



Psychometric Properties Of The Need For Cognitive Closure Scale In A Peruvian Sample: An ESEM Approach To Achieve An Acceptable Factor Solution And A Shorter Scale

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Received 26.06.2025; Received revised 10.10.2025; Accepted 13.10.2025;
Available online 13.11.2025

Aim: This study evaluated the psychometric properties of the Revised Need for Cognitive Closure Test (RT-NCC).

Method: A non-probabilistic snowball sample of 328 Peruvian participants was used. Then, structural validity for previously reported models was assessed with a series of Confirmatory Factor Analysis (CFA). Additionally, the most robust items were identified using Exploratory Structural Equation Modeling (ESEM) with Factorial Simplicity Indices (FSI). Subsequently, a new CFA was performed for the short scale. Finally, the reliability of the short version was assessed using McDonald's omega and Cronbach's Alpha.

Results: The models using all questionnaire items showed unacceptable fit. However, the short model showed acceptable fit and reliability indices.

Conclusions: The short version of the RT-NCC is a valid and reliable instrument for psychological research. However, further studies are needed to obtain more evidence on the selected items.

Keywords: Need for Cognitive Closure, Motivations, Decision making, Psychometrics, ESEM

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Introduction

The Need for Cognitive Closure (NCC) is a psychological construct that reflects the individual's willingness to seek and maintain a final solution or answer to a specific problem, thereby avoiding ambiguity, confusion, or uncertainty (Webster & Kruglanski, 1994). At one end of the spectrum, there is the need to obtain an immediate response to a problem, referred to as the seizing process or urgency (Kruglanski & Webster, 1996; Horcajo et al., 2011). At the opposite end, the freezing process or permanence manifests by maintaining a solution or cognitive model for future problems or scenarios (Kruglanski & Webster, 1996; Horcajo et al., 2011). Individuals with higher NCC exhibit less willingness to process information in detail and greater motivation to use previously learned solutions (Roets et al., 2015; Kruglanski et al., 2006).

NCC serves as a bridge between cognition and motivation, showing how motivational factors can shape cognitive ones (Webster & Kruglanski, 1994). NCC acts as a cognitive predisposition that biases people's information-gathering, decision-making, and actions (Kruglanski et al., 2013).

NCC has been described as a relevant construct for belief formation and social cognition (Kossowska, et al., 2018), as it is positively related to strong parental

relationships and faster (urgency) and stronger (permanence) conformity to group norms, which favors the cultural transmission of norms (Livi et al., 2015). Additionally, individuals high in NCC more easily transfer traits from one person to others (Pierro & Kruglanski, 2008), leading to favoritism toward in-group members (Kruglanski et al., 2002; Orehek et al., 2010) and potential prejudice and hostility against outgroups, such as immigrants (De Cristofaro et al., 2022; Dugas et al., 2018). Additionally, NCC is positively associated with speed of response in perceptual decision-making (Evans et al., 2017), leading to fast judgments based on limited information (Kruglanski et al., 2009).

NCC measurements began with the work of Webster & Kruglanski (1994), who developed a one-dimensional 42-item scale. This scale was criticized because it had a low inter-item correlation, and showed more than one factor in factor analyses, questioning its dimensionality (Neuberg et al., 1997). Due to this, the two-factor model was proposed, theoretically encompassing the concepts of urgency and permanence. Urgency on one hand, is the willingness to close a task, and permanence to prevent a solution from being opened again (Roets, 2017).

Subsequently, Pierro & Kruglanski (2005) developed a scale that explicitly measured these two constructs of the NCC using 14 items, 7 measuring urgency and 7 measuring permanence. The scale, called the Need for Cognitive

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Closure Revised Test (RT-NCC), obtained equivalent score results to the original 42-item scale ($r = .93$, $p < .001$), with acceptable psychometric properties, such as test-retest reliability ($r = .84$, $p < .001$), and good internal consistency using Cronbach's alpha (between $\alpha = .70$ and $\alpha = .80$) (Pierro & Kruglanski, 2005; cited in Horcajo et al., 2011; Jaume et al., 2015; Jaume et al., 2022).

The RT-NCC has been used in multiple studies (eg. De Grada et al, 1999; Pierro et al., 2015; Baldner & Pierro, 2019, De Cristofaro et al., 2022, Albarello, et al., 2023; Contu et al., 2024), and has also been adapted and validated for Spanish-speaking countries in three psychometric studies (Horcajo et al. 2011; Jaume et al., 2015; Jaume et al., 2022). Specifically, Horcajo et al. (2011) developed in Spain a Spanish translation of the RT-NCC and, through a sample of 598 participants, obtained favorable results for the two-factor model with a second-order factor (RMSEA = .06, SRMR = .08) and two-correlated factors ($r = .67$) (RMSEA = .06, SRMR = .08). It should be noted that in this study the covariance between item 6 and 7 was allowed so the models would fit. Also, the study showed acceptable reliability indices for the general scale ($\alpha = .79$), permanence ($\alpha = .70$) and urgency ($\alpha = .79$).

Additionally, Jaume et al. (2015) conducted an Argentine adaptation of the instrument using a sample of 350 university students, exploring item descriptives and obtaining acceptable values for skewness and kurtosis for each item, with a reliability for the entire scale of $\alpha = .79$.

Finally, the psychometric properties of the RT-NCC were tested again in Argentina by Jaume et al., (2022), obtaining a reduced scale. Using a sample of 690 university students. The results found unacceptable values of structure validity for the one- and two-dimensional models, but adequate fits for the short version of the scale with either a two-factor with a second-order factor (CFI = .989, TLI = .982, RMSEA = .025, SRMR = .034), and a two-correlated factors model ($r = .22$, $p < .001$) (CFI = .989, TLI = .982, RMSEA = .025, SRMR = .034), it should be noted that to obtain these fit indices, the authors also allowed covariances between the same-factor item errors. Additionally, reliability indices for the short version were urgency ($\alpha = .76$) and permanence ($\alpha = .64$).

Thus, the RT-NCC in its Spanish version has faced challenges in its structural validity in Argentina (Jaume et al., 2022), as the authors had to allow item error covariances to achieve an acceptable factor solution. Similarly, in Spain, Horcajo et al. (2011) also had to allow error covariances between items 6 and 7 to achieve an acceptable fit.

The residuals in a CFA represent the portion of variance that could not be explained by the latent variable. Allowing covariance among residuals indicates that some of this unexplained variance is shared between the observed variables (MacCallum et al., 1992). However, allowing covariance among residuals is a questioned practice due to its dependence on data from a particular sample, limiting the replicability of the model, something that gets worse if it does not have a theoretical justification, contributing little to the understanding of the psychological construct (Bandalos, 2021; MacCallum et al., 1992).

In the present study, the psychometric properties of the RT-NCC will be evaluated without using correlated residuals, opting for Exploratory Structural Equations Modelling (ESEM) to evaluate and select the most representative and robust items to get an acceptable structural solution.

This is the first Peruvian study to examine the psychometric properties of the RT-NCC. A task that seems

important due to the difficulty in previous studies to get an acceptable factor solution without using factor covariances. Thus, the findings will be relevant for validating the properties of this tool in Peru and for providing a more robust version of the questionnaire that can be tested in other Spanish-speaking countries.

Methods

Participants

A pool of 339 participants from the general population of Lima, Peru, was obtained through non-probabilistic snowball sampling. Eleven participants were excluded because they did not report both Peruvian nationality and residence in Lima, leaving a total of 328 participants ($M_{age} = 26.48$, $SD_{age} = 6.66$, 164 females (50%)).

Participants were similar in age to those in the Horcajo et al. (2011) and Jaume et al. (2022) samples ($M_{age} = 23$; $M_{age} = 28.11$ respectively). However, the proportion of female participants differed (77% female in Horcajo et al. (2011), 81% female in Jaume et al. (2022)).

Measurement instruments

Need for Cognitive Closure

The Spanish version of the RT-NCC (Horcajo et al., 2011) was used because its terms are simple and familiar to participants. The scale has 14 items with a 6-anchor Likert-type agreement scale (1 = Strongly disagree, 6 = Strongly agree). It is composed of two dimensions, namely urgency (e.g. In case of uncertainty, I prefer to make an immediate decision, whatever it may be.) and permanence (e.g. I prefer things I am used to than those I do not know and cannot predict).

Procedure

The instrument was disseminated via social media platforms. At the beginning of the forms, a section presented the informed consent, outlining the voluntary nature of the study, ensuring the anonymity of responses and the exclusive use of data for scientific purposes, and complying with local and international ethical principles for psychologists (CPSP, 2017; American Psychological Association, 2017).

Results

Data Analysis procedure

A descriptive analysis was performed for each item using Jamovi software to verify their normality. Responses were considered normally distributed if skewness was less than ± 2 and kurtosis was less than ± 7 (Kim, 2013). Subsequently, a Confirmatory Factor Analysis was performed using the lavaan package in R for one-factor, two-factor, and hierarchical factor models with the Weighted Least Squares Means and Variance Adjusted Estimator (WLSMV), an estimator specifically designed for ordinal Likert-type data (Li, 2016).

To assess model fit, a Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) greater than .90 were considered, along with a Standardized Root Mean Square Residual (SRMR) and Root Mean Square Error of Approximation (RMSEA) less than .08 (Hu & Bentler, 1999; MacCallum et al., 1996). For reliability, the omega coefficient was used, as it is recommended for ordinal variables, alongside Cronbach's alpha to facilitate comparison with previous studies (Dunn et al., 2014).

The most representative items were identified using Exploratory Structural Equation Modeling (ESEM) with the

Factor Simplicity Index (FSI). Thresholds of .80 for the FSI (Fleming & Soto, 2005) and .40 for factor loadings (Domínguez-Lara, 2018) were used to identify acceptable items. These items were used to reevaluate the structural validity of the theoretical factors through a new Confirmatory Factor Analysis.

Descriptive Analysis

A descriptive analysis was conducted for the responses to each of the items, obtaining their mean, standard deviation, skewness and kurtosis. Skewness and kurtosis

met the criteria for the responses to be considered normally distributed (Kim, 2013). Details are presented in Table 1.

Structural Validity and reliability

Subsequently, structural validity was verified by performing a Confirmatory Factor Analysis for the one-factor, two-factor, and hierarchical factor models. The fit indices for the models were not acceptable according to the criteria of Hu & Bentler (1999) and MacCallum et al. (1996). Additionally, the hierarchical model could not be estimated due to incalculable standard errors. Details of the model fit indices are presented in Table 2.

Table 1. Descriptive analysis

Item	Content	M	SD	g1	g2
NCC1	1. In cases of uncertainty, I prefer to make an immediate decision, whatever it may be.	2.71	1.41	0.5367	-0.55
NCC2	2. When faced with several potentially valid alternatives, I decide on one quickly and without hesitation.	2.76	1.45	0.5109	-0.667
NCC3	3. I prefer to go with the first available solution rather than consider in detail which decision I should make.	2.25	1.27	0.9288	0.164
NCC4	4. I feel very uncomfortable when things around me are not in their proper place.	3.7	1.43	-0.0901	-0.893
NCC5	5. I generally avoid participating in discussions about ambiguous and controversial topics.	3.38	1.48	0.0713	-0.93
NCC6	6. When I need to confront a problem, I don't think about it too much and make a decision without hesitation.	2.78	1.38	0.4019	-0.697
NCC7	7. When I need to solve a problem, I generally don't waste time considering different points of view.	2.63	1.47	0.6624	-0.513
NCC8	8. I prefer to be with people who have the same ideas and tastes as me.	3.39	1.4	0.0216	-0.729
NCC9	9. I generally don't look for alternative solutions to problems for which I already have a solution available.	3.08	1.45	0.2452	-0.848
NCC10	10. I feel uncomfortable when I can't find a quick answer to a problem I face.	3.86	1.49	-0.336	-0.832
NCC11	11. Any solution to a problem is better than remaining in a state of uncertainty.	3.78	1.51	-0.3473	-0.864
NCC12	12. I prefer activities in which it is always clear what needs to be done and how to do it.	4.21	1.37	-0.5353	-0.439
NCC13	13. After finding the solution to a problem, I consider it a waste of time to consider other possible solutions.	2.66	1.38	0.5833	-0.451
NCC14	14. I prefer things I am used to rather than those I don't know and can't predict.	3.29	1.39	0.0721	-0.816

Note. M = Mean, SD = Standard Deviation, g1 = Skewness, g2 = Kurtosis. The number after the "NCC" indicates the order of the item presented to the participants. Item responses can be considered normally distributed.

Table 2. Model fit indices

Model	CFI	TLI	RMSEA	[90% - IC]	SRMR
One Factor	0.719	0.668	0.130	[0.119 - 0.141]	0.103
Two Factors	0.827	0.793	0.103	[0.092 - 0.114]	0.084

Note. CFI: Comparative Fit Index, TLI: Tucker-Lewis Index, RMSEA: Root Mean Square Error of Approximation. SRMR: Standardized Root Mean Squared Error. Previous models show an unacceptable fit.

Since the questionnaire did not yield an acceptable factorial solution using previously reported models, an Exploratory Structural Equation Modeling (ESEM) analysis was conducted to identify the most representative items using the Factor Simplicity Index (FSI). Table 3 presents the factor loadings for the two-factor and two-factor ESEM models.

Items NCC1, NCC2, NCC6, and NCC7 met the Factor Simplicity Index (FSI) threshold of .80 (Fleming & Soto, 2005) and factor loadings greater than .40 (Domínguez-

Lara, 2018) for the urgency latent variable. Thus, they were selected for the urgency scale.

Items NCC4, NCC8, NCC10, and NCC12 also exceeded the Factor Simplicity Index (FSI) threshold (Fleming & Soto, 2005). Except for NCC4, these items surpassed the factor loading threshold of .40 (Domínguez-Lara, 2018) for the permanence latent variable. Consequently, NCC8, NCC10 and NCC12 were selected for the permanence scale. However, since NCC4 showed the highest degree of Factorial Simplicity Index, it was decided

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to include it in the permanence dimension as well. Additionally, as its inclusion does not increase model complexity and maintains interpretability (Fleming & Soto, 2005), it enhances reliability (Dunn et al., 2014) and

minimizes impact on the scale's content (DeVellis & Thorpe, 2021). Details of the Factor Simplicity Index (FSI) values and factor loadings can be seen in Table 3.

Table 3. Factor Loadings

	CFA		ESEM		FSI
	U	P	U	P	
NCC1	0.576	0	0.612	0.096	0.952
NCC2	0.613	0	0.639	0.128	0.923
NCC3	0.627	0	0.595	0.212	0.775
NCC6	0.488	0	0.561	0.036	0.992
NCC7	0.586	0	0.68	0.054	0.987
NCC9	0.547	0	0.304	0.454	0.381
NCC13	0.577	0	0.382	0.416	0.085
NCC14	0	0.692	0.244	0.621	0.733
NCC12	0	0.605	0.02	0.681	0.998
NCC11	0	0.494	0.269	0.376	0.323
NCC10	0	0.559	0.045	0.606	0.989
NCC8	0	0.58	0.107	0.596	0.938
NCC5	0	0.42	0.224	0.328	0.364
NCC4	0	0.278	-0.002	0.308	1

Note. P = Permanence, U = Urgency. Items with highest factorial simplicity retained for urgency and permanence.

Table 4. Factor Loadings and reliability

		U	P
NCC1	1. In cases of uncertainty, I prefer to make an immediate decision, whatever it may be. [<i>En caso de incertidumbre, prefiero tomar una decisión inmediata, sea la que sea</i>].	0.635	
NCC2	2. When faced with several potentially valid alternatives, I decide on one quickly and without hesitation. [<i>Cuando me encuentro frente a varias alternativas potencialmente válidas, me decido a favor de una rápidamente y sin vacilaciones</i>].	0.662	
NCC6	6. When I need to confront a problem, I don't think about it too much and make a decision without hesitation. [<i>Cuando necesito enfrentarme a un problema, no pienso mucho sobre él y me decido sin dudar</i>].	0.611	
NCC7	7. When I need to solve a problem, I generally don't waste time considering different points of view. [<i>Cuando necesito solucionar un problema, generalmente no pierdo el tiempo considerando diversos puntos de vista sobre el mismo</i>].	0.614	
NCC4	4. I feel very uncomfortable when things around me are not in their proper place. [<i>Me siento muy incómodo cuando las cosas a mi alrededor no están en su sitio</i>].		0.352
NCC8	8. I prefer to be with people who have the same ideas and tastes as me. [<i>Prefiero estar con personas que tienen las mismas ideas y los mismos gustos que yo</i>].		0.581
NCC10	10. I feel uncomfortable when I can't find a quick answer to a problem I face. [<i>Me siento incómodo cuando no logro dar una respuesta rápida a un problema al que me enfrento</i>].		0.670
NCC12	12. I prefer activities in which it is always clear what needs to be done and how to do it. [<i>Prefiero actividades en las que está siempre claro qué es lo que hay que hacer y cómo hay que hacerlo</i>].		0.631
McDonald's Omega (ω)		.67	.62
Cronbach's Alpha (α)		.67	.60

Note. P = Permanence, U = Urgency, Items show acceptable factor loadings. Reliability indices are acceptable, but lower than the common threshold.

A Confirmatory Factor Analysis (CFA) was performed with the selected items, showing an acceptable fit for the two-correlated-factor model (CFI = .96, TLI = .93, RMSEA = .069, SRMR = .052). The correlation between urgency and permanence was small, positive, and significant ($r = .15$, $p < .01$). Details of the factor loadings and reliabilities can be seen in Table 4.

Finally, reliability indices for the urgency and permanence dimensions did not exceed the conventional threshold of $\alpha > .70$ (Smith et al., 2000). However, this is likely due to the small number of items in each subscale. Authors such as DeVellis & Thorpe (2021) emphasize that a value of $\alpha = .60$ is tolerable in research settings, considering a small number of items.

Discussion

In the present study, the psychometric properties of the RT-NCC were evaluated. The instrument, in its Spanish version, has shown some instability in its psychometric properties, as authors of adaptation studies added covariances among item errors to achieve acceptable fit indices (Horcajo et al., 2011; Jaume et al., 2022). This method is typically sample-dependent and does not contribute to understanding the construct (Bandalos, 2021; MacCallum et al., 1992). Therefore, the psychometric properties of the instrument were evaluated in the present study without using correlated item residuals, using Exploratory Structural Equation Modeling (ESEM) and the Factor Simplicity Index (FSI) instead to identify the most representative items and thereby find a viable factor solution.

The CFA fit indices were unacceptable for all tested models (MacCallum et al., 1996; Hu & Bentler, 1999). Thus, the most robust items were evaluated using the ESEM and FSI, considering a FSI superior to .80 (Fleming & Soto, 2005) and factor loadings greater than .40 (Dominguez-Lara, 2018) in an ESEM. Four items were selected for each dimension: NCC1, NCC2, NCC6, and NCC7 for urgency, and NCC4, NCC8, NCC10, and NCC12 for permanence. Then, the items were included in a new two correlated factors CFA, obtaining adequate fit indices (Hu & Bentler, 1999 and MacCallum et al., 1996).

The two correlated factors model has 4 items per dimension, similar to the model by Jaume et al. (2022), which also used four items per dimension but included correlated item errors to achieve better model fit. The correlation between the permanence and urgency subscales was similar to the Jaume et al. (2022) results, being both small and positive ($r = .15$, $p < 0.1$ in the present study and $r = .22$, $p < .001$ in Jaume et al. (2022)). However, the items selected for each factor differed, as the authors used a different criteria for the item selection, and added correlated errors to the model.

Reliability indices were higher in Jaume et al. (2022), with $\alpha = .74$ for urgency and $\alpha = .64$ for permanence, compared to $\alpha = .67$ and $\alpha = .60$ in this study. This indicates that the scale has a higher measurement error (>30%) than typically recommended. Consequently, the variance of the

dimension scores captures 67% of the construct of interest for urgency and 60% for permanence, with the remainder attributed to noise, leading to less precise interpretations (Dunn et al., 2014; DeVellis & Thorpe, 2021). These values obtained don't surpass the classic threshold of $\alpha = .70$ although it is tolerable due to the small number of items per subscale (DeVellis & Thorpe, 2021).

Compared to the full 14-item scale of Horcajo et al. (2011) in Spain, the correlation between dimensions is lower ($r = .15$, $p < .1$) than that observed in that study ($r = .67$), suggesting a possible overlap between dimensions in the 14-item scale. The reliability indices for the full item instrument of the subscales were higher ($\alpha = .79$ for urgency and $\alpha = .70$ for permanence), which points to the idea that the decrease in reliability in the subscales in the present version is due to the reduction of the number of items.

Conversely, the eliminated items in the present study were similar in meaning and wording, which typically leads to correlated item residuals (Bandalos, 2021). This phenomenon can be identified for example in NCC1 (“En caso de incertidumbre, prefiero tomar una decisión inmediata, sea la que sea. [*In case of uncertainty, I prefer to make an immediate decision, whatever it may be.*]”) and NCC11 (“Cualquier solución a un problema es mejor que permanecer en un estado de incertidumbre. [*Any solution to a problem is better than remaining in a state of uncertainty.*]”). Participants may interpret these items, from different dimensions, similarly due to the shared use of ‘incertidumbre’ [uncertainty] and their focus on problematic situations, making them highly similar.

Similarly, in the case of the item NCC7 (“Cuando necesito solucionar un problema, generalmente no pierdo el tiempo considerando diversos puntos de vista sobre el mismo. [*Any solution to a problem is better than remaining in a state of uncertainty.*]”) and NCC13 (“Después de encontrar la solución a un problema, considero que es una inútil pérdida de tiempo tener en cuenta otras soluciones posibles. [*Any solution to a problem is better than remaining in a state of uncertainty.*]”) may also generate correlated residuals, in this case within the same factor (permanence) because they share the words “solución [solution]” and “problema [problem]”.

Thus, by eliminating problematic items and using the most robust ones, the two-factor model was replicated (Horcajo et al., 2011, Jaume et al., 2022), maintaining the original theoretical consistency of the instrument (Pierro & Kruglanski, 2005). This study's benefits include the use of ESEM and the FSI to achieve a factor solution with acceptable fit for the RT-NCC in Peru. However, further are needed across diverse populations and cultures to enhance the validity of the proposed items for the instrument's structure.

Limitations include the use of non-probabilistic snowball sampling, which prevents generalizing the results to the general population of Lima, Peru, particularly to those without internet access or who do not use social media. Also, this requires that subsequent research evaluate the proposed model in other samples from the same place, checking if it

can be replicated in it, especially because the responses to the questionnaire may vary due to the absence of the other items, since it is theorized that the responses of those evaluated are influenced by the set of items in the questionnaire (Schwarz, 1999). Additionally, future research should address another limitation of the present study by evaluating the convergent and discriminant validity with constructs theoretically relevant to NCC (DeVellis & Thorpe, 2021).

This study concludes that the RT-NCC, in its 8-item version, is a valid and reliable instrument for use in research contexts. However, further research should evaluate the psychometric properties of this short version of the scale in other samples, assessing convergent, discriminant, and structural validity.

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