Navigating Ambiguity: Adapting and Validating the Personal Need for Structure Scale in Spanish

[1]Rafael Gil, [1]Javier Horcajo, [1,2]Pablo Nájera, and [1]Miguel Ángel Sorrel https://orcid.org/0000-0002-5234-5217

Universidad Autónoma de Madrid (Spain)

Universidad Pontificia Comillas (Spain

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Correspondence concerning this article should be addressed to Miguel Ángel Sorrel Luján. Universidad Autónoma de Madrid. Departamento de Psicología Social y Metodología. E-mail: miguel.sorrel@uam.es

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Abstract

The Personal Need for Structure (PNS) scale assesses individuals' tendency to seek out clarity and structured ways of understanding and interacting with their environment. The main aim of this study was to adapt the PNS scale to Spanish and assess its psychometric properties. There are two versions of the PNS scale being used, which vary in the number of dimensions (1 vs. 2), and in the number of items (12 vs. 11; because one version excludes Item 5). Therefore, an additional aim of this study was to compare the two existing versions of the PNS scale. This comparison aimed to address the debate regarding the inclusion of Item 5, and the number of dimensions that comprise the PNS scale. A sample of 735 individuals was collected. First, through an approach combining exploratory and confirmatory analyses, evidence was found in favor of the scale being composed of two related but distinguishable factors: Desire for Structure and Response to the Lack of Structure. Scores on these subscales showed acceptable internal consistency and test-retest reliability. Evidence supporting the invariance of the internal structure across sociodemographic variables such as gender and age was found. Validity evidence was also analyzed by examining the relationships with other relevant measures. The results indicated that Item 5 can be excluded without reducing scores validity or reliability, which supports preceding research in the literature. In conclusion, the PNS scale was satisfactorily adapted to and validated in Spanish and its use in this context is recommended.
Keywords: factor analysis, personal need for structure, reliability, validity

The ability of human beings to process information from the multiple stimuli of their environment is limited. To deal with the complexity and ambiguity of those stimuli, individuals create and use cognitive structures (i.e., schemas), which are mental frameworks used to acquire, organize, and, in general, interpret information about the world around us, such as social categories (e.g., stereotypes) and scripts (see Blanco et al., 2017; Fiske & Taylor, 2013; for a review). Cognitive structures facilitate the processing of information by reducing its complexity and assigning meaning, thereby making the information more manageable. Importantly, individuals differ in their preference for creating and using cognitive structures. Specifically, the personal need for structure (PNS) refers to individuals' tendency to seek out clarity and structured ways of understanding and interacting with their environment. High PNS is characterized by a preference for routine, predictable social situations, and tightly organized life (both cognitively and behaviorally), coupled with a discomfort towards ambiguity and confusion (Neuberg & Newsom, 1993, Thompson et al., 2001). That is, "an individual possessing a high chronic need for structure prefers structure and clarity in most situations, with ambiguity and grey areas proving troublesome and annoying" (Thompson et al., 2001, p. 20).

In 2001, along with the proposal of the construct, Thompson and colleagues developed a measurement instrument: The PNS scale. Three studies were conducted which led to a final 12-item version capturing cognitive, affective, and behavioral manifestations of PNS (see Table 1). This PNS scale showed a single factor that was extracted using principal components. Relevantly, Thompson and colleagues' results had previously been reported at a conference twelve years earlier before being published (Thompson et al., 1989), which allowed Neuberg and Newsom (1993) to test the PNS scale and suggest a different measurement instrument which included 11 items from the original Thompson et al. scale (i.e., excluding Item 5), before Thompson et al. (2001) published their version of the PNS scale. The 11-item PNS scale, proposed by Neuberg and Newsom in 1993, has arguably become the most widely used scale to assess PNS. Importantly, whereas the original scale proposed by Thompson and colleagues (1989) suggested only one factor, Neuberg and Newsom's (1993) research identified two factors: *Desire for Structure* (i.e., defined as individuals' desire to establish structure in their daily lives) and *Response to Lack of Structure* (i.e., that assesses how individuals react to the lack of structure). Neuberg and Newsom (1993) conducted a confirmatory factor analysis (CFA) testing the one- and two-factor solutions, and found that the two-factor solution showed noticeably better fit indices.

-- Please insert Table 1 around here --

Both the 12-item (Thompson et al., 2001) and the 11-item (Neuberg & Newsom, 1993) versions of the PNS scale have been used in prior research to examine the role of PNS in a diverse array of very relevant cognitive and social processes and effects. These include studies on behavior in situations with a lack of control (Kuo et al., 2018; Noordewier & Rutjens, 2021), mental health (Bellapigna, 2021), use of stereotypes (Ma et al., 2019), moral behavior (Bell & Showers, 2021), team leadership (Wang et al., 2022), consumer risk taking in decision making (Brunyé et al., 2019; Zhou et al., 2019), emotional reactions towards robots (Lischetzke et al., 2017), and fake news (Axt et al., 2020), among other diverse phenomena.

Relevant to the current study, the Neuberg and Newsom's (1993) PNS scale has been adapted into a variety of languages, including German (Machunsky & Meiser, 2006), Chinese (Shi et al., 2009), and Japanese (Kashihara, 2016). Both exploratory and confirmatory approaches have been conducted in those adaptations, although no study has followed the most recent recommendations for studying dimensionality (Ferrando et al., 2022; Golino et al., 2020). We summarize in Table 2 the results of previous studies regarding the internal structure of the PNS scale. One important limitation of prior research was the use of small or only university student samples (Franco-Martínez et al., 2023). Therefore, an important goal of the current study was to test the generalizability of prior findings to populations beyond samples that relied purely on university students.

-- Please insert Table 2 around here --

Most importantly, to the best of our knowledge, the PNS scale has not yet been adapted and validated into Spanish. Thus, we aimed to adapt and validate the PNS scale in Spanish. As noted above, there are two versions of the PNS scale being used, which vary in the number of dimensions (1 vs. 2), and in the number of Items (12 vs. 11; because one version excludes Item 5). Therefore, an additional aim of this study was to compare the two existing versions of the PNS scale. Given the variety of domains in which the two different versions of the PNS scale have been applied, as well as the different considerations about its factor structure, we also aimed to provide an in-depth examination of the PNS scale and provide evidence-based guidelines for its use in accordance with a more systematic and updated psychometric approach. Relevantly, prior studies have demonstrated that the PNS was associated with relevant social psychological constructs, such as stereotypes and prejudices (e.g., Ma et al., 2019; Neuberg & Newsom, 1993; Newheiser & Dovidio, 2012). Indeed, within the context of Spanish culture, research on stereotypes, prejudice, and discrimination is also a particularly pertinent and relevant field of study (e.g., Blanco Abarca et al., 2017; Sabucedo Cameselle & Morales Domínguez, 2015; for a review). Thus, the availability of a validated Spanish adaptation of the

PNS scale would enable Spanish-speaking researchers to study the PNS and its relationships with those relevant social issues in a Spanish cultural context.

In addition, validity evidence was analyzed by examining the relationship between the PNS scale and other relevant measures. Based on prior research, we selected some measures and made specific predictions accordingly. For example, Neuberg and Newsom (1993) found associations between the PNS scale and the Need for Cognition Scale (NCS). In line with their results, we hypothesized a negative correlation between NCS and the PNS scale (total score), as well as with the Response to Lack of Structure dimension. Additionally, we expected a non-significant correlation with the Desire for Structure dimension, although a small negative correlation was found in larger samples (Neuberg & Newsom, 1993). In relation to the *Big Five* personality traits (i.e., Extraversion, Agreeableness, Conscientiousness, Neuroticism, and Openness), according to Neuberg and Newsom (1993), we hypothesized the PNS scale (total score) to be positively correlated with Neuroticism and Conscientiousness, and negatively correlated with Openness. In addition, the Desire for Structure dimension was expected to show a positive correlation with Conscientiousness and a negative one with Openness; whereas the Response to Lack of Structure dimension was expected to correlate positively with Neuroticism and negatively with Extraversion and Openness to experience. These anticipated outcomes were aligned with findings from other adaptations, although a negative relationship between Extraversion and both PNS subscales have also been observed in the German and Japanese adaptations (Kashihara, 2016; Machunsky & Meiser, 2006; Shi et al., 2009).

Also, the PNS scale has been used as a measure of validity in the development and validation process of other instruments (e.g., the Need for Affect Questionnaire). The results of those studies allowed us to propose some hypotheses. The Need for Affect Questionnaire (NAQ; Maio & Esses, 2001) has showed a significant negative correlation with the PNS scale (total score). Although the two-factor structure was not considered, those results enabled us to predict that the correlation with both dimensions would also be significantly negative. In line with the results found in the development of the Need to Evaluate scale (NES; Jarvis & Petty, 1996), we predicted no significant correlation between NES scores and with either the PNS scale (total score) or both subscales' scores. Regarding the Need for Cognitive Closure scale (NCCS; Webster & Kruglanski, 1994), we hypothesized a positive correlation with the PNS scale (total score), suggesting also a significant positive correlation with both dimensions of the PNS. Furthermore, evidence on the PNS scale has yielded notable findings in relation to affect, where Response to Lack of Structure has been observed to negatively correlate with positive affect and positively with negative affect (Reich et al., 2001).

Finally, we predicted that, hypothetically, the PNS scores could be related to other important psychological construct used as a criterion variable for adaptation and validation of other instruments such as the NAQ (Horcajo et al., 2023; Maio & Esses, 2001), that is, attitude extremity, because of individuals who prefer having a clear and defined structure in their lives might be more inclined to hold extreme attitudes (i.e., evaluations) on controversial issues, as these extreme opinions provide a clear and predictable framework (i.e., good vs. bad). Indeed, individuals with high PNS often simplify reality to make it more manageable, showing, as noted, the use of more stereotypes (Neuberg & Newsom, 1993; Newheiser & Dovidio, 2012). Furthermore, we included another criterion variable through a custom-designed questionnaire aimed at assessing specific behaviors in either work or study contexts (see Ersche et al., 2017, for a similar measure). Our prediction was that the PNS scale (total score) and both subscales would show a positive correlation with this criterion variable.

Method

Participants

Seven hundred and thirty-five individuals (62.40% females, 36.80% males, and 0.80% indicated "other") were recruited through non-probabilistic sampling methods. Age ranged from 18 to 87 years old (M = 34.28, SD = 15.62). The collected sample had a bimodal distribution, with one group of individuals under than 25 or with (50%) and another group of individuals over 25 (50%). The educational level distribution was as follows: 69.25% university degree, 10.34% vocational training, 12.65% high school, 4.22% secondary education, 1.22% primary school, and 2.32% indicated "other". After examining the response patterns, three participants were removed from the database because they showed no variability in their responses, leaving the final database comprising 732 participants.

Instruments

Personal Need for Structure scale (PNS scale, Thompson et al., 2001). The PNS scale is a 12-item measure that assesses an individuals' tendency to seek out clarity and structured ways of understanding and interacting with their environment. Following the two-dimensional version proposed by Neuberg and Newsom (1993), Items 3, 4, 6, and 10 were expected to load in the Desire for Structure Dimension, while Items 1, 2, 7, 8, 9, 11, and 12 were expected to load in the Response to the Lack of Structure Dimension. Participants responded on a 6-point scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*).

The Spanish version was created following recommendations from Hernández et al. (2020), Maneesriwongul and Dixon (2004), and Muñiz et al. (2013), regarding the translation

and back translation process. More specifically, according to the International Test Commission (ITC) guidelines and in line with the criterion checklist proposed by Hernández et al. (2020), we applied the following recommendations: First, we constituted a multidisciplinary team comprising two professional translators proficient in both the source and target languages and familiar with both cultures, two experts in the measured construct (first and second author of this manuscript), and one expert psychometrician (corresponding author of this manuscript). Next, the two translators independently worked to perform the forward and backward translation processes. That is, a bilingual translator (Spanish-English) translated the items of the PNS scale into Spanish. Then, another bilingual translator back-translated the Spanish version of the items. Next, two experts reviewed, compared, and consolidated the translations through judgmental reviews. These experts addressed discrepancies and produced a consensus version. They also ensured that the instructions were clear and comprehensible, using terminology familiar to the target population, for example, using terms with a high frequency of use in Spanish. Additionally, they focused on maintaining clarity and similar levels of commonality and difficulty in the item content across both source and target cultures, avoiding linguistic elements like words with varying meanings. They conducted a thorough revision of each item to ensure its relevance and semantic appropriateness, making specific adjustments post translation and back-translation to enhance clarity and cultural pertinence. As a result, for example, "I find" was adapted as "*Considero*" ["I consider"] in Spanish (Items 6 and 10); or "I hate" was adapted as "*Detesto*" (Item 8) and "*Me desagrada*" (Item 9), because these Spanish terms have a more moderate emotional intensity than the literal translation ("*Odio*"). Lastly, they maintained consistency in the item format, response options, and administration mode across the original and adapted versions, ensuring parallelism in presentation. The target population is sufficiently familiar with the use of scales like this one. Although there was no pilot study as such, the scale was answered and reviewed by another coauthor with expertise in psychometrics who did not take part in the translation and a PhD student doing his thesis in social psychology who is not part of the study. Their clear understanding and positive assessment of the item understandability provided us with confidence regarding the wording of the items, with no reported comprehension issues on their part.

Need for Affect Questionnaire (NAQ; Maio & Esses, 2001). The NAQ consists of 26 items that measure individuals' motivation to approach or avoid emotion-inducing situations and activities. This scale has two different factors: Emotion Approach and Emotion Avoidance (13 items per factor). Participants responded to the items on 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). We used the Spanish adaptation by Horcajo et al.

(2023) which has demonstrated good validity and reliability evidence. Reliability and internal consistency data for all further measures are reported in the results section.

Need for Cognition Scale (NCS; Cacioppo & Petty, 1982). Need for cognition refers to the tendency of individuals to engage in and enjoy effortful cognitive endeavors. The NCS consists of 18 items, all rated on a 5-point scale from 1 (*extremely uncharacteristic*) to 5 (*extremely characteristic*). The Spanish adaptation of the NCS was used (Falces et al., 2001).

Need to Evaluate Scale (NES; Jarvis & Petty, 1996). The NES measures the individuals' tendency to form and develop attitudes. We used the Spanish adaptation of the NES (Horcajo et al., 2008) which consists of 16 items rated on a 5-point scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

Need for Cognitive Closure Scale (NCCS; Webster & Kruglanski, 1994; Kruglanski, 2004). The NCCS assess the individuals' motivation to seek and maintain a definitive answer to a given problem, to avoid confusion, ambiguity, and uncertainty. The Spanish adaptation of the revised NCC scale was used (namely, TR-NCC, Horcajo et al., 2011). This scale consists of 14 items rated on a 6-point Likert scale, ranging from 1 (*strongly disagree*) to 6 (*strongly agree*).

The Positive and Negative Affect Schedule (PANAS; Watson et al., 1988). The PANAS is a 20-item measure in which 10 items refer to Negative Affect (e.g., nervous, irritable, hostile) and 10 items refer to Positive Affect (e.g., excited, inspired, active). We used the Spanish version of the PANAS proposed by López-Gómez et al. (2015). Participants are asked to reflect on how they have felt over the last month, including today, and to respond on a 5-point scale, ranging from 1 (*not at all or very little*) to 5 (*extremely*).

Ten-Item Personality Inventory (TIPI–10; Gosling et al., 2003). The TIPI–10 measures the five dimensions of the Five Factor Model (specifically, Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness) including 2 items per factor. The TIPI–10 was adapted to the Spanish by Renau et al. (2013). The response format is a 7-point Likert scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). The available evidence for this brief measure of personality indicates that it is congruent with measurements using longer questionnaires (Gosling et al., 2003) and is reasonably stable over time (Renau et al., 2013).

Criterion Measures. A subset of the sample (N = 312) also responded to a set of criterion variables (specifically, attitude extremity, and self-reported behaviors concerning either work or study settings). First, the *attitude extremity* measure was adapted from Maio and Esses (2001) who assessed attitude extremity towards different topics as a criterion variable of the Need for Affect Questionnaire (NAQ). Furthermore, this measure has been also used in the Spanish

population as criterion variable for the Spanish validation of NAQ (Horcajo et al., 2023). Most importantly, attitude extremity is a relevant construct in social psychology because has been associated with, for instance, thought polarization, as well as group polarization and conflict (e.g., Abelson, 1995; Rocklage & Fazio, 2015; Westfall et al., 2015). Thus, participants were requested to express their opinions on 20 controversial topics (e.g., death penalty, euthanasia, artificial intelligence, abortion, immigration, etc.). They rated their attitudes by answering one question for each topic on an 11-point scale, from 0 (*extremely unfavorable*) to 10 (*extremely favorable*). Attitude extremity was computed by obtaining the absolute value of the deviation between the participants' responses to each Item and 5, which is the middle point on the scale. The score used as a criterion is the sum of the absolute distances from the center of the response scale (5). Higher values reflect more extreme judgments in one direction or the other.

Second, based on prior research (e.g., Ersche et al., 2017), we specifically developed a measure to assess various behaviors commonly exhibited in either work or academic settings. This measure assessed self-reported behaviors related to the planning of work [study] and reactions when that setting was not well-structured. Specifically, this measure was composed of 12 items regarding *behaviors concerning either work or study settings* that could be performed. Depending on whether each participant identified themselves as either a worker (N = 95) or a student (N = 217), the same 5 items referred to either study or work. Examples of those items include *"I have avoided performing multiple tasks simultaneously and focused on a single task"* and *"I have made an effort to keep my study space/workspace clean and organized"*. The response format was a 5-point Likert scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

Sociodemographic measures. Information such as age, gender, and educational level were collected. These questions were included at the very end of the battery.

Procedure

The institutional ethics committee of the Universidad Autónoma de Madrid approved the current study to be conducted. To collect the sample, we followed two processes. First, we asked university students studying Psychology and Tourism degrees to participate. Second, each student was subsequently required to recruit two adults to complete the same questionnaire. Participation was anonymous, voluntary, and unpaid. Participants were required to read and sign an informed consent form prior to begin the study. Then, they completed the online questionnaire answering all measures (i.e., omissions were not permitted).

To assess the test-retest reliability of the PNS scale scores, it was administrated to a selected sample (N = 100) over a period of 16 weeks to ensure that the results of the second

administration were not influenced by any memory effect from the first administration. We contacted those participants and all of them consented to take the test-retest.

Data Analysis

Before assessing the internal structure of the PNS scale, item descriptive statistics were computed. Item univariate and multivariate normality were checked using the Anderson-Darling test (Anderson & Darling, 1952) and the Mardia test (Mardia, 1970), respectively. Next, dimensionality was assessed using parallel analysis with principal component extraction, column permutation, Pearson correlations, and mean eigenvalue criterion following the results when comparing different implementations of the parallel analysis procedure in the studies of Garrido et al. (2013) and Nájera et al. (2021). We also relied on the bootstrap exploratory graph analysis (EGA) procedure using a Gaussian graphical model, the Louvain algorithm, and 500 replications (Christensen & Golino, 2021; Golino & Epskamp, 2017). These two procedures with this particular implementation are among those that have shown the best performance in detecting dimensionality in recent studies (Golino et al., 2020). Lastly, the Kaiser-Meyer-Olkin (KMO) index was computed to determine the factorization adequacy of the item correlation matrix, with values higher than 0.80 considered as meritorious (Kaiser, 1974).

Based on the results of the previous analyses, the internal structure of the PNS scale was subsequently assessed using an exploratory-based confirmatory factor analysis (ECFA; Nájera et al., 2023a). That is, an exploratory factor analysis (EFA) using oblique Oblimin rotation and weighted least squares estimation with the mean and variance adjusted test statistic (WLSMV; Asparouhov & Muthén, 2010) was first fitted to the data. Next, the R^2 method using the comparative fit index (CFI) as the model selector was conducted to identify the relevant factor loadings, which were then used in a confirmatory factor analysis (CFA) using again the WLSMV estimator (see Nájera et al., 2023a, for details regarding the $ECFA_{R2}$ method). Apart from the ECFA fitted to all 12 items, an additional ECFA was also conducted excluding Item 5 from the analysis to test the proposal by Neuberg and Newsom (1993) and compare the two versions of the PNS scale (i.e., with and without Item 5). Model fit was assessed by means of the CFI, Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA), using the following recommended thresholds as indicators of good and acceptable fit, respectively: CFI $\geq$ .95 and .90; TLI $\geq$ .95 and 0.90; RMSEA $\leq$ .05 and .08 (Hu & Bentler, 1999). As an additional precaution, following a reviewer's comment, we checked that robust maximum likelihood estimation produced equivalent results.

Internal consistency was assessed by means of both Cronbach's alpha (α) and McDonald's omega (ω), with values higher than 0.70 considered satisfactory. Test-retest

reliability was also examined by computing the intraclass correlation coefficient (ICC; Koo & Li, 2016) and the test-rest correlation ($r_{test\text{-}retest}$). Furthermore, the determinacy of the factor score estimates was measured using the square multiple correlation (R^2) between the factor score estimates and the levels on the latent factors they estimate (Grice, 2001), using the model-implied correlation matrix as suggested by Beauducel (2011). This index can be interpreted as the common variance between the factor and the corresponding factor score estimate, thus being a reliability coefficient (Ferrando & Lorenzo-Seva, 2018). For individual assessments, an $R^2 \geq 0.81$ is regarded as adequate (Ferrando & Lorenzo-Seva, 2018; Grice, 2001). Lastly, the stability of the factor solutions was also assessed by conducting a nonparametric bootstrap resampling so that each model was fitted with 100 different datasets resulting from sampling with replacement from the original sample (Christensen & Golino, 2021; Nájera et al., 2023a). In the case of the personality items, where each dimension corresponds to only two items, reliability was estimated using the Spearman-Brown coefficient (Eisinga et al., 2013).

Measurement invariance across gender (females vs. males) and age (age of 25 or less vs. older than 25) was evaluated for the retained factor analysis solution. That is, configural invariance (i.e., equal structure), metric invariance (i.e., equal loadings), and scalar invariance (i.e., equal intercepts) were assessed by inspecting the loss in model fit associated with each new degree of restrictiveness. Namely, the changes in CFI, TLI, and RMSEA were used to assess each level of measurement invariance, with values of ΔCFI and ΔTLI $\leq -.010$ and ΔRMSEA $\geq .015$ indicating a relevant loss of fit (i.e., lack of invariance; Chen, 2007). If scalar invariance held, a *t*-test was used to compare the groups' means of the PNS scale. Finally, Pearson correlations between PNS scale scores and the measures included in the present study were computed to explore concurrent validity evidence.

All analyses were conducted in *Mplus* version 8 (Muthén & Muthén, 2017) and R version 4.2.2 making use of the following packages: cdmTools version 1.0.3 (Nájera, Sorrel, et al., 2023), Classical Test Theory Functions (CTT) Version 2.3.3 (Willse, 2018), effectsize Version 0.8.1 (Ben-Shachar et al., 2020), EGAnet version 1.1.0 (Golino & Christensen, 2022), lavaan Version 0.6–15 (Rosseel, 2012), Multivariate Normality (MVN) Version 5.9 (Korkmaz et al., 2014), psych version 2.2.9 (Revelle, 2022), semTools version 0.5–6 (Jorgensen et al., 2022), and wrapFA version 0.0.2 (Nájera et al., 2023b). In the spirit of transparency (Flores-Kanter & Mosquera, 2023), the data and scripts for reproducing the analyses have been made available at an online repository[1].

[1] https://osf.io/378ge/?view_only=None.

Results

Item Descriptive Statistics

Table 1 displays the mean, standard deviation, skewness, and kurtosis for the 12 PNS scale items. Most items were slightly to moderately negative skewed, with means higher than the midpoint of the scale (i.e., 3.5). Both univariate and multivariate normality tests indicated the lack of normally distributed scores ($p < .001$).

Dimensionality Assessment

Parallel analysis suggested the presence of two underlying dimensions, while bootstrap EGA suggested two and three dimensions in 33.6% and 66.4% of the replications, respectively. When excluding Item 5 from the analysis, bootstrap EGA recommended the retention of two dimensions in 99% of the replications. Consequently, a two-dimensional model (i.e., Desire for Structure and Response to Lack of Structure) was explored for the remaining analyses. The KMO index obtained a value of .87, indicating a meritorious factor adequacy.

Internal Structure

Before describing the results for the two-dimensional model, a one-dimensional CFA was fitted to the data to examine this commonly used model in prior research. Despite obtaining an adequate reliability ($\alpha = .821$; $\omega = .853$), model fit was unacceptable (CFI = .847; TLI = .813; RMSEA = .135). These results did not substantially improve by removing Item 5 from the analysis (CFI = .852; TLI = .815; RMSEA = .142).

Table 3 shows the estimated factor loading matrix, as well as additional information regarding reliability and model fit, for the two-dimensional EFA and the resulting CFA after applying the ECFA procedure, either considering or excluding Item 5.

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First, the results were very similar regardless of whether Item 5 was included or not in the analyses. Nevertheless, the solutions without Item 5 obtained a slightly better model fit. Thus, we will focus on these results in the remainder of this section. Second, the theoretical structure of the PNS scale (without Item 5) was properly recovered by the EFA. That is, all items primarily loaded on the intended factor with a substantial magnitude ($\lambda \geq .388$) and showed minimal cross-loadings ($|\lambda| \leq .154$). Consequently, the R^2 method identified as relevant only the primary loadings, leading to a CFA that was totally aligned with the theoretical model; that is, with simple items showing substantial loadings ($\lambda \geq .490$). Factor correlations were equal to .559 and .646 for the EFA and CFA models, respectively. Third, reliability was acceptable for the CFA dimensions, showing a satisfactory internal consistency ($\alpha \geq .751$; $\omega \geq$

.773), test-retest reliability (ICC ≥ .755 and $r_{test\text{-}rest}$ ≥ .774), and determinacy of factor score estimates (R^2 ≥ .819). The factor loading matrix was also very stable across replications (Congruence Coefficient; CC ≥ .982). Lastly, both the EFA (CFI = .966; TLI = .945; RMSEA = .077) and resulting CFA (CFI = .961; TLI = .950; RMSEA = .074) obtained a similar and acceptable model fit.

Measurement Invariance and Mean Comparison

Table 4 summarizes the model fit of the different levels of measurement invariance for the two-dimensional CFA without considering Item 5 across gender and age. Overall, scalar invariance obtained an acceptable fit for both gender (CFI = .957; TLI = .965; RMSEA = .061) and age (CFI = .941; TLI = .953; RMSEA = .074). The difference in fit indices across increasing levels of measurement invariance remained between reasonable levels (ΔCFI and ΔTLI > –.010; ΔRMSEA < .015), with the only exception of ΔTLI = .013 for configural invariance regarding gender and ΔCFI = .020 for scalar invariance regarding age. That is, according to most, but not all, indicators, the invariance model can hold. Overall, these results supported the use of observed scores to compare means in these groups.

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Based on the aforementioned results, *t*-tests were conducted using the observed scores to assess potential differences across gender or age for the two dimensions of the PNS scale (i.e., Desire for Structure and Response to Lack of Structure). Table 5 shows that no differences were found between youngsters (equal to or less than 25) and adults (older than 25) for any of the two subscales. Moreover, significant differences were found between females and males, with females obtaining larger scores on both the Desire for Structure (p = .018; d = 0.183) and Response to Lack of Structure (p = .022; d = 0.243) subscales. These differences were small according to the effect size measure.

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Relationship with Other Measures

The score of each of the two PNS scale dimensions (i.e., Desire for Structure and Response to Lack of Structure) was correlated with the sum score of each dimension of the additional measures included in the present study. In all cases the additional measures had adequate reliability, with the exception of some of the dimensions of the TIPI–10 (Agreeableness, Conscientiousness, and Openness). While this is due to the small number of items and it has been documented in other studies that these short measures converge well with longer measures, the results concerning these three variables should be interpreted with caution. As in previous analyses, these correlations were computed by including or excluding Item 5

from the Response to Lack of Structure dimension. No differences were obtained in the correlation patterns between considering or not Item 5 in the analyses (see Table 6). On the one hand, the Desire for Structure dimension showed a correlations pattern consistent with our predictions, except for Urgency Tendency dimension from the NCCS, and Emotion Approach dimension from the NAQ. On the other hand, the Response to Lack of Structure dimension showed a correlations pattern consistent with our predictions, except for the Urgency Tendency dimension from the NCCS, and Conscientiousness dimension from TIPI–10. With respect to the criterion measures, both the Desire for Structure dimension and the Response to the Lack of Structure dimension showed significant positive correlations with the attitude extremity measure, as well as with the measure of self-reported behaviors in either work or study settings, although the correlations were significantly higher with respect to the latter measure.

-- Please insert Table 6 around here --

Discussion

This research adapted and validated the PNS scale to Spanish, addressed several limitations of previous research, and relevantly, findings provided clear recommendations for its use. Most relevant, the PNS scale has also been adapted and validated in other languages; however, most adaptations have used principal component analysis, which has been questioned in prior literature (e.g., Izquierdo et al., 2014). Likewise, the parceling technique has also been used in the Japanese version of the scale to improve the model fit indices (Kashihara, 2016), but this practice has also been criticized (Little et al., 2002). Similarly, prior research has used model fit indices as a dimension indicator, which is a questionable procedure (Garrido et al., 2016). Consequently, past research has shown wide variability in the utilization of the PNS scale. Some studies have referenced the Neuberg and Newsom's (1993) version of the PNS scale and presented the average of all items as a unidimensional measure (e.g., Stanley & Kay, 2022), others have referenced the Thompson et al.'s (2001) version, but excluded Item 5 (e.g., Natarajarathinam, 2022), whereas others selected specific items from the scale and reported the average (e.g., Brunyé et al., 2019). In sum, prior research on the PNS scale has been characterized by a lack of consistency regarding its use, primarily due to the inclusion/exclusion of Item 5, as well as due to the number of dimensions employed in the analyses.

Importantly, Neuberg and Newsom (1993) removed Item 5 from Thompson et al.'s (2001) scale based on conceptual and empirical grounds. They argued that Item 5 assessed a different construct than the other items and noted a positive skewness and inconsistent factor loadings across multiple samples, although these results were not reported (see Neuberg and

Newsom, 1993). Contrarily, our findings indicated that although Item 5 showed the factor loading expected (without crossloadings), its mean was the lowest comparing with the rest of the items, but the skewness value was not extreme. Nevertheless, we agree with Neuberg and Newsom's (1993) decision to remove Item 5 for two main reasons. First, its removal led to improved fit indices in our study. More relevantly, the exclusion of Item 5 did not substantially alter the relationship between the PNS scale scores with other variables. In fact, removal of Item 5 did not impact either the interpretability or reliability of the model. Considering these findings, we agree with Neuberg and Newsom (1993), that Item 5 should be removed from the scale.

Based on the results obtained from our dimensionality assessment procedures, the two-dimensional model specified by Neuberg and Newsom (1993) received empirical support. The one-factor model proposed by Thompson et al. (2001) showed poor fit indices, suggesting that the single-factor structure initially proposed by these authors was not supported. In contrast, the two-factor solution showed good fit and reliability, particularly when focusing on the more parsimonious CFA solution. In addition, the factor loadings extracted from the two-factor model aligned adequately with the theoretical two-factor model proposed by Neuberg and Newsom (1993), thus providing additional support for this model. Namely, the remaining items, including Item 9 which was discarded in Machunsky and Meiser (2006) due to exhibiting a moderately high factor loading in both factors, functioned appropriately.

Most importantly, our results reveal that the two factors can predict different relationships with measures of other relevant psychological constructs. For example, while the Response to Lack of Structure predicted the Emotion Approach subscale from the NAQ, Need for Cognition and both dimensions from the PANAS; the Desire for Structure did not. This further highlights the advantages of considering a two-factor structure for a more comprehensive understanding and clearer relations with various relevant variables. More specifically, regarding the correlation's patterns, most results were consistent with previous studies (see Table 4). As predicted, we found a negative correlation between the Response to Lack of Structure dimension and the Need for Cognition Scale (Neuberg & Newsom, 1993). This supports the notion that those with a higher need for cognition tend to be more flexible when faced with uncertain situations. Regarding the Ten-Item Personality Inventory, we found a significant negative relationship between both PNS dimensions with Extraversion and Openness. This suggests that individuals who score higher on both PNS dimensions tend to be less extraverted and open, possibly preferring predictability and routine over spontaneity and novelty. Although it was predicted that only the Desire for Structure dimension would correlate

with Conscientiousness, unexpectedly, both dimensions had a significant positive correlation with Conscientiousness; however, in line with the hypothesis, this relationship was stronger with Desire for Structure. Moreover, the Response to the Lack of Structure dimension had a significant positive correlation with Neuroticism, suggesting that individuals high in this dimension may experience more emotional instability. According to our hypothesis, the NAQ's Emotion Avoidance dimension was negatively correlated with both dimensions of the PNS scale. However, with the NAQ's Emotion Approach dimension, a significant negative correlation was observed only with the PNS' Response to Lack of Structure dimension (Maio & Esses, 2001). This suggests that individuals with a high Emotion Approach tendency do not necessarily react negatively to unstructured situations. Instead, they might actively seek out such environments to experience emotions in a more intense and diverse manner, even though this could be less predictable and manageable for them. In contrast, the Desire for Structure dimension, which assesses a preference for structured environments, did not show a significant correlation with Emotion Approach. This may suggest that the preference for structured environments does not directly relate to an individuals' propensity to seek emotional experiences.

Moreover, as predicted, we found no relationship between both factors of PNS scale and Need to Evaluate Scale (Jarvis & Petty, 1996). We found a positive relationship between the two PNS factors and the Need for Cognitive Closure Scale (total score), as well as with the Permanence Tendency dimension; however, we found no relationship with the Urgency Tendency dimension (Webster & Kruglanski, 1994). Additionally, in line with our hypothesis, we found a negative relationship between the Response to Lack of Structure dimension and the Positive subscale of the PANAS, as well as the positive relationship with the Negative subscale of the PANAS (Reich et al., 2001), suggesting that individuals with a higher Response to Lack of Structure might experience fewer positive emotions and more negative emotions, indicating a potential link to emotional well-being. Finally, we also obtained a significant positive correlation between both factors of the PNS scale with attitude extremity; thus, individuals with higher PNS showed higher extreme attitudes. Furthermore, the positive correlation between both PNS dimensions and self-reported behaviors in either work or study contexts indicated the scale's potential utility in predicting academic and work-related behaviors. Understanding one's personal need for structure can help identify individuals who may benefit more from structured environments, for example, in work and academic contexts.

In summary, our findings from the Spanish adaptation of the PNS scale were similar to those found by Neuberg and Newsom (1993). This highlights the cross-cultural applicability of

the scale and emphasizes the importance of personal need for structure in understanding personality, cognition, and behaviors in various contexts. In addition, as novel findings, the present research has identified for the first time a relationship between personal need for structure and attitude extremity, as well as regarding the self-reported behaviors in academic and workplace settings. Furthermore, we emphasize the relationship between Response to the Lack of Structure and the PANAS scale, which was not explored by Neuberg and Newsom (1993) or in other adaptations (Kashihara, 2016; Machunsky & Meiser, 2006; Shi et al., 2009).

Nevertheless, the present research is not without limitations. Most relevantly, on the one hand, although a large sample size was used and bootstrapping procedures were run to test the stability of the factor structure, it is important to test the generalizability of the results in other probabilistic samples (Franco-Martínez et al., 2023). In relation to this, in the present research we chose to follow the exploratory-based confirmatory factor analysis approach proposed by Nájera et al. (2023a). In that study, the authors showed that this strategy is recommended when working with structures in which the factors are correlated. In the revision of the current article, thanks to the comment of one of the reviewers, we went deeper into this idea and found that this approach does not present substantial differences with respect to the more common practice of dividing the sample in two and estimating EFA in the first half and CFA in the second half. The advantage of the approach followed in the article is that it avoids the variability that may be due to working with two specific subsamples out of all possible ones. Nevertheless, it will be interesting for new studies to explore these methodological possibilities in greater depth. On the other hand, all measures employed were self-report measures administered online. It should be noted in this regard that response time analyses were run, and implausible response patterns were ruled out, thereby supporting the quality of the data obtained. Even so, it would be ideal to collect data using objective, automatic, or implicit measures (see Blanco Abarca et al., 2017). This approach would allow the accumulation of more evidence supporting criterion-referenced validity.

In conclusion, based on the present results, we recommend using the current adaptation of the PNS scale to Spanish in future research concerning an individual's personal need for structure. Specially, we recommend the use of the 11-item PNS scale (excluding Item 5), as well as the two-factor structure solution proposed by Neuberg and Newsom (1993).

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Table 1.
Item Descriptive Statistics for PNS Scale

Item	*M*	*SD*	Skew	Kurtosis
1. *Me incomoda meterme en una situación sin saber lo que puedo esperar de ella* [It upsets me to go into a situation without knowing what I can expect from it]	3.99	1.24	–0.43	–0.47
2 [a]. *No me molestan las cosas que alteran mi rutina diaria* [I'm not bothered by things that interrupt my daily routine]	3.71	1.35	–0.14	–0.87
3. *Disfruto teniendo un modo de vida claro y estructurado* [I enjoy having a clear and structured mode of life]	4.34	1.08	–0.73	0.39
4. *Me agrada que haya un lugar para cada cosa y que cada cosa esté en su sitio* [I like to have a place for everything and everything in its place]	4.53	1.06	–0.79	0.73
5 [a]. *Me gusta ser una persona espontánea* [I enjoy being spontaneous]	2.83	1.15	0.48	–0.19
6 [a]. *Considero que una vida bien organizada con horarios estables es aburrida* [I find that a well-ordered life with regular hours makes my life tedious]	3.78	1.18	–0.25	–0.35
7. *No me gustan las situaciones que conllevan incertidumbre* [I don't like situations that are uncertain]	4.09	1.15	–0.33	–0.21
8. *Detesto cambiar mis planes en el último momento* [I hate to change my plans at the last minute]	4.18	1.28	–0.45	–0.39
9. *Me desagrada estar con personas que son impredecibles* [I hate to be with people who are unpredictable]	3.42	1.28	–0.01	–0.64
10. *Considero que una rutina constante me permite disfrutar más de la vida* [I find that a consistent routine enables me to enjoy life more]	3.54	1.18	–0.08	–0.42
11 [a]. *Disfruto del entusiasmo que me provoca estar en situaciones impredecibles* [I enjoy the exhilaration of being in unpredictable situations]	3.59	1.21	–0.02	–0.48
12. *Me genera incomodidad que las normas de una situación sean confusas* [I become uncomfortable when the rules in a situation are not clear]	4.34	1.11	–0.72	0.49

Note. [a] Reversed-scored items.

Table 2.

Previous Studies Seeking Evidence of Validity for the PNS Scale

Authors	Language	Sample	Dimensionality assessment procedure	Estimation Method	Model Fit	Factors (items)	Comments
Thompson et al. (2001)	English	*N* = 210 (University psychology students)	Starting from a largeritem bank, items with factor loadings on minor factors were eliminated	Principal Component Analysis	Not reported	Unidimensional (12 items)	
Neuberg & Newsom (1993)	English	*N* = 2,900 (six subsamples; university students)	Model fit comparation (CFA)	Not reported	χ^2 (*df* = 43) from 49.96 to 351.58 Bentler-Bonett Normed Fit Index from .82 to .93 TLI from .81 to .99 CFI from .86 to .99	Factor 1 (3, 4, 6, and 10) Factor 2 (1, 2, 7, 8, 9, 11, and 12)	Item 5 excluded
Machunsky & Meiser (2006)	German	*N* = 710 (University students)	Scree-Test (EFA)	Principal Component Analysis	χ^2 (*df* = 44) = 335.23, *p* < .01 CFI = .90 RMSEA = .10 GFI = .92	Factor 1 (3, 4, 6, 10) Factor 2 (1, 2, 7, 8, 11, 12)	Item 5 excluded. Item 9 removed based on its factor loadings PROMAX rotation obtained similar results
			Model fit comparison (CFA)		χ^2 (*df* = 43) = 171.20, *p* < .01 CFI = .95 RMSEA = .07 GFI = .96	Factor 1 (3, 4, 6, 10) Factor 2 (1, 2, 7, 8, 9, 11, 12)	
Shi et al. (2009)	Chinese	*N* = 665 (University psychology students)	Model fit comparison (CFA)	Not reported	χ2 (*N* = 665) = 189.88, *p* < .001 CFI = .92 RMSEA = .04 GFI = .95 AGFI = .92	Factor 1 (3, 4, 6, 10) Factor 2 (1, 2, 7, 8, 9, 11, 12)	Item 5 excluded

Kashihara (2016)	Japanese	*N* = 244 (University students)	Model fit comparison (CFA)	Full Information Maximum Likelihood Estimation	With parceling: $\chi^2(8) = 10.44$, $p = .235$ CFI = .99 TLI = 0.98 RMSEA = .035 Without parceling: $\chi^2(43) = 75.77$, $p = .001$ CFI = .92 TLI = 0.88 RMSEA = .056	Factor 1: 3, 4, 6, 10 Factor 2: 1, 2, 7, 8, 9, 11, 12	Item 5 excluded

Table 3.
Summary of Different Factor Solutions for the PNS Scale

	EFA		CFA		EFA [a]		CFA [a]	
	DS	RLS	DS	RLS	DS	RLS	DS	RLS
Item	*Estimated factor loadings*							
1	–.090	**.681**		.588	–.076	**.676**		.593
2	.111	**.412**		.500	.126	**.388**		.490
5	.146	**.387**		.507	-	-	-	–
7	–.040	**.740**		.685	–.028	**.740**		.694
8	.050	**.565**		.596	.053	**.575**		.608
9	.085	**.464**		.527	.093	**.463**		.533
11	.128	**.588**		.691	.154	**.538**		.665
12	.041	**.509**		.532	.043	**.525**		.549
3	**.742**	.095	.828		**.733**	.113	.831	
4	**.528**	.093	.606		**.518**	.118	.614	
6	**.738**	–.124	.604		**.746**	–.144	.592	
10	**.729**	.039	.758		**.728**	.046	.759	
	Internal consistency, stability and reliability							
CC	.972	.980	.999	.998	.982	.986	.999	.998
α	-	-	.751	.771	-	-	.751	.757
ω	-	-	.615	.778	-	-	.774	.773
ICC	-	-	.837	.777	-	-	.837	.755
$r_{\text{test-retest}}$	-	-	.841	.792	-	-	.841	.774
R^2	.826	.823	.839	.830	.824	.813	.840	.819
	Model Fit							
CFI		.947		.950		.966		.961
TLI		.919		.938		.945		.950
RMSEA		.089		.077		.077		.074

Note. Factor loadings higher than .300 for the EFA models are in bold. DS = Desire for Structure; RLS = Response to Lack of Structure; CC = average congruence coefficient of factor loadings after a 100 resampling nonparametric bootstrap procedure; α = Cronbach's alpha; ω = McDonald's omega; ICC = intraclass correlation coefficient; R^2 = determinacy of factor score estimates.

[a] EFA and CFA are conducted by excluding Item 5.

Table 4.

Measurement Invariance across Gender and Age for the CFA Excluding Item 5

Model	*np*	χ^2	*df*	CFI	TLI	RMSEA
			Gender			
One-group	67	213.41	43	.961	.950	.074
Configural	134	299.40	86	.951	*.937*	.083
Metric	125	281.77	95	.957	.950	.074
Scalar	83	324.50	137	.957	.965	.061
			Age			
One-group	67	213.41	43	.961	.950	.074
Configural	134	278.10	86	.959	.947	.078
Metric	125	277.23	95	.961	.954	.072
Scalar	83	411.03	137	*.941*	.953	.074

Note. *np* = number of parameters; *df* = degrees of freedom. Values that indicate a substantial loss of fit are shown in italics.

Table 5.

PNS Scale Mean Comparison across Gender and Age

	Gender						*Age*					
Measure	Female	Male	*t*	*p*	*d*	95%CI	≤ 25	> 25	*t*	*p*	*d*	95%CI
DS	16.42	15.80	2.37	.018	0.183	[0.032, 0.334]	16.05	16.33	–1.07	.283	–0.079	[–0.224, 0.066]
RLS^{5-}	27.82	26.48	3.14	.002	0.245	[0.093, 0.396]	27.40	27.25	0.38	.703	0.028	[–0.117, 0.173]

Note. Female = mean for females; Male = mean for males; ≤ 25 = mean for participants with 25 years or less; > 25 = mean for participants older than 25; *d* = Cohen's *d*; DS = Desire for Structure; RLS^{a} = Response to Lack of Structure (without Item 5).

Table 6.

Correlations between the PNS Scale Subscales and Other Variables

Measure	α / ω	*r*(DS)	*r*(RLS)	*r*(RLS^{5-})
NAQ	.825 / .813	–.142***	–.369***	–.350***
Approach	.794 / .779	–.070	–.135***	–.106**
Avoidance	.805 / .808	–.149***	–.428***	–.424***
NCS	.897 / .898	–.040	–.213***	–.218***
NES	.835 / .838	.008	.029	.051
NCCS	.785 / .736	.191***	.302***	.312***
Permanence Tendency	.687 / .701	.399***	.564***	.572***
Urgency Tendency	.814 / .821	–.066	–.044	–.035
PANAS				
Positive	.897/.897	.010	–.249***	–.238***
Negative	.886/.891	.049	.173***	.187***
TIPI				
Agreeableness	.214 [a**]	.047	–.001	.006
Conscientiousness	.516 [a**]	.321***	.097**	.089*
Extraversion	.719 [a**]	–.103**	–.288***	–.248***
Neuroticism	.698 [a**]	.037	.259***	.267***
Openness	.489 [a**]	–.308***	–.396***	–.370***
Criteria measures				
Attitude Extremity	.759 [b]	.080*	.074*	.100**
Behaviors in work/study setting	.709 / .697	.424***	.398***	.399***

Note. The score used is the *r*(DS) = correlation with the Desire for Structure subscale; *r*(RLS) = correlation with the Response to Lack of Structure subscale, including Item 5; *r*(RLS^{5-}) = correlation with the Response to Lack of Structure subscale, excluding Item 5; NAQ = Need for Affect Questionnaire; NCS = Need for Cognition Scale; NES = Need to Evaluate; NCCS = Need for Cognitive Closure Scale; PANAS = the Positive and Negative Affect Schedule; TIPI = Ten-Item Personality Inventory.

[a] = Spearman-Brown coefficient. [b] = The score used as a criterion is the sum of the absolute distances from the center of the response scale (5). Higher values reflect more extreme judgements in one direction or the other. To calculate the reliability of this measure, we used the split-half approach to reliability, considering Items 1 to 10 as the first half and Items 11 to 20 as the second half.

* $p < .05$. ** $p < .01$. *** $p < .001$.