	Sd	95% C.I.
0.94	0.94	0.95	2.7	1.2	(0.92,0.95)

3.1.3 Correlation Matrix

Further, the correlations between the 18 items of BPRS for the 'Case' group were computed. It was found that the items '**Excitement'** and '**Anxiety'** had the maximum correlation, r = 0.696. This means that for about 70% of the respondents, the scores associated with these two traits behave similarly. This has also been established by the

'Radar' chart above which shows the maximum frequencies are associated with these two traits. The correlation between items '**Uncooperativeness'** and '**Guilt'** feelingswas found to be minimum, r = 0.155 which suggests a very weak linear relationship between these two traits. None of the correlations has been found to be negative which means that all the 18 traits tend to move in the same direction. The graph below is a pictorial representation of the above correlation matrix. The color line at the horizontal axis represents the range of the correlation values. The correlation can be examined by looking at the color of the dot at the intersection of two items. For example, the dots below the item 'Q 14' on the diagonal represent the correlations of 'Q14' with all the items. The color intensity of the dots shows the strength of the correlation between two traits. Obviously, correlation dot of an item with itself has the highest color intensity.Correlation is obtained between all the items in the following table and is also displayed graphically.

Table 5: Correlation between the items of BPRS

ITEM	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18
Q1	1																	
Q2	0.53	1																
Q3	0.31	0.41	1															
Q4	0.34	0.48	0.39	1														
Q5	0.26	0.47	0.53	0.4	1													
Q6	0.45	0.55	0.42	0.54	0.34	1												
Q7	0.41	0.56	0.49	0.49	0.49	0.59	1											
Q8	0.39	0.52	0.34	0.41	0.39	0.39	0.44	1										
Q9	0.43	0.59	0.59	0.52	0.46	0.49	0.48	0.57	1									
Q10	0.35	0.58	0.55	0.36	0.45	0.38	0.37	0.42	0.54	1								
Q11	0.42	0.64	0.34	0.39	0.41	0.47	0.56	0.51	0.5	0.62	1							
Q12	0.33	0.51	0.26	0.4	0.33	0.53	0.54	0.49	0.52	0.43	0.51	1						
Q13	0.41	0.46	0.34	0.46	0.46	0.36	0.44	0.28	0.41	0.56	0.4	0.46	1					
Q14	0.37	0.45	0.32	0.27	0.16	0.26	0.25	0.41	0.47	0.51	0.49	0.41	0.36	1				
Q15	0.38	0.33	0.32	0.35	0.18	0.23	0.41	0.39	0.37	0.28	0.58	0.33	0.3	0.31	1			
Q16	0.37	0.6	0.29	0.51	0.35	0.5	0.49	0.36	0.43	0.51	0.59	0.54	0.6	0.35	0.42	1		
Q17	0.43	0.7	0.52	0.44	0.49	0.56	0.59	0.49	0.57	0.66	0.65	0.46	0.56	0.32	0.39	0.68	1	
Q18	0.41	0.61	0.38	0.42	0.4	0.3	0.45	0.37	0.54	0.59	0.56	0.45	0.47	0.52	0.31	0.42	0.49	1

Qi- refers to the ith items of BPRS; *i* = 1,2…18

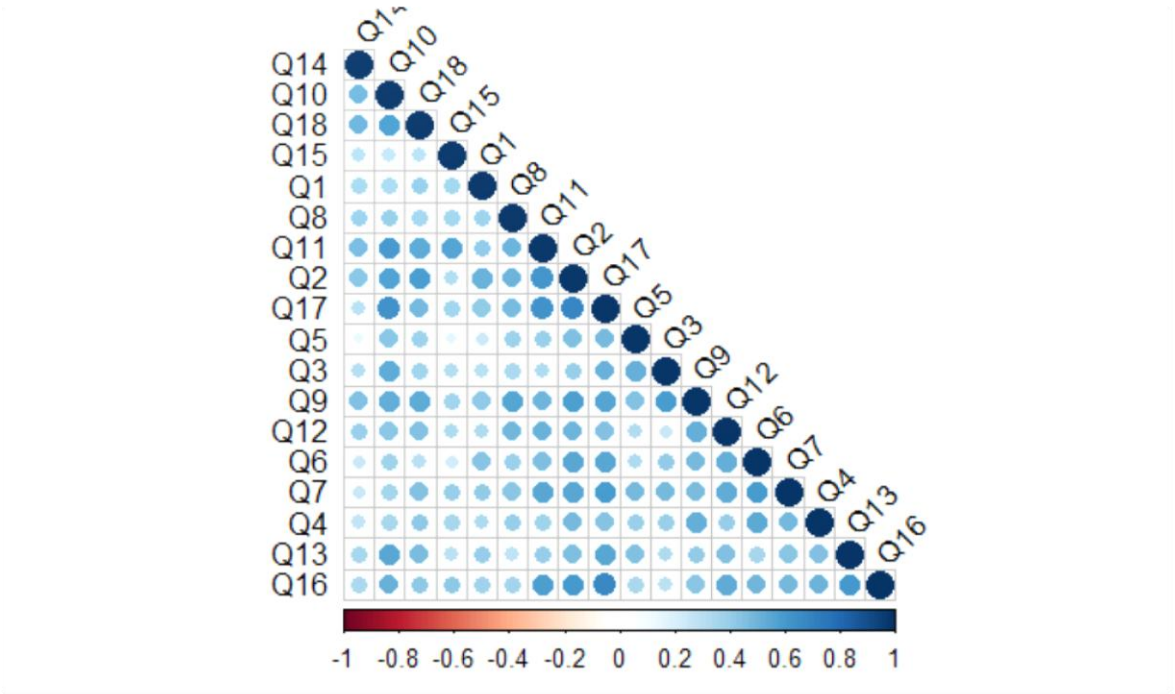


Figure 1: Correlations between various items of BPRS

3.1.4 Hypothesis Testing

To examine the effect of Group (respondents belonging to the 'Control' and the 'Case' groups), Sex (male and females), Age (Below and above 16 years of age) and Income (Below and above level L according to the Kuppuswamy scale) on the BPRS total scores of the respondents, the following null and alternate hypotheses were set:

H_0: mean score of total(BPRS) first group = mean score of total(BPRS)second group
H_1: mean score of total(BPRS) first group > mean score of total(BPRS)second group;

The following results are obtained through permutation test:

Table 5: Comparison of BPRS scores of the groups under grouping variables 'Group', 'Sex', 'Age' and 'Income'

Grouping variable	**Group**		**Sex**		**Age**		**Income**	
	Test tatistic	*p*-value	Test Statistic	*p*-value	Test Statistic	*p*-value	Test statistic	*p*-value
Statistic value	-9.266	<0.001	-0.6038	0.546	0.0257	0.9795	-1.175	0.24

There is a significant difference on the basis of grouping variable 'Group' and no significant difference is there on the basis of grouping variables 'Sex' , 'Age' and 'Income'.

Next, to check the effect of the grouping variable 'Group' on each of the BPRS items through permutation test, the following hypotheses were set:

H_{0i}: *mean score of* i^{th} *item of BPRS of Case group = mean score of* i^{th} *item of BPRS of Control group*

H_{1i}: *mean score of* i^{th} *item of BPRS of Case group >mean score of* i^{th} *item of BPRS of Control group*

$i=1,2,\ldots,18$

The following results were obtained (Table 6).For the grouping variable 'Group', all the 18 items' *p*-values were found to be less than 0.05, which meant that all the attributes are significantly different for the two groups viz., the 'Control' and the 'Case'.

Table 6: Comparison of BPRS scores per item on the basis of Group

Item	**Test Statistc**	***p*-value**	**Item**	**Test Statistic**	***p*-value**
Somatic concern	-4.159	< 0.001	**Hostility**	-5.989	< 0.001
Anxiety	-7.922	< 0.001	**Suspiciousness**	-5.622	< 0.001
Emotional withdrawal	-6.98	< 0.001	**Hallucinatory behavior**	-5.837	< 0.001
Conceptual disorganization	-7.586	< 0.001	**Motor retardation**	-5.481	< 0.001
Guilt feelings	-6.102	< 0.001	**Uncooperativeness**	-4.146	< 0.001
Tension	-7.212	< 0.001	**Unusual thought content**	-4.021	< 0.001
Mannerism and posturing	-6.885	< 0.001	**Blunted effect**	-6.342	< 0.001
Grandiosity	-6.191	< 0.001	**Excitement**	-7.729	< 0.001
Depressive mood	-7.426	< 0.001	**Disorientation**	-6.108	< 0.001

3.2 DISCUSSION

The burden of mental disorders worldwide is a major public health problem that affects patients, society, and nations as a whole. The impact of parental psychiatric disorder on children is not included routinely in medical education, but previous study by Taylor, D. C. (1985) suggested that context and background of patients' sickness should be considered to avoid misdiagnosis of childhood maladjustment and disorders.

Calculating data reliability has commonly being used in medical education research when multiple-item measures of a concept are employed. In this study data reliability is tested using Cronbach α as this is the most sophisticated and widely applied index of internal consistency. This examines the average inter-item correlation of the items in a questionnaire [13].The value of Cronbach α is 0.94, indicating high reliability and the fraction of a test score that is attributable to error is less.

The Brief Psychiatric Rating Scale with 18 items is one of the most widely used scales in psychiatric research. In this study we have obtained correlation matrix between all the items and found that excitement is significantly correlated with anxiety, hostility and suspiciousness. There is significant correlation between other items also; however some items like uncooperativeness and guilt are not correlated. This result is in accordance with a previous study that the items of the BPRS-18 can be grouped in clusters or factors, each one comprising a set of items that correlate highly among themselves, but associate little with the remaining items [16].

Parental psychiatric illness is among the most consistent and well replicated risk factors of adolescence anxiety, depressive mood, excitement, and other disruptive behavior disorders. We have applied permutation test to compare case and control group to find the effect of parental psychiatric illness on adolescents through BPRS (18 item questionnaire). Permutation test is widely used in practice as nonparametric statistics because of minimal assumptions and flexibility of the test statistic. Permutation tests can be applied to continuous, ordinal or categorical data from normal as well as non-normal distribution [17]. The two groups are found to be significantly different as the p value $<.05$ corresponding to each item. These problems are more than a two to three fold in offspring of psychiatric ill compared with healthy parents. Using BPRS, we have found that the fully evolved psychopathology in the parent is producing psychological changes in the

offspring, affecting their wellbeing shown by the higher scoring on various items in the scale by the case group.

4. Conclusion

The psychiatric disorders are more than a two to three fold in offspring of psychiatric ill compared with healthy parents.

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