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Original Article

Psychiatry/Mental Health Section

Factor Structure of Schizotypal Personality in India

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ABSTRACT

Introduction: Schizotypal personality represents genetic underpinning of schizophrenia spectrum disorders; hence, it provides conceptual models for understanding psychosis as well as a scheme for high-risk group identification. The study of structure of schizotypal personality is largely confined to western societies, whereas its assessment in varied socio-cultural groups is highly required.

Aim: To study the factor structure of schizotypal personality in an Indian population.

Materials and Methods: A sample of 492 college students (age, Mean= 21.3, SD= 2.61) filled the Hindi translated version of 74-items Schizotypal Personality Questionnaire (SPQ). Confirmatory Factor Analysis (CFA) technique was used to test the fitness (consonance of the modeled relationships, among latent and observed variables, in the sampled population) of different schizotypal personality models, that is, two-, three-, four-, bi-, and uni-factor models. The best-fit model was also studied for Measurement Invariance (MI) across gender groups.

Results: Three, four, and bi-factor models adequately fitted the data. Whereas, four-factor model was the best good-fit model. It also showed partially strong MI across gender groups. The internal consistency of total SPQ was 0.90 and of subscales ranged from 0.62 to 0.78. Men scored higher on several schizotypal facets but lower on social anxiety as compared to women.

Conclusion: The factor structure of schizotypal personality in India is similar to that reported elsewhere in the world. Thus, the present study supports the generalisation of schizotypal personality construct to the Indian people.

Keywords: Anxiety, Factor analysis, Personality assessment, Schizotypal personality disorder, Students

INTRODUCTION

Schizotypal personality is a construct that is similar to traits of schizophrenia except for the extremely deleterious psychotic symptoms [1,2]. Consistent with the recent conceptualisation schemes [3-5], it may be conceived as a category representing personality disorder (schizotypy) as well as a set of traits present in the general population. Because a large number of studies report higher schizotypal personality scores in blood relatives and patients of schizophrenia [6-10]; genetic linkages [11,12]; and heritability in twins [13-14], schizotypal personality may represent genetic underpinning of schizophrenia spectrum disorders [15,16] or of psychosis in general [17,18]. The occurrence of structural and behavioural correlates, akin to schizophrenia, further supports this likelihood [19,20]. Thus, the study of schizotypal personality offers opportunity to understand the basis of schizophrenia spectrum disorders, free from confounds like medication and psychotic incapacitation, through robust large sample studies among healthy people [21]. It also provides scheme for identification of high-risk groups [3] as well as supports the identification of factors that defend against the culmination to psychosis [15].

The schizotypal personality is conceptualised as representing nine basic traits; that is, ideas of reference, magical thinking, unusual perceptual experiences, paranoid ideation, social anxiety, no close friends, blunted effect, odd behaviour, and odd speech [22]. It fails to organise as a uni-factor structure, although the exact number or the form of multifactor structure varies across populations, methods of study, and scales [23]. Some studies have reported two factors, namely, positive and negative schizotypy [24,25], whereas, the cognitive-perceptual, interpersonal, and disorganised behaviour domains conception is the widely accepted one [26-31]. Recently, a comparatively better fit is reported for cognitive-perceptual, paranoid, interpersonal, and disorganised behaviour domains [32-37]. Moreover, a bi-factor structure with a common factor (for all the nine basic traits) and specific factors (negative and positive) has also been identified [21,38].

The 74-items forced-response choice (yes/no) based SPQ questionnaire, covering all the nine aspects, is a widely used tool for schizotypal personality assessment [39], translated and adapted for several cultures [27,29,37]. Both exploratory factor analytic and CFA studies report that Raine A et al., [30] three-factor model is a good fit for SPQ [10,17,27-29,40] showing invariance across sex [26,28,29,41,42] as well as across age [26,28,29]. This, along with the possibilities of invariance across different cultures and societies, supports identification of a cross-culturally valid schizotypal personality profile, which may be used in the development of criteria for the high-risk groups [3,4]. However, the assessment of schizotypal personality is limited in range and has inconsistencies because studies have reported a partial [21,29,36,43] or no invariance (in a shorter form of SPQ [44]) across cultures; most studies are limited to western countries [21], and environmental [45,46] and ethnic [47] factors do play a role in the occurrence of schizophrenia but their contributory effects are not clear. Hence, the assessment of schizotypal personality structure in more varied socio-cultural and regional groups is quite important [45].

No prior study attempted to study the structure of schizotypal personality in India. Earlier, Reynolds CA et al., did study an Indian population but that was in Mauritius and using Creole translated version of SPQ [29]. Thus, the present study attempted CFAs of the different structural models, proposed to be fitting to the schizotypal personality data, in a mainly "Hindi" speaking northern Indian population. On the basis of findings of earlier studies [35-36, 38], authors hypothesised that Raine A et al., [30] three-factor, Wuthrich VM and Bates TC's [31] three-factor (modified model tested by Compton et al. [35]; W-Bm), Stefanis NC et al.'s [37] four-factor, and Preti A et al.'s [38] bi-factor models show adequate fitness with the schizotypal personality data, whereas Stefanis NC et al.'s [37] model

is the best good-fit one [37,38]. Moreover, because invariance in the structure of multiple groups is an important construct validity test [48], authors further studied MI in gender groups for the best fitting model. The study of gender differences in schizotypal facets and internal consistency measurements of SPQ were the additional aims of the present study.

MATERIALS AND METHODS

Participants: A total of 492 college students (age, Mean=21.3, SD=2.61), selected through opportunity sample, participated in this study conducted during the academic session of 2010-2011 (August to February) in a government-aided college of Muzaffarnagar city, Uttar Pradesh, India. There were 314 women (63%). Women (Mean=21.03, SD=2.67) were slightly younger than men (Mean=21.78, SD=2.45). Although no explicit information on socio-economic status was collected, most participants were expected to be from lower and lower-middle income sections of society because of the demography of this low-fees institution. Moreover, because a sample of >5-10 times of parameter variables is adequate [49], the sample size, in the present study, was appropriate for the second order CFA of SPQ.

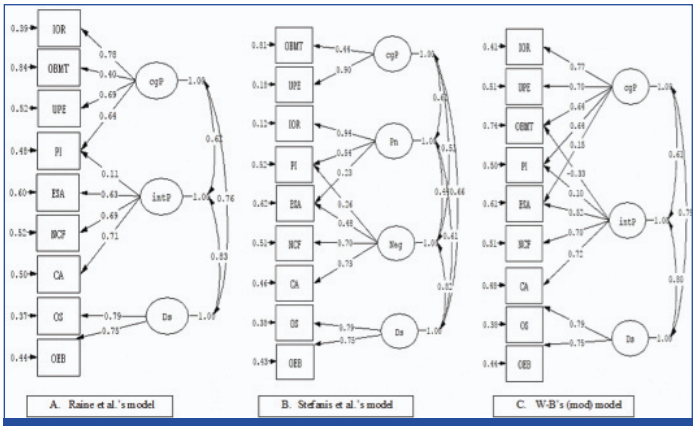
Instrument: In the present study, a Hindi translated version of 74-items SPQ [39; supplementary material] was used to assess the schizotypal personality. For translation, a committee approach was followed. An initial draft, prepared by two psychologists, was presented to two English language teachers, for independent review, and to 10 students, for feedback on clarity and meaningfulness of the questionnaire. Based on their inputs, the committee of psychologists and language teachers approved the final draft of questionnaire. It was also sent to the original author (Raine A) for record [39]. The scoring procedure of SPQ involved awarding one score to each 'yes' response in the forced-response choice (yes/no) and calculating nine sub-factors of schizotypal personality by totalling relevant items.

Procedure: Although no Institutional Ethics Committee existed at the time of study, data collection procedure was largely guided by the principles laid down in Helsinki declaration for human subjects [50]. Participants gave an informed consent prior to the questionnaire administration. Moreover, participation was voluntary and without credits. A research assistant administered the questionnaire, in small groups (10-40), to students in their classroom and monitored them during the filling of questionnaire. Participants took 15 to 20 minutes on this task.

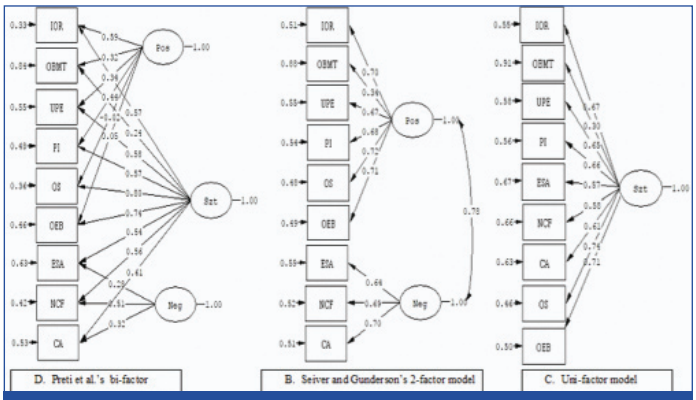
STATISTICAL ANALYSIS

For CFAs, authors used Satorra-Bentler's (S-B's) robust maximum likelihood method in LISREL 8.8, which corrects for the non-normality effects in data. Authors tested six CFA models: Seiver LJ and Gunderson JG's [25] two-factor model, Raine A et al., [30] three-factor model, Stefanis NC et al.'s [37] four-factor model, Preti A et al.'s [38] bi-factor model, W-Bm [35] three-factor model, as well as, a basic, uni-factor model. The structure of relationships among variables, as proposed by the different models, may be apparent from [Table/Fig-1,2].

The good-fitness of the models was decided on the basis of several a priori set indices. First, non-significant chi-square value shows the good-fitness of model; however, large sample size renders it ineffective (increases chances of significant difference). Second, the Root Mean Square Error of Approximation (RMSEA), along with 90% confidence interval, is a robust criterion, which reports a reasonably fit model at smaller values (<0.08; good fit:< 0.06) when the 90% class interval range is below 0.1 [51]. Third, Standardised Root Mean Square (SRMR) reports goodness-of-fit at lower values (reasonably fit: < 0.08; good fit: < 0.06; [51]). Moreover, CFI and TLI are other criteria that report reasonable fit at values higher than 0.90 (good fit: > 0.95; [51]). Lastly, the lower values of Akaike Information



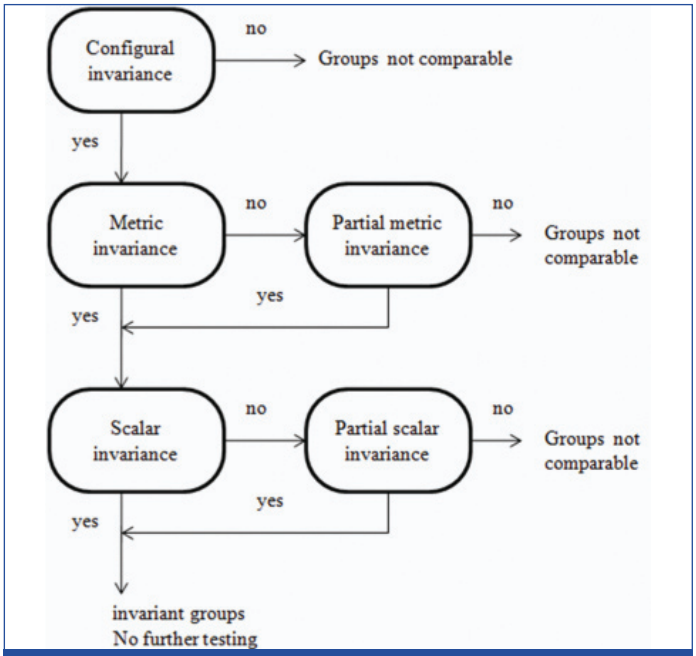
[Table/Fig-1]: Standardised factor loadings and covariances for: a) Raine A, three-factor; b) Stefanis NC et al., four-factor; and c) W-B's three-factor (modified) models.
Factors: CgP: Cognitive-perceptual, intP: Interpersonal, Ds: Disorganised, Pn: Paranoid and Neg: negative, Subscales: IOR: Idea-of-reference, UPE: Unusual perceptual experiences, OBMT: Odd beliefs/magical thinking, PI: Suspiciousness, ESA: Excessive social anxiety, NCF: No-close-friends, CA: Constricted affect, OS: Odd speech and OEB: Odd/eccentric behaviour



[Table/Fig-2]: Standardised factor loadings and covariances for Preti A et al., bi-factor; b) Siever LJ and Gunderson JG, two-factor; and c) uni-factor models.
Factors: Szt: Schizotypal, Pos: Positive, and Neg: Negative, Subscales: IOR: Idea-of-reference, UPE: Unusual perceptual experiences, OBMT: Odd beliefs/magical thinking, PI: Suspiciousness, ESA: Excessive social anxiety, NCF: No-close-friends, CA: Constricted affect, OS: Odd speech and OEB: Odd/eccentric behaviour

Criterion (AIC) scale the comparative fitness of different models, especially in non-hierarchical model testing [51].

For MI testing between multiple groups, models with increasing levels of constraints are hierarchically tested {48; flow chart in [Table/Fig-3]}. As a first step, the configural invariance is tested



[Table/Fig-3]: Flow chart of the plan of hierarchical measurement invariance testing followed in the present study.

in which the same model is constrained to occur in different subgroups. If configural invariance is established, it means that same model is good-fit in different subgroups, and therefore, the pattern of relationship between the variables is similar in different subgroups. The configural invariance is a prerequisite for testing higher order similarities or equivalences. In the second step, the weak (metric) MI model is tested by constraining the factor loadings (the measure of relationship of observed variable with underlying 'latent' factor). If the modelling indexes of MI and lower (here configural) models are within range, the constrained parameters of the higher model are considered invariant. Earlier chi-square difference value was used as such index, but it has problem of sensitivity to the sample size. Hence, in the present study authors used the difference between CFI values of MI and lower models (^CFI < 0.01; ^ denotes difference) as criterion for equivalence testing [52]. After weak MI, the next step is to test the strong MI (scalar) model, in which intercepts are additionally constrained for equality. Thus, if the ^CFI value, between scalar and lower (metric) models, is lower than 0.01, strong MI is established. However, in case, higher MI model is worse than lower (metric or configural) model, partially invariant (weak or strong) models should be established by relaxing the equality constraints on some of the parameters. Moreover, although strict MI's (constraining factor variances, factor covariances, and residual error variances) have been proposed, they are considered unrealistic. Thus, practically, invariance testing terminates after strong MI [48].

Studies have reported that the standard methods for analysis of nominal and ordinal data severely affect the MI testing in lower sample size studies [53,54], whereas, the Maximum Likelihood (ML) method is robust against non-normality in invariance testing in small samples [54,55] and it does not inflate chi square differences for mixed-item formats and sample size combinations [56]. Thus, authors used ML method for the MI testing across gender groups in the present study.

The internal consistency for non-continuous psychological scales (ordinal and nominal) is better assessed by omega reliability coefficient [57]. Therefore, in the present study, authors reported omega reliability of SPQ and its subscales, calculated using R software. Moreover, the mean differences in gender groups were calculated using SPSS version 17.0 program. Authors used MANCOVA for the study of gender differences in schizotypal facets after controlling for the possible confounding age effects.

RESULTS

The goodness-of-fit indices for different models fitting the total sample are given in [Table/Fig-4]. In accordance with authors' expectations, three-, four-, and bi-factor models were reasonably fit models on all goodness-of-fit indices (RMSEA, SRMR, CFI, & TLI). Whereas, two- and uni-factor models were below the acceptable level of fit indices (RMSEA). Furthermore, as per the AIC indices, the Stefanis NC et al., four-factor model was the best good-fit amongst all models [37]. This is supported by other indices also (RMSEA, CFI, and TLI; exception, SRMR). [Table/Fig-1,2] show the values of factor loadings and factor correlates of these models.

Because invariance of the factor structure in subgroups of a population is an important test for the criterion validity, authors studied MI across gender groups for the best-fitting four-factor model [Table/Fig-5]. Hierarchical testing, reported configural and metric invariance but not scalar invariance. Thus, attempts were made to identify a partially strong MI model. Freeing the intercepts of excessive-social-anxiety and odd-eccentric-behaviour from the equality constraints led to the identification of a partially strong MI model (^CFI < .01). Hence, gender groups had similar factor structure and factor loadings, whereas intercepts were equivalent only after discounting excessive social anxiety and odd-eccentric behaviour.

The internal consistency estimates for the whole scale was 0.90 and for the subscales 0.62 to 0.78 [Table/Fig-6]. After controlling for the effect of age, MANCOVA analysis showed a significant effect of gender, $F(9, 481)=7.13$, $p<.001$. Subsequent univariate analyses showed that the men had higher odd beliefs, unusual perception, odd behaviour, odd speech, constricted affect, and suspiciousness, but lower social anxiety, than women [Table/Fig-6].

DISCUSSION

Similar to prior studies on healthy populations [27-38], the present study reports adequate-to-good fitness of three-, four-, and bi-factor models. Moreover, it identifies four-factor model as the best good-fit model, similar to earlier studies [34-37]. Thus, the present study strongly supports the likelihood that the structure of schizotypal personality traits in India is similar to that reported elsewhere in the world. This, in turn, also supports the general acceptability of SPQ.

	S-Bχ^2	df	p-value	CFI	TLI	SRMR	RMSEA (90% CI)	AIC
One factor (F) model	238.82	27	<0.001	0.92	0.9	0.072	0.13 (0.11-0.14)	274.82
Siever LJ and Gunderson JG, 2F model	167.90	26	<0.001	0.95	0.93	0.062	0.11 (0.091-0.12)	205.90
Raine A, 3F model	89.66	23	<0.001	0.98	0.96	0.049	0.077 (0.060-0.094)	133.66
Stefanis NC et al., 4F model	40.44	19	0.003	0.99	0.98	0.036	0.048 (0.027-0.068)	92.44
Preti A et al., Bi-F model	76.77	18	<0.001	0.98	0.96	0.041	0.082 (0.063-0.10)	130.77
WBm 3F model	71.69	21	<0.001	0.98	0.97	0.034	0.07 (0.053-0.088)	119.69

[Table/Fig-4]: Goodness-of-fit indices for six models studied.
SBχ^2: Satorra-bentler corrected chi-square; df: Degrees of freedom; CFI: Comparative fit index; TLI: Tucker-lewis index; SRMR: Standardised root mean square residual; RMSEA (90% CI): Steiger-lind root mean square error of approximation (90% class interval); and AIC: Akaike information criteria

	χ^2	df	CFI	TLI	SRMR	RMSEA (90% CI)	AIC	^χ^2	^df	^CFI
Configural	74.37	38	0.985	0.972	0.0278	0.0625 (0.041; 0.083)	178.365			
Weak MI	87.16	45	0.982	0.971	0.0346	0.0618 (0.042; 0.081)	213.164	12.79	7	0.003
Strong MI	157.62	54	0.958	0.944	0.0345	0.0885 (0.073; 0.105)	265.617	70.46	9	0.024
Partial Strong MI	109.44	52	0.975	0.965	0.034	0.0671(0.05; 0.085)	221.438	22.28	7	0.007
(OEB & ESA intercepts freed)										

[Table/Fig-5]: Fit indices of configural, weak, strong, and partially-strong MI models for Stefanis NC et al.'s four factor model.
χ^2: Chi-square; df: Degrees of freedom; CFI: Comparative fit index; TLI: Tucker-lewis index; SRMR: Standardised root mean square residual; RMSEA (90% CI): Steiger-lind root mean square error of approximation (90% class interval); AIC: Akaike information criteria; ^χ^2: Difference of chi-square values; ^Df: Difference of degree of freedom values; ^CFI: Difference of comparative fit index values; ESA: Excessive social anxiety; and OEB: Odd/eccentric behaviour

	Men		Women		ANOVA (1, 489)*		Effect Size!	Consistency
Facets	M	SD	M	SD	F	p-value	d	Ω (Total)
IOR	4.84	2.03	4.67	2.27	0.9	0.3	0.08	0.68
ESA	2.84	2.04	3.31	2.27	3.9	0.049	-0.21	0.78
OBMT	2.98	1.59	2.64	1.72	4.4	0.04	0.20	0.66
UPE	3.45	1.75	2.75	1.88	17.3	<0.001	0.38	0.62
OEB	3.00	1.86	2.01	1.91	33.1	<0.001	0.52	0.78
NCF	3.36	1.94	3.01	2.18	3.7	0.055	0.17	0.65
OS	3.28	2.17	2.72	2.31	8	0.005	0.25	0.75
CA	2.87	1.72	2.40	1.81	8.5	0.004	0.26	0.65
PI	4.42	1.72	4.09	2.21	4.4	0.04	0.16	0.72
SPT	31.03	9.8	27.6	12.72	-	-	0.29	0.90

[Table/Fig-6]: Descriptive statistics, uni-variate analyses of variance, and effect sizes of differences between men and women, as well as internal consistency coefficients for SPQ sub-scales.
IOR: Idea-of-reference; ESA: Excessive social anxiety; OBMT: Odd beliefs/magical thinking; UPE: Unusual perceptual experiences; OEB: Odd/eccentric behaviour; NCF: No-close-friends; OS: Odd speech; CA: Constricted affect; PI: Suspiciousness; and SPT: Schizotypal personality total score; *after controlling the effect of age; !Positive effect size value indicates that men have higher score than women, whereas negative value indicates the opposite pattern

Furthermore, the present study strengthens the recently growing support for the conception of schizotypal personality in terms of cognitive-perceptual, paranoid, interpersonal, and disorganised behaviour domains [32-37,58]. However, because clinical [6-7,13] and exploratory factor analytic [10,27-30,40] studies support the cognitive-perceptual, interpersonal, and disorganised behaviour domains conception and because four-factor model has psychometric difficulties (loading of multiple facets on to the multiple factors [21]), the need of search for better structural model of schizotypal personality cannot be denied. Perhaps, the exploratory structural equation modeling and translational studies holds prospects of developing better conceptualization of schizotypal personality [3].

Also, authors found partially strong MI for four-factor model across gender groups. Thus, men and women have similar meaning of schizotypal personality and have similar strength of its structural relationships. In addition, with the exception of excessive social anxiety and odd-eccentric behaviour, the differences in observed mean scores express the differences in mean values of latent constructs similarly in men and women. Earlier studies also have reported partial strong [58] and strong [41] MI in gender groups for Stefanis NC et al., four factor model [37]. Thus, the present study lends additional support to the construct validity of SPQ.

The present study also reports gender differences in the sub-scales of SPQ, that is, men having higher unusual perception, odd speech, odd behaviour, constricted affect, and lower social anxiety than women. This is consistent with the earlier reports [28,31,34]. Thus, the pattern of gender differences in schizotypal personality in India is largely similar to that reported in other countries. Furthermore, because the meaning of schizotypal personality is the same across gender groups, these differences may be reflecting the real effects of developmental or cultural factors.

LIMITATION

The present study has following limitations. Firstly, instead of the first-order factor analysis (based on SPQ items), it involves a second-order factor analysis (based on derived sub-factors). However, because the nine sub-factors classification of schizotypal personality is valid and the first-order factor analysis requires a large sample size; the present second-order factor analysis is justified.

Lastly, no attempt has been made to assess the psychiatric problems among the young participants, which represents a highly vulnerable age group. However, because the college-going population is expected to have comparatively lesser psychiatric problems and because it has been extensively focused by earlier studies, authors can expect a lesser atypical sample in the present study. Thus, whereas SPQ may serve as a tool for early identification of the schizophrenia susceptibility of the students' population, community-based studies, corroborated by diagnostic interviews, are required for its widespread use in India.

CONCLUSION

The factor structure of schizotypal personality in India is similar to that reported elsewhere in the world. The meaning of schizotypal personality (as measured by SPQ) is similarly structured by men and women. Moreover, the pattern of gender differences in schizotypal personality is also similar to that reported in other parts of the world. Thus, the present study supports the generalisation of the schizotypal personality construct to the Indian people.

SUPPLEMENTARY MATERIAL

The supplementary material is available at: https://jcdr.net/articles/supplementarydata/12456/37464_SPQ-hindi.pdf.

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