

# Premorbid Adjustment in Predicting Symptom Severity and Social Cognitive Deficits in Schizophrenia

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CME

## Abstract

**Objective:** Schizophrenia patients have deficits in premorbid adjustment (PMA) and social cognition (SC); both deficits are associated with symptom severity, neuro-cognitive deficits, and prognosis. This study aimed to determine symptom severity and two domains of SC deficit by assessing specific areas of PMA in schizophrenia patients.

**Methods:** This cross-sectional study included 60 male and 60 female patients with paranoid schizophrenia aged 20 to 35 years from two psychiatric inpatient departments of Chhattisgarh state of India. They were assessed using the Scale for Assessment of Positive Symptoms, Scale for Assessment of Negative Symptoms, Premorbid Adjustment Scale, Recognition of Facial Expression Task, and Picture Arrangement Test.

**Results:** Deficits in premorbid sociability and in scholastic performance were the best predictors of severity of positive symptoms, social knowledge, and negative emotion recognition deficit in schizophrenia patients.

**Conclusion:** Given the important role of SC and PMA, assessing premorbid functioning can help in deciding early and appropriate intervention for schizophrenia.

**Key words:** Affective symptoms, Schizophrenia, paranoid; Social adjustment

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## Introduction

Premorbid adjustment (PMA) is defined as a combination of peer and social relationships, school adaptation, job functioning, and satisfactory opposite sex relationship prior to the development of schizophrenia.<sup>1</sup> It is associated with the onset, symptomatology, cognitive functioning, and prognosis of schizophrenia.<sup>2-4</sup> In both chronic<sup>5-7</sup> and first-episode<sup>3,8</sup> cases of schizophrenia, disturbances in several areas of functioning have been observed prior to the onset of diagnosable illness. PMA studies that compare schizophrenia disorder, bipolar disorder,<sup>9</sup> and mania<sup>10</sup> have reported larger deterioration in functioning in schizophrenia cases. Schizophrenia can be considered a neurodevelopmental disorder,<sup>11</sup> and its manifestation affects several areas of general and cognitive functioning.<sup>12</sup> PMA studies may enable early detection of the illness.

PMA is associated with negative schizophrenia symptoms.<sup>3-5</sup> In a study of 41 schizophrenia patients, poor PMA was associated with a poor Positive and Negative Syndrome Scale score that was in turn associated with progressive deterioration from childhood to adulthood, poor peer relationships, and poor scholastic performance.<sup>13</sup> In a follow-up study of the PMA Scale in 87 schizophrenia patients, three patterns of premorbid deterioration (stable-good, stable-poor, and continuous deterioration) were identified in 36.8%, 35.6%, and 27.6% of patients, respectively.<sup>3</sup> Patients with stable-poor PMA had significantly more severe negative symptoms in their second- and third-year course than patients with stable-good PMA, whereas patients with good PMA had fewer negative symptoms even in their third year of follow-up.

Social cognition (SC) is defined as a cognitive process to make sense of the social world and its utilisation to facilitate social interactions.<sup>14,15</sup> Five domains of SC have been identified by the Measurement and Treatment Research to Improve Cognition in Schizophrenia working group: emotion processing, theory of mind, social perception, social knowledge, and attributional bias.<sup>16</sup> Schizophrenia patients consistently have cognitive deficits,<sup>17,18</sup> which are targets for intervention.<sup>19,20</sup> In first-degree relatives and first-episode schizophrenia patients, cognitive deficits in verbal memory and executive function are commonly reported and thus schizophrenia is considered a neurodevelopmental disorder.<sup>21</sup> These deficits can exist in childhood, long

before the development of schizophrenia.<sup>22</sup> They are caused by abnormal brain development that hinders the patient's ability to acquire appropriate cognitive abilities. PMA is also associated with clinical and gender issues.<sup>23-25</sup> Nonetheless, studies of association between PMA and SC are lacking. This study aimed to predict symptom severity and two domains of SC deficit through specific areas of PMA in schizophrenia patients.

## Methods

This study was approved by the Institutional Ethical Committee for Human Research, Pt. Ravishankar Shukla University Raipur, Chhattisgarh, India (reference No. 038/IEC/PRSU/2014). Written informed consent was obtained from each patient and/or adult caregiver. A total of 60 males and 60 females diagnosed with paranoid schizophrenia as per ICD-10 Classification<sup>26</sup> were recruited through purposive sampling from the in-patient department of two psychiatric hospitals in Chhattisgarh state of India. Inclusion criteria were: age 20-35 years (so as to match the principal age of onset of schizophrenia in Indian and other populations,<sup>27,28</sup> to indirectly control illness duration to ensure accurate memory of premorbid functioning, and to ensure age-wise homogeneity of participants for better generalisation), minimum education of 10 years (to fulfil the minimum requirement for outcome measures), and absence of any history of neurological or severe physical illness or comorbidity of other psychiatric illness. Patients with any other comorbidity were excluded to ensure that social cognitive deterioration was due to schizophrenia only.

Severity of positive symptoms (hallucinations, delusions, bizarre behaviour, and positive formal thought disorder) and negative symptoms (affect disturbances, alogia, avolition, anhedonia, and attention) of schizophrenia was assessed using the Scale for Assessment of Positive Symptoms (SAPS)<sup>29</sup> and Scale for Assessment of Negative Symptoms (SANS).<sup>30</sup> Both were a 6-point Likert scale (0-5); a higher score indicated more severity. The SAPS comprised 34 items, with a possible score of 0 to 170. The SANS comprised 25 items, with a possible score of 0 to 125. Both scales have been used in Indian samples.<sup>31,32</sup>

The PMA Scale<sup>1</sup> was used to assess the degree of sociability and peer interactions, scholastic performance and adaptation, and socio-sexual behaviour in childhood (0-11 years), early adolescence (12-15 years), late adolescence (16-18 years), and adulthood ( $\geq 19$  years) by interviewing close informers (parents, siblings, and patients). Performance in different domains of the PMA scale one year before schizophrenia onset was obtained. Higher score indicated poorer adjustment.

Two domains of SC were assessed: recognition of facial expression task<sup>33</sup> and social knowledge.<sup>15</sup> Eight standardised photographs (four male and four female) depicting seven facial expressions (neutral, aggression, surprise, happiness, disgust, fear, and sad) were shown one-by-one on a computer screen. Patients were asked to

recognise them from a list of six random affects. Neutral affect was used only for trial purposes and was not included in analysis. These photographs were dichotomised into positive emotions (happy and surprise) and negative emotions (aggression, disgust, fear, and sad). One point was assigned for each correct recognition and zero point for wrong recognition. Social knowledge was assessed using the Indian version Picture Arrangement test,<sup>34</sup> a subtest of the Wechsler Adult Intelligence Scale.<sup>35</sup> The Picture Arrangement test is a time-bound test and consists of nine sets of pictures depicting nine themes. Patients were asked to arrange a given set of pictures in a way that described the correct sequence of theme. Higher score indicated better social knowledge (range, 0-42).

Stepwise regression analyses were conducted by entering age, sex, and education level as independent variables in the first step and then entering all PMA scale domains to determine the predictors. Domains that significantly predicted the criterion were retained; the regression model did not predict SANS and positive emotion (criteria) and hence these were not reported. A *p* value of  $<0.05$  was considered statistically significant. All statistical

**Table 1. Demographic, clinical, and performance variables of participants (n = 120).**

Variables	Value*
Age, y	25.34 $\pm$ 3.06 (20-32)
Gender	
Male	60 (50)
Female	60 (50)
Education	
Secondary, 10 y	14 (11.7)
Intermediate, 12 y	55 (45.8)
Graduation, 15 y	51 (42.5)
Scale for Assessment of Positive Symptoms	30.19 $\pm$ 7.30 (8-46)
Scale for Assessment of Negative Symptoms	33.31 $\pm$ 8.88 (14-56)
Premorbid adjustment	
Sociability and withdrawal	0.15 $\pm$ 0.15 (0-0.54)
Peer relationship	0.18 $\pm$ 0.16 (0-0.54)
Scholastic performance	0.45 $\pm$ 0.21 (0-0.83)
Adaptation in school	0.11 $\pm$ 0.18 (0-0.56)
Social-sexual aspect	0.20 $\pm$ 0.20 (0-0.67)
Social cognition	
Social knowledge (picture arrangement test)	8.53 $\pm$ 3.10 (4-18)
Recognition of positive emotions	1.36 $\pm$ 0.58 (0-2)
Recognition of negative emotions	2.81 $\pm$ 1.03 (0-4)

\* Data are presented as mean  $\pm$  SD (range) or No. (%) of participants

analyses were performed using SPSS (version 21.0; IBM Corp, Armonk [NY], USA).

## Results

A total of 60 males and 60 females with schizophrenia (mean age,  $25.34 \pm 3.06$  years) were included (Table 1). Most had education up to an intermediate level (45.8%) or graduation (42.5%). Severity of positive symptoms of schizophrenia was positively associated with premorbid sociability

( $\beta = 0.226$ ,  $p = 0.015$ ) and scholastic performance ( $\beta = 0.20$ ,  $p = 0.036$ ) [Table 2]. Education level was positively associated with social knowledge ( $\beta = 0.23$ ,  $p = 0.014$ ). After controlling for education level and other demographic variables, premorbid poor scholastic performance remained predictive of poor social knowledge ( $\beta = -0.259$ ,  $p = 0.006$ ). Females scored better for recognition of negative emotions ( $\beta = 0.194$ ,  $p = 0.029$ ). Premorbid deficit in sociability also predicted poor recognition of negative emotions ( $\beta = -0.315$ ,  $p = 0.001$ ).

**Table 2. Step-wise regression analysis with premorbid adjustment as a predictor of severity of positive symptoms, social knowledge, and recognition of negative emotions.**

Predictor	$\beta$	t	R	R <sup>2</sup>	$\Delta R^2$	$\Delta F$	p Value
Severity of positive symptoms (Scale for Assessment of Positive Symptoms)							
Model 1							
Age	-0.067	-0.704					0.483
Sex	-0.131	-1.395					0.166
Education	-0.081	-0.862	0.167	0.028	0.028	1.115	0.390
Model 2							
Age	-0.095	-1.001					0.319
Sex	-0.130	-1.410					0.161
Education	-0.028	-0.298					0.766
Sociability and withdrawal	0.213	2.286	0.265	0.070	0.042	5.224	0.024
Model 3							
Age	-0.081	-0.874					0.384
Sex	-0.114	-1.248					0.214
Education	0.036	0.365					0.716
Sociability and withdrawal	0.226	2.461					0.015
Scholastic performance	0.200	2.127	0.253	0.106	0.036	4.526	0.036
Social knowledge (picture arrangement test)							
Model 1							
Age	-0.031	-0.327					0.744
Sex	-0.074	-0.804					0.423
Education	0.230	2.486	0.232	0.054	0.054	2.190	0.014
Model 2							
Age	-0.050	-0.543					0.588
Sex	-0.095	-1.055					0.294
Education	0.151	1.607					0.111
Scholastic performance	-0.259	-2.776	0.336	0.113	0.059	7.704	0.006
Recognition of negative emotion							
Model 1							
Age	0.048	0.516					0.607
Sex	0.195	2.120					0.036
Education	0.159	1.732	0.262	0.068	0.068	2.843	0.086
Model 2							
Age	0.089	0.989					0.325
Sex	0.194	2.209					0.029
Education	0.081	0.900					0.370
Sociability and withdrawal	-0.315	-3.566	0.402	0.161	0.093	12.718	0.001

## Discussion

PMA significantly predicted symptom severity along with SC deficits in schizophrenia. Severity of negative symptoms has been reported to be associated with poor sociability and poor prognosis of schizophrenia.<sup>3,36,37</sup> Cognitive deficits have been reported to be associated with scholastic performance and thus both poor sociability and scholastic performance are associated with negative symptoms.<sup>3</sup> In our study, none of the PMA domains was associated with severity of negative symptoms, but poor premorbid sociability and scholastic performance were predictive of the severity of positive symptoms. About 88% of participants had at least 12 years of education, but they may have had several failures during this period as suggested by PAS. Higher education attainment was positively associated with better social knowledge. Thus, we found no association of PMA with negative symptoms. In addition, the PMA deficit score in our participants was less severe than that reported in other studies.<sup>3,37</sup> Further study is required to explore the association of symptom severity and PMA with different demographics.

Social knowledge as a domain of SC has been less studied, probably because of the lack of proper assessment tools. In our study, the Picture Arrangement test was used to determine social knowledge, as described by other studies.<sup>35,38</sup> Poor social knowledge was affected by poor premorbid scholastic performance; better scholastic performance predicted better social knowledge. Picture Arrangement score has been shown to increase with increasing education.<sup>39</sup>

Schizophrenia patients have a deficit in recognition of negative emotions (i.e. sad, disgust, fear, and anger).<sup>40-42</sup> In our study, poor premorbid sociability was the best predictor of this deficit, and female sex was a protective factor. Fitness threat suggests that by evolution, females have had to recognise negative emotions of infants in order to take protective measures.<sup>43</sup> Accurate recognition of facial expression is important in social interaction. Deficit in this component may result in ineffective or disturbed social functioning. Poor PMA and deficits in facial expression recognition have been reported to be associated with the presence of neuro-cognitive deficits.<sup>7,44</sup>

There are limitations to our study. Only two dimensions of SC were used; other dimensions of SC should have been explored. This is a cross-sectional study; a longitudinal study is required to understand the association between PMA and SC and generalisation of results. PAS has not been validated in an Indian population. Indian standardisation is required, because (1) despite scholastic disturbances a large number of participants had high educational attainment, therefore norms required to establish disturbed pattern; (2) some items from the socio-sexual domain of PAS were not suitable, as sex relationship (especially premarital) is unreported by most Indian families.<sup>45,46</sup> Nonetheless, certain domains of PMA can be used to predict symptomatology and SC deficits, and can help in planning early intervention

and predicting prognosis in schizophrenia. Advances in schizophrenia treatment have facilitated control of florid symptoms; management has shifted from being institutional to community-based. Early detection of a propensity to develop illness and possible skill deficits may help in management through skill training, stress management, and neuroleptic medication to control symptoms and episodes and support better community living.<sup>47</sup>

## Conclusion

Premorbid sociability and scholastic performance were predictive of the severity of positive symptoms, social knowledge, and negative emotion recognition deficit in schizophrenia. Given the important role of SC and PMA, assessing premorbid functioning can help in deciding early and appropriate intervention for schizophrenia.

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