Exploring the Five-Factor Structure of the Need for Closure Scale on Indian Samples Using Exploratory and Confirmatory Factor Analysis

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Abstract: This study was conducted to explore the five-factor structure of the Need for Closure scale on Indian samples using exploratory and confirmatory factor analysis. Data were initially collected from 450 samples which were reduced to 235 cases later based on the lie score criteria of the Need for Closure Scale. To rule out the problems caused by all questionnaire items like low reliability and low communalities, parceling of the items (creating three parcels from each facet) was done before the multivariate analysis (EFA and CFA). In the results, EFA showed that the five-factor structure of the NFC scale explains 52% of the variance. The goodness of fit statistics in the CFA model met the criteria (χ2 = 190.153, GFI = 0.908, TLI = 0.855, CFI = 0.890, RMSEA = 0.077) for the reasonable fit of the single factor structure of the NFC construct. In conclusion, this study presented the good psychometric properties of the NFC scale. It can be used to assess the individual's need for closure in the wider contexts of Indian studies.

Keywords: *Confirmatory factor analysis, exploratory factor analysis, five-factor structure, need for closure, parcels method.*

Introduction

Kruglanski (1990), in his 'Lay Epistemic Theory', introduced the concept of the need for closure (NFC) as a stable individual predisposition which refers to the degree to which an individual has an aversion toward ambiguity and uncertainty. The desire for NFC varies on a continuum, with a strong need for closure at one end and a solid need to avoid closure at the other end. Two tendencies are intrinsically associated with this desire: the urgency tendency that denotes the desire to "seize" on closure quickly and the permanence tendency that represents the desire to maintain or "freeze" on closure (Kruglanski & Webster, 1996). These tendencies serve individuals to opt for any reasonable but immediate answer or judgment and avoid ambiguity or confusion. Early research assumed that NFC's preference of an individual is proportionate to the perceived benefits of seeking closure and the perceived cost of avoiding closure (Kruglanski & Aizen, 1983). This cost-benefit analysis varies as a function of situation and person. The cases like proximity of decision deadlines (Kruglanski & Webster, 1996), unpleasant task conditions in which closure works as a means of escapism (Webster, 1993), when information processing becomes laborious and effortful (Webster et al., 1996), and the mental fatigue (Webster et al., 1996) instigates the tendency towards achieving closure. Though situations work significantly in heightening the tendency of NFC, it is also represented as a stable individual predisposition. To measure NFC as a dispositional variable or "trait", Kruglanski & his team (Kruglanski et al., 1993; Webster & Kruglanski, 1994) developed and validated the NFC scale.

The development of the NFC scale allowed assessing the subjective experience in various person-situation interactions in the social and non-social world. In the last two decades, this scale gained enormous popularity that it has been translated into multiple languages like Turkish (Atak et al., 2017), Italian (Pierro et al. 1995), and Chinese (Moneta & Yip, 2004). Studies also investigated its psychometric properties in the multi-cultural samples (American, Polish, Flemish, Korean, Chinese, Italian, Croatian, etc.). However, to the best of the researcher's knowledge, no study established the psychometric properties of the NFC scale on Indian samples. Nevertheless, the objective of the present study is to

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investigate the psychometrics of the NFC scale (Internal consistency, structural validity – EFA and CFA) on Indian samples.

Literature Review

Webster and Kruglanski (1994) developed the NFC scale, assuming it as a latent variable that manifests through five significant aspects. One aspect of this scale includes the *preference for Orderliness*. Individuals high in this subset prefer order and structure around themselves (e.g., "I think that having clear rules and order at work is essential for success", ten items). Five items of this subset were taken from the PNS scale developed by Thompson et al. (1993). The second aspect pertained to the affective discomfort incited by the ambiguity in the absence of closure. Individuals high in this facet would rather like to embrace pain instead of staying in confusion (e.g., "I don't like situations that are uncertain", nine items). The third aspect taps the urgency of closure in judgments and decision-making. Individuals with a high need for closure would experience a speed in making choices which reflects in the *Decisiveness* of their decisions (e.g., "I usually make important decisions quickly and confidently", seven items). Three items of this subset were taken from the PFI scale developed by Thompson et al., 1992. The fourth and fifth facets pertained to secure and stable knowledge preference. A secure knowledge can be relied on across various circumstances and implies the *predictability* of the future contexts (e.g., "I don't like to go in a situation without knowing what I can expect from it"). Some items of the fourth aspect were also taken from the PNS scale (Thompson et al., 1992). The fifth subset taps the tendency to protect knowledge. This *Close-Mindedness* leads to the unwillingness to accept alternative opinions (e.g., "I dislike questions which could be answered in many different ways", eight items). On this scale, subjects respond on a six-point Likert scale ranging from 1 (Strongly Disagree) to 6 (Strongly Agree) to indicate their endorsements of each item on the NFC scale.

Webster and Kruglanski (1994) expected the NFC construct as a unitary latent variable. They evaluated their assumption by Confirmatory Factor Analysis which supported a single factor model as the best fit of their data (χ^2 = 1097.00, GFI = .818). Although Webster & Kruglanski validated NFC as a one-dimensional measure, it was challenged by Neuberg et al. (1997) based on their psychometric analysis as a two-dimensional measure. With the first factor tapping the facets of Orderliness, Predictability, Ambiguity, and Close-Mindedness while the second factor taps the Decisiveness items. Studies conducted by Kossowska et al. (2010) and Mannetti et al. (2002) on multi-cultural sample populations were consistent with the findings of Neuberg et al. (1997). They presented the two-factor structure of NFCS, showing Decisiveness facet is not related to the other aspects of NFCS. This major dispute on the structural validity of the NFCS tried to be resolved by Roets and Van Hiel (2007), who developed new items for the Decisiveness facet of the 41 items NFC scale and replicated the one-factor model of the NFC construct as suggested by Webster and Kruglanski (1994). In their subsequent study, they further revised the 41 items NFCS and reduced it into the 15 items abridged version of one-dimensional NFCS (Roets & Van Hiel, 2011).

Methodology

Research Design

Depending upon the data, a quantitative paradigm was adopted. In a quantitative paradigm, objectives are tested by examining the relationship among variables using statistical procedures (Creswell, 2009). Here in this study, EFA and CFA were conducted to explore the five-factor structure of the NFC.

Sample and Data Collection

Data in the present study were initially collected from 450 samples (Male = 225, Female = 225). The age range of the participants was from 18 to 30 years, with engineering (48%), arts (33%) and information technology (18%) backgrounds (see Table 1). These participants were sent the URL of an online NFC questionnaire. Participation was voluntary, and no incentive was given to fill out the questionnaire.

Table 1. Profile of the participants (N = 450)

Variables	Categories	Number	% (of total)
Age	18-20	353	78.00
	21-25	78	17.00
	26-30	19	5.00
Gender	Female	225	50.00
	Male	225	50.00
Course	B.Sc.	85	18.00
	B.Tech.	216	48.00
	BA	149	33.00

Note: B.Sc. = Bachelor of Science, BA = Bachelor of Arts, B.Tech. = Bachelor of Technology

Measure

The Need for Closure Scale (Kruglanski et al., 2013) contains 47 items with 16 reverse-scored items (2, 5, 7, 12, 13, 16, 19, 20, 23, 25, 28, 29, 36, 40, 41, and 47) and 5 lie score items. This scale has five subscales with ten items (1, 6, 11, 20, 24, 28, 34, 35, 37, 47) constituting the Preference for Order subscale (e.g., I think that having clear rules and order at work is essential for success). Eight items (5, 7, 8, 19, 26, 27, 30, 45) make up the Preference for Predictability (e.g., I like to have friends who are unpredictable). Seven items (12, 13, 14, 16, 17, 23, 40) make up the Decisiveness subscale (e.g., I would describe myself as indecisive). Nine items (3, 9, 15, 21, 31, 32, 33, 38, 42) constitute the Discomfort with Ambiguity subscale (e.g., I don't like situations that are uncertain). Eight items (2, 4, 10, 25, 29, 36, 41, 44) constitute a Close Mindedness subscale (e.g., I dislike questions that could be answered in many different ways). Scoring of the total need for closure scale was done by summing all 42 items. For five subscale scores, their specific subscale items were computed. Webster and Kruglanski (1994) and Kruglanski et al. (1997), in their international papers, have demonstrated the strong internal consistency of the total Need for Closure (Cronbach's alpha = .84) and of each separate five facets ranging from 0.62 (Closed Mindedness) to 0.82 (Preference for Order).

Ethics statement

Before conducting any research on human subjects, the essential ethical endorsement is needed to be gotten following the predominant institutional standards for data collection. We applied for Ethical Approval to the Institutional Human Ethics Committee of IIT Roorkee for consent for gathering information. The board inspected the investigation proposition that followed the collection of data after informed consent from the members. In the informed consent, members have clarified the motivation behind the investigation; they are guaranteed that their responses are exclusively for research purposes, and secrecy will be maintained. After inspecting all the details of the data collection procedure, the ethical committee approved the research project.

Statistical Analyses

EFA was performed using IBM SPSS Statistics v21, and CFA was performed using AMOS software. At first, the samples were restructured based on the lie scores. Those samples whose lie scores were more than 15 were removed from further analysis; this led to the final sample size of 235. Then, parceling of the items was done by constructing representative domain parcels, as Kishton and Widaman (1994) suggested. In this method, one must have a fair idea of the dimension that each construct relevant item represents. One would then assign all items from all dimensions into one parcel set so that each parcel is equally representative of each dimension of the construct. Then, assumptions of univariate normality were tested using the Kolmogorov-Smirnov and Shapiro-Wilk tests which indicated the normality of the data (p = .200 and p = .181; p > 0.05).

The Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were checked to assess the suitability of the data for factor analyses. EFA was performed using *Principal Axis Factoring* with *Promax rotation* and *Kaiser normalization.* The goodness of statistics for CFA model fit was suggested by Hu and Bentler (1999). They have suggested the chi-square test values ($\chi 2$) and normed chi-square ($\chi 2$ /df) value less than or equal to 3, Root Mean Squared Error of approximation (RMSEA) value close to 0.06, Tucker Lewis Index (TLI), The Goodness of Fit Index (GFI) and Comparative Fit Index (CFI) values nearby 0.90 or greater, and CFI value around 0.90 as the criteria of the suitable model fit.

Results

Table 2 presents the means and standard deviations of all the parcel items along with the range of Skewness (-.572 to .336) and Kurtosis (-.522 to 1.189), which are within the acceptable range (Hair et al., 2010). The internal consistency of the NFC construct (Cronbach's Alpha) was also checked at both factor and facet levels. Cronbach's Alpha value of NFC at the factor level is 0.68, and at the facet, the level ranges between 0.638 and 0.701. The observed values of the Cronbach's Alpha indicate the acceptable internal consistency of the NFC construct.

Table 2. Parcel items with their Means, Standard Deviations, Skewness, Kurtosis and internal consistency (Cronbach's Alpha)

	Mean	**SD**	**Skewness**	**Kurtosis**	**Cronbach's Alpha**
Order1	4.1745	1.04063	-.291	-.318	.654
Order2	4.1546	1.04605	-.547	-.019	.647
Order3	3.7064	.90874	-.336	-.082	.657
Predictability1	3.4908	1.04381	-.181	.209	.638
Predictability2	3.4709	1.02970	.065	-.013	.644
Predictability3	3.7957	1.15783	-.094	-.269	.647
Ambiguity1	3.9844	.93687	-.543	.821	.674
Ambiguity2	4.2184	.91911	-.572	1.189	.668
Ambiguity3	4.1348	.85862	-.240	-.329	.673
Decisiveness1	3.6766	1.09622	-.128	-.391	.693

Table 2. Continued

	Mean	SD	Skewness	Kurtosis	Cronbach's Alpha
Decisiveness2	3.5894	1.23797	-.130	-.522	.701
Decisiveness3	3.2277	1.05929	.131	-.168	.695
Closed Mindedness1	2.3730	.75632	.325	.076	.694
Closed Mindedness2	2.6695	.86396	.124	-.288	.681
Closed Mindedness3	2.8255	.97916	.336	.043	.686

Note: SD = Standard Deviation

Exploratory Factor Analysis

The EFA results showed that the five-factor structure of the NFC construct explained 52% of the variance. The Kaiser-Meyer-Olkin (KMO) value was 0.74, whereas Bartlett's test was significant with 99% confidence (p<0.001), suggesting that the sample is adequate. EFA was conducted using *Principal Axis Factoring* and enforcing a five-factor structure with *Promax rotation* to compare with the fit of the theoretical dimensionality of the NFC. This solution produced five factors. The pattern matrix and the percent of variance accounted for are presented in Table 3. As anticipated, all the factors comprised loadings from the expected NFC items for each dimension. The five factors were Orderliness, Predictability, Decisiveness, Ambiguity and Close Mindedness.

Table 3, Factor loadings of the parcel items of the facets of the Need for Closure Scale (N=235)

	Factor				
	1	2	3	4	5
Order1	.807				
Order2	.780				
Order3	.665				
Predictability1		.702			
Predictability2		.669			
Predictability3		.616			
Ambiguity1			.813		
Ambiguity2			.750		
Ambiguity3			.598		
Decisiveness1				.830	
Decisiveness2				.765	
Decisiveness3				.585	
ClosedMindedness1					.576
ClosedMindedness2					.565
ClosedMindedness3					.526

Note: Principal axis factoring, Promax rotation method

Confirmatory Factor Analysis

CFA was conducted to assess whether the parcel items representing the five dimensions of the NFC construct confirm the one-dimensional structure of the NFC scale. Before conducting CFA with parcel items, two CFA models were prior tested using all the questionnaire items. The first model test was conducted for the unidimensional model. This model fit indices indicated that the model was a poor fit (see Table 4). The second model structure involved testing five dimensions. Again, this model fit suggested that the model was a poor fit (see Table 4). Thus, the final test model was conducted using item parcels. The third model fit indices (χ^2 (df) = 190.153 (80), GFI = 0.908, TLI = 0.855, CFI = 0.890, RMSEA = 0.077) were suggestive of reasonable fit to the data (see Table 4). Consequently, the NFC scale was valid for proceeding with further statistical analysis. Also, the path coefficients of the NFC dimensions vary between the ranges 0.3 and 0.8 (see Figure 1), which seems acceptable (Kline, 2005).

Table 4, Model Fit Statistics (N=235)

Model	χ^2 (df)	Normed χ^2	GFI	TLI	CFI	RMSEA
Unidimensional (all items)	2438.383 (819)	2.977	0.589	0.301	0.335	0.092
Five dimensions (all items)	1743.305 (809)	2.155	0.723	0.592	0.616	0.070
Five dimensions (parcel items)	190.153 (80)	2.377	0.908	0.855	0.890	0.077

Note: χ^2 /df = Normed Chi-Square, RMSEA = Root Mean Squared Error of approximation, TLI= Tucker Lewis Index, GFI = Goodness of Fit Index, CFI = Comparative Fit Index
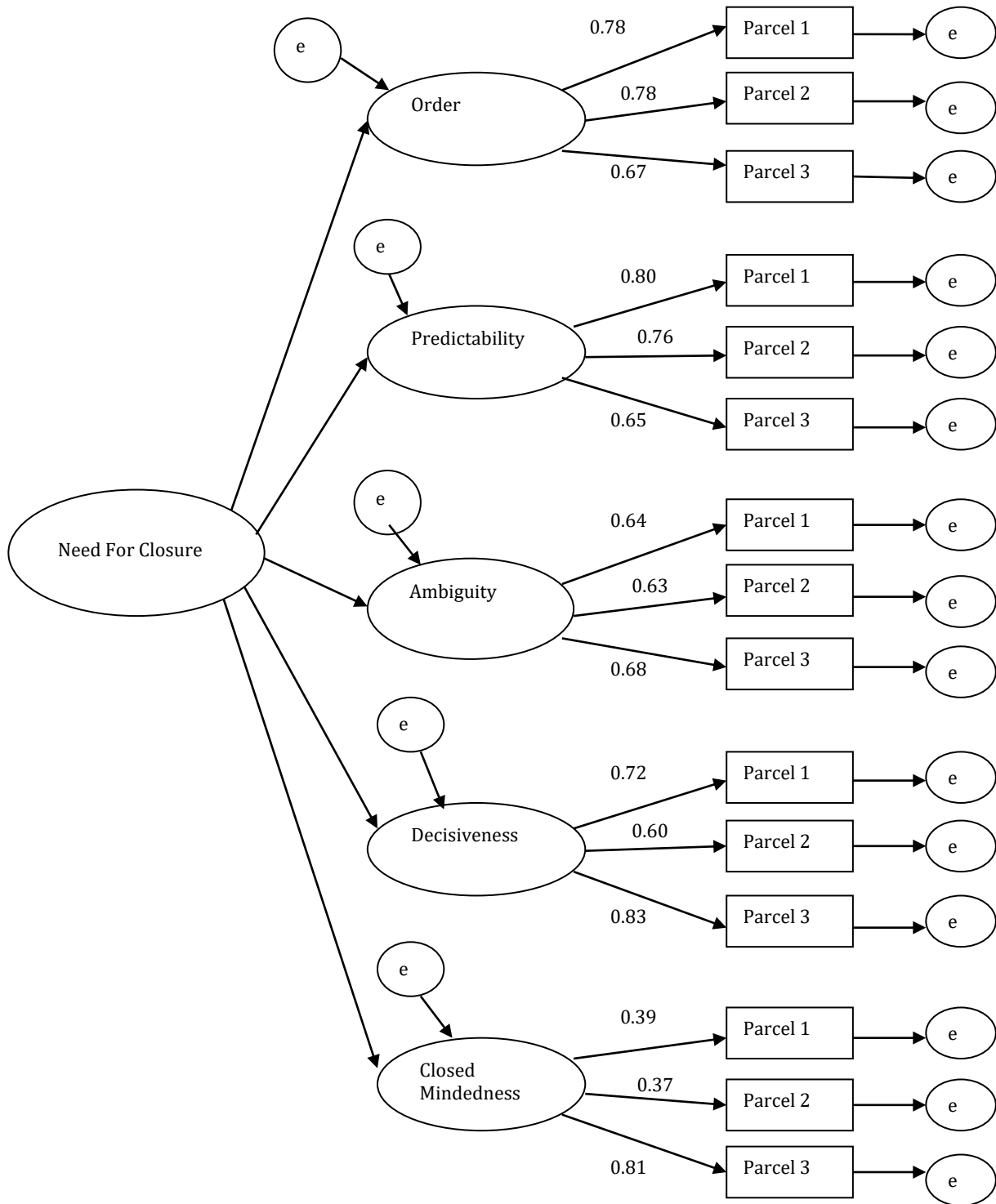
Figure 1. A representation of the unidimensional structure of the NFC scale using the parcels method

Discussion

In this study, the psychometric properties of the Need for Closure Scale developed by Kruglanski et al. (2013) were examined by using EFA and CFA on Indian samples. Parceling of the items was done prior to conducting the further analysis as suggested by Kishton and Widaman (1994) to rule out the problems caused by all questionnaire items like low reliability and low commonalities. Highlighting the merits of the parcels method, Coffman and MacCallum (2005) put forward that the parcels have several advantages over independent items. Firstly, parcels generally have higher reliability than single items. Secondly, it reduces the number of measured variables in the model. Thirdly, parcels can be used as an alternative to data transformation for non-normally distributed data. In the current study, all items from all five dimensions (Orderliness, Predictability, Decisiveness, Ambiguity and Close Mindedness) were assigned to one parcel (three parcels from each dimension) to make them representative of each dimension of the NFC construct.

The EFA showed the five-factor structure of the NFC construct explains 52% of the variance. CFA was conducted to test the model fit of the data with three models. The comparison of the model fit indices of all three models revealed that the 15 items NFC scale (using the parcels method) was a better fit than the unidimensional (all items) and five dimensions (all items) models. Based on the factor loadings, it can be said that the overall model fit of the 15 NFCS items is somewhat similar to that presented in Webster and Kruglanski (1994) and Roets and Van Hiel (2011) studies. However, in the current study, the items measuring the facet of Decisiveness appeared as the good indicators of the NFC construct, which is entirely dissimilar to the previous studies. Somehow, the poor loading of the aspect of the Close Mindedness is similar to the Roets and Van Hiel (2011) study, which demands a re-evaluation of this facet in the NFC scale. In addition, the adequate internal consistency of the 15 item NFC scale and subscales indicated that this scale is a reliable measure of the individual's NFC tendency in Indian samples.

Conclusion

In the present study, the internal consistency of the construct was found to be adequate in the Indian data. Both EFA and CFA results demonstrated that the five-dimensional structure best fits the data. Hence, the conclusion can be made that the NFC construct can be used in the broader context of Indian studies.

Recommendations

The main contribution of the present study is establishing the usability of the Need for Closure (NFC) scale in the Indian context. Another contribution is that the five aspects (Preference for Order, Predictability, Decisiveness, Ambiguity, and Close Mindedness) presented broadly represent the NFC construct. There is no need to frame the items separately to assess the five dimensions. However, Kruglanski et al. (1997) argued that in future research, it would be interesting to investigate the different effects of these five dimensions of NFC separately on cognitions and actions. This study also strengthens the multi-cultural consistency of the NFC scale. Nevertheless, it would be interesting to investigate the psychometric properties of the NFC in more Western and Asian cultures. Future researchers should collect data from the wider age groups, diverse groups of populations, and controlled settings for better psychometric findings of the NFC scale.

Limitations

There are several limitations of this study too. First, the data were collected from the university students only, and non-student participants were omitted. Second, the participants were between 18 to 30 years, not from other age groups. Third, extraneous factors that could affect the results were not considered while collecting data.

Funding Details

Conflict of Interest Statement

The authors declare that there is no conflict of interest.

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Authorship Contribution Statement

In this research work, the conception or design of the work and data collection was done by Paliwal. Kumar made the data analysis and interpretation. Both of the authors did drafting of the article.

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