

# A short form of the positions on nursing diagnosis scale: development and psychometric testing

A FORMA ABREVIADA DA ESCALA POSIÇÕES FRENTE AO DIAGNÓSTICO DE ENFERMAGEM: DESENVOLVIMENTO E AVALIAÇÃO PSICOMÉTRICA

DESARROLLO Y EVALUACIÓN PSICOMÉTRICA DE UNA FORMA ABREVIADA DE LA ESCALA DE POSICIONAMIENTO ANTE EL DIAGNÓSTICO ENFERMERO

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## ABSTRACT

The Positions on Nursing Diagnosis (PND) is a scale that uses the semantic differential technique to measure nurses' attitudes towards the nursing diagnosis concept. The aim of this study was to develop a shortened form of the Spanish version of this scale and evaluate its psychometric properties and efficiency. A double theoretical-empirical approach was used to obtain a short form of the PND, the PND-7-SV, which would be equivalent to the original. Using a cross-sectional survey design, the reliability (internal consistency and test-retest reliability), construct (exploratory factor analysis, known-groups technique and discriminant validity) and criterion-related validity (concurrent validity), sensitivity to change and efficiency of the PND-7-SV were assessed in a sample of 476 Spanish nursing students. The results endorsed the utility of the PND-7-SV to measure attitudes toward nursing diagnosis in an equivalent manner to the complete form of the scale and in a shorter time.

## DESCRIPTORS

Nursing diagnosis  
Students, nursing  
Scales  
Semantic differential  
Psychometrics

## RESUMO

O *Position on Nursing Diagnosis* (PND) é uma escala que utiliza a técnica do diferencial semântico para medir atitudes em relação ao conceito diagnóstico de enfermagem. O objetivo deste estudo foi desenvolver uma forma abreviada da versão em espanhol desta escala e avaliar suas propriedades psicométricas e eficiência. Foi utilizada uma dupla abordagem teórico-empírica para obter uma forma curta do PND, o PND-7-SV, que era equivalente à original. Usando um desenho transversal através de pesquisa, foi avaliada a confiabilidade (consistência interna e confiabilidade teste-reteste), validade de constructo (análise fatorial exploratória, técnica de grupos conhecidos e validade discriminante) e de critério (validade concorrente), sensibilidade à mudança e eficiência da PND-7-SV em uma amostra de 476 estudantes de enfermagem espanholas. Os resultados endossaram a utilidade do PND-7-SV para medir atitudes em relação ao diagnóstico de enfermagem de maneira equivalente à forma completa da escala e em um curto tempo.

## DESCRITORES

Diagnóstico de enfermagem  
Estudantes de enfermagem  
Escala  
Diferencial semântico  
Psicometria

## RESUMEN

El *Position on Nursing Diagnosis* (PND) es una escala que utiliza la técnica del diferencial semántico para medir las actitudes hacia el concepto diagnóstico enfermero. El estudio objetivó desarrollar una forma abreviada de la versión española de esta escala, evaluar sus propiedades psicométricas y eficiencia. Se utilizó un doble enfoque empírico-teórico para obtener una forma reducida del PND, el PND-7-SV, que fuera equivalente a la original. Mediante un diseño transversal a través de encuesta, se evaluó la fiabilidad (consistencia interna y fiabilidad test-retest), validez de constructo (análisis factorial exploratorio, técnica de grupos conocidos y validez discriminante) y de criterio (validez concurrente), sensibilidad al cambio y eficiencia del PND-7-SV en una muestra de 476 estudiantes de enfermería españoles. Los resultados avalaron la utilidad del PND-7-SV para medir las actitudes hacia el diagnóstico enfermero de manera equivalente a la forma completa de la escala y en un tiempo más reducido.

## DESCRIPTORES

Diagnóstico de enfermería  
Estudiantes de enfermería  
Escala  
Diferencial semántico  
Psicometría

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## INTRODUCTION

The nursing diagnosis is the clinical judgment made by the nurse about the responses of the individual, family or community that provides the basis for the selection of interventions directed to achieving the results for which the nurse has responsibility<sup>(1)</sup>. Therefore, these results will be conditioned by the ability to identify the problems that create a need for care. A good ability in the diagnostic process is essential for accurate detection of the patient's problems<sup>(2)</sup> to encourage the provision of adequate care.

Based on the above, the acquisition of knowledge and skills necessary to perform the diagnostic process acquires a vital importance in the formation of future nurses; therefore, these competencies have become part of the curricula of the undergraduate nursing educational program<sup>(3)</sup>. However there are factors, external to the education, which may be determinants for students to put into practice the nursing diagnosis in their future professional practice. One of these factors would be attitudes. The attitudes that people have about the concepts play an important role in implementing behaviors related to these<sup>(4)</sup>. Therefore, the attitude toward nursing diagnosis is a major factor in their utilization.

Despite this, more attention has been paid to research on formative factors<sup>(5)</sup> than the attitudinal, and few studies have focused on knowing the students' attitudes toward the nursing diagnostic activity. The limited evidence available may be due to the difficulty of measuring the attitudes, as they are latent variables inferred through the conduct or oral statements of people, so are not directly measurable<sup>(4)</sup>. One of the most widely used techniques for measurement is the use of instruments that allow inference on the attitudes of the subjects starting from the responses that are given to a series of propositions.

The Positions on Nursing Diagnosis (PND) is a scale that was developed to measure the attitudes of nurses towards nursing diagnosis<sup>(6)</sup>. This instrument uses the semantic differential technique of the words to measure and encourage the expression of people's attitudes towards concepts. The logic underlying this type of scale is that the ideas a person has about something can be broadly represented and communicated through adjectives<sup>(7)</sup>. The semantic differential measures primarily connotative aspects of meaning, that is to say, the implications that the concept evaluated have for the person responding to the instrument. Attitudes are composed of several indicators; therefore, a series of items will describe relatively complex constructs better than one alone. That is why, to measure attitudes, it is always better to construct a scale than to be limited to a single question. In addition, the separate analysis of the items can help to determine which aspects of the attitude highlighted in positive

or negative sense, to be useful when designing interventions directed at modifying it. The PND has been translated into several languages and validated in several international samples, which have shown adequate psychometric properties<sup>(6,8-9)</sup>. However, the results of the tests of internal consistency suggest some redundancy in items<sup>(10)</sup>, with extremely high Cronbach alpha values in all validation studies<sup>(6,8-9)</sup>. This emphasizes the desirability of eliminating this redundancy, by eliminating some items, developing an abbreviated form of the scale that maintains similar psychometric properties to the full version and that, also, reduces the completion times. The use of brief questionnaires is the most effective method for increasing the response rate and reducing potential bias because of the loss of subjects in studies that utilize them<sup>(11)</sup>.

Taking into consideration the important role of the attitudes of students in the implementation of nursing diagnosis in their future professional practice and the benefits that its implementation would be possible to infer, it would be worth the effort to develop and validate a version reduced of the PND to facilitate their study, reducing the time spent by respondents and enhancing therefore, its use in many

research context. The abbreviated form of the scale might be useful for generating knowledge that serves as a starting point for the implementation of strategies to produce a change in attitudes that result in increased diagnostic activity of nurses.

The objectives of this study were: 1) to develop an abbreviated form of the Spanish version of the Positions on Nursing Diagnosis scale, and 2) to evaluate its psychometric properties (reliability, validity and sensitivity to change) and its efficiency in a sample of Spanish nursing students.

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## METHOD

### Item reduction

To develop the reduced version of the PND, it was studied the psychometric properties demonstrated by each of the 20 items of full scale in a previous study<sup>(9)</sup>, whose objective was the transcultural adaptation and validation of the PND in a sample of 621 Spanish nurses.

Those that demonstrated a reduced psychometric performance were eliminated based on criteria that are shown in the following table (Table 1).

To check that the factorial structure of the retained items was analogous to that of the complete scale, an exploratory factor analysis (EFA) was performed, using principal component analysis (PCA) without rotation, on the data obtained in the study outlined above<sup>(9)</sup>. Additionally, the correlation between score of the complete scale, and the sum of the scores obtained for the retained items to verify the equivalence of both scales

was evaluated. In addition, a committee of experts in nursing methodology reviewed the retained items to evaluate face and content validity as a new scale. The

abbreviated form of the PND scale (Positions on Nursing Diagnosis-7-Spanish Version) was obtained from the above process, hereafter PND-7-SV.

**Chart 1** – Selection of the eliminated items, criteria utilized, theoretical foundation, analysis performed and statistical references

Criteria	Theoretical foundation	Analysis	Statistical reference	Eliminated items
Construct validity	Items that did not define the only factor that makes up the scale.	Kown groups technique	Factor loads > 0.30 in more than one factor in the principal component analysis with quartimax rotation.	03 Unpleasant-Pleasant 04 Weak-strong 08 Comfortable-Uncomfortable 09 Difficult-Easy
	Items that did not differentiate between subjects who belonged to two groups that differed in their attitude towards the concept.	Variability in the responses	Scores with no significant differences ( $p < 0.05$ ) between both groups measured by Student t-test or Mann-Whitney u-test.	01 Ambiguous-Clear 03 Unpleasant-Pleasant 09 Difficult-Easy
Distribution of the responses	Items that demonstrated reduced ability to detect differences among participants.	Test-retest	Selection of the 10 items with less variability, those with a standard deviation <1.55 in their mean score.	03 Unpleasant-Pleasant 04 Weak-Strong 06 Negative-Positive 07 Dumb-Intelligent 09 Difficult-Easy 13 Insignificant-Significant 16 Inconvenient-Convenient 17 Unacceptable-Acceptable 18 Bad-Good 20 Unimportant-Important
Reliability	Items whose scores were not stable over time.	Item-total correlation	Intraclass correlation coefficient <0.70 for scores between two scale applications separated by a period of two weeks.	03 Unpleasant-Pleasant
	Items that did not seem to represent the same construct.	Item-item correlation	Pearson or Spearman Correlation coefficient <0.60 between the total score of the scale and the item.	04 Weak-Strong
	Items that presented informative redundancy with others.	Correlación ítem-ítem	Pearson or Spearman Correlation coefficient >0.70 between the item score and at least 5 other items.	05 Worthless-Valuable 06 Negative-Positive 13 Insignificant-Significant 16 Inconvenient-Convenient 17 Unacceptable-Acceptable 18 Bad-Good 20 Unimportant-Important

### Design

The design used was a transversal observational validation of a measurement scale.

### Participants

An opportunistic sample of undergraduate nursing students was recruited from four Spanish universities: University of Alicante, University of Cádiz, Valencia University and University of Granada. For the recruitment, the collaboration of all of the centers, departments and professors was requested.

It was considered that the sample should be made up of a minimum of 200 participants, the sample size recommended if you intend to perform factor analysis<sup>(12)</sup>. However, the effort was made to recruit the largest possible number of subjects, since the use of larger sample sizes reduces the sampling error and produces more stable factorial structures.

### Instruments

The questionnaire used for data collection included:

*Sociodemographic and academic data.* Information for demographic and academic data were collected on one sheet for the participants, including age, sex, university, course and degree of contact with the nursing diagnosis in clinical practicum, rated on a 4-point Likert scale where 1 corresponded to *nothing* and 4 corresponded to *a lot*.

*Opinion about nursing diagnosis.* The general opinion of participants about nursing diagnoses was assessed through the degree of agreement with the statement, *I am in favor of nursing diagnosis as a concept*, evaluated on a 5-point Likert scale where 1 equated to *completely disagree* and 4 meant *completely agree*.

*Positions on Nursing Diagnosis-Spanish Version (PND-SV) and Positions on Nursing Diagnosis-7-Spanish*

*Version (PND-7-SV).* As discussed previously, the PND is a 20-item scale that uses the semantic differential method to assess attitudes toward nursing diagnosis<sup>(6)</sup>. Each item is composed of a pair of opposing adjectives that represent opposing properties of the diagnostic process. The order of the positive and negative descriptors is random to avoid acquiescence. In each item, two adjectives were joined by a line divided by 7 equidistant points. A score ranging from 1 to 7 is assigned to each one of these points, so that 1 corresponds with the point closest to the unfavorable adjective and 7 to the favorable adjective. The respondents must place a mark on the line, to coincide with the point that best expresses their feelings towards the concept. The scores obtained on each item are summed to obtain an overall score on the scale, which can vary between 20 and 140, with the attitude rated at the highest value being more positive with to the concept. A score of 80 corresponds to a neutral stance, which is equivalent to obtaining a mean of 4 points on the 20 items. The PND original and its adaptation to Brazilian Portuguese and Spanish, have shown adequate psychometric properties in different samples that have been evaluated<sup>(6,8-9)</sup>. For this study the Spanish version of the instrument, the PND-SV, was used<sup>(9)</sup>. The PND-7-SV is an abbreviated form of PND-SV composed of 7 items that were developed based on the previously described method.

*Completion time.* The participants were asked to estimate the time invested in completing the complete and abbreviated versions of the scale.

### **Data Collection**

Participants completed an electronic version of the instrument that fully respected the structure and layout of the original scale in paper form. Through the virtual campus, a web platform to support teaching, invitational messages were sent to participate in the study containing a letter, informing about the purposes of this study, along with a hyperlink that led to the collection notebook of data. The student accessed the message through his/her personal area in the virtual campus, which has password protected access. To assess the stability of the scores a second link to the scale was sent in a two week interval to those participants who agreed, in this case, by email. All cases with incomplete data were eliminated. Collecting these lasted from April to May 2012.

### **Ethical considerations**

The Committee on Ethics in Research in Healthcare reviewed and approved the research (Record N. 12/09). Participants were guaranteed confidentiality and anonymity. The return of the completed questionnaire was considered consent to participate. All necessary permits from the faculties of nursing to distribute the questionnaires and from the authors for the reproduction of the original scale were obtained.

### **Statistical analysis**

Normality of the variables was examined using the Kolmogorov-Smirnov-Lilliefors test. Using descriptive statistics, sociodemographic and academic variables were summarized, as well as the distribution of the total scores and each item of the scale. The evaluation of reliability included tests of internal consistency and test-retest reliability. Internal consistency was assessed by calculating the Cronbach alpha coefficient for the entire scale and when each item was removed, as well as through the corrected item-total correlation by means of the Pearson's r test. Alpha coefficients  $> 0.80$  were considered desirable while they did not exceed 0.90, indicating again the existence of redundancy among the items of the shortened form<sup>(13)</sup>. Additionally, correlations  $\geq 0.40$  for each item with the total score of the scale, when the item was removed, were considered adequate<sup>(14)</sup>. The test-retest reliability was assessed by correlating the scores obtained by 101 participants between two administrations of the scale separated by an interval of two weeks. For this the intraclass correlation coefficient (ICC) for the total and for each item were calculated. Intraclass correlation coefficient values  $\geq 0.70$  were considered to denote good stability of the scores<sup>(7)</sup>.

The construct validity, through the EFA and the technique of known groups, discriminant validity and criterion validity in terms of concurrent validity were evaluated. Through the EFA an attempt was made to ascertain whether the reduced version of the scale maintained the unidimensionality of the complete instrument<sup>(6,9)</sup>. To do this, the factorial structure of of the PNS-7-SV and the factor loadings of the items through a PCA without rotation was explored. To determine the number of factors to be extracted those that presented eigenvalues  $\geq 1.00$  were selected, and were positioned above the elbow in the scree plot<sup>(12)</sup>. It was considered that the items with factor loadings  $\geq 0.40$  properly defined the factor<sup>(15)</sup>. Factoriability of the data was previously evaluated by means of the the Kaiser-Meyer-Olkin test (KMO) and Bartlett test of sphericity<sup>(13)</sup>. Based on the known group technique, the scores in the scale of the participants that declared, in a general way, in favor of the nursing diagnosis were compared with those who showed they were against or indifferent to the concept. The hypothesis was that the first would obtain significantly distinct scores on the scale than the latter. To characterize both groups, the responses to the statement *I am in favor of nursing diagnosis as a concept* were utilized. To check this hypothesis, the Mann-Whitney test was performed. The discriminant validity was evaluated by means of the analysis of the receiver operating characteristic (ROC) curve to determine the ability of the scale to detect correctly among participants who belonged to one or the other of the groups described above. The area under the curve (AUC), the standard error (SE) and the confidence interval at 95% (CI 95%) were calculated. The AUC allows the assessment of the ability of the scale to distinguish between those who have a positive attitude of those who have a negative attitude or neutral based on their statements. An AUC of 0.80 to 0.90 was considered indicative of a good precision<sup>(16)</sup>. Concurrent

validity was estimated by evaluating the concordance between the scores of the reduced and complete forms of the scale, which were determined through the Spearman's Rho test. Correlations  $> 0.75$  were considered as proof of excellent concordance<sup>(17)</sup>.

The sensitivity to change of the PND-7-SV was evaluated in 25 students who received an intervention in the form of theoretical and practical educational activity about the nursing methodology, based on the resolution of clinical cases by conducting care plans and imparted by a professor specializing in nursing diagnosis with extensive teaching and research experience in the field. Previous studies<sup>(8,18)</sup> associate the use of nursing diagnosis and education in the subject with positive attitudes towards the concept. The ability of the scale to detect changes in the scores in the same subject, between the situation before and after completing the educational activity, was evaluated through the paired t-test, by checking the hypothesis of changes in attitudes. This statistic is focused solely on the significance of the observed change, so it was considered desirable to also use coefficients in which both the magnitude of the change and its variability intervene. For that reason, the standardized mean response (SMR) was also calculated, by dividing the mean change in scores between the standard deviation (SD), which reflects the variability of change. Values of 0.20, 0.50 and 0.80 indicate, respectively, instruments with limited, moderate and high sensitivity to change<sup>(19)</sup>.

The efficiency of the PND-7-SV was evaluated by calculating the reduction in the time of implementation with respect to the complete scale.

Values of  $p < 0.05$  were considered statistically significant. All data were analyzed using SPSS version 17 (SPSS Inc., Chicago).

## RESULTS

### Scale reduction

Thirteen items of the complete scale complied with at least one of the criteria for exclusion, so they were eliminated (Table 1). The remaining seven items were selected to be retained, forming the proposed abbreviated version of the scale (Table 2). This was subjected to analysis to assess its factorial structure and the correlation of their scores with those of the complete form. The PCA revealed that the shortened version consisted of a single factor, equivalent to the full scale<sup>(6,9)</sup>, which explained 66.2% of the variance with high factor loadings of all items on the same (0.70 to 0.86). An extremely high correlation was also found between the score on the complete scale and the sum of the scores of the seven retained items ( $r_s = 0.97$ ;  $p < 0.001$ ). Based on the positive results obtained by the proposal for a shortened form in the previous analysis, it was reviewed by a committee of experts in nursing methodology who determined that it seemed to adequately measure the construct and the items that conformed were representative and contemplated the primordial aspects of it.

### Sample description

Five hundred and sixty-three questionnaires were sent obtaining a response rate of 84.5%, representing a final sample of 476 students. The mean age of participants was 23.46 years (SD: 7.45) with 74.6% of them being women. In the sample, 68.1% acknowledged having little or no contact with the nursing diagnosis in clinical practicum performed in health institutions as part of their education. Table 1 shows in detail the above data with the distribution of participants per course and university.

**Table 1** – Sociodemographic and academic data of the participants

Participant characteristics	n	%
<b>Sex</b>		
Woman	355	74.6
Man	121	25.4
<b>University</b>		
University of Alicante	212	44.5
University of Cádiz	127	26.7
University of Valencia	98	20.6
University of Granada	39	8.2
<b>Course Year</b>		
First	235	49.4
Second	124	26.1
Third	101	21.2
Fourth	16	3.4
<b>Contact with nursing diagnosis in clinical practicum</b>		
None	146	30.7
Little	178	37.4
Some	125	26.2
A lot	27	5.7

Note: (N = 476)

### Distribution of scores

The mean score of the scale for the sample was 36.43 (SD: 7.76). The range of scores observed was between 7 and 49 points, coinciding with the minimum and maximum that theoretically could be obtained in the scale. All of the items received high mean scores, shown along with their SD in Table 2.

### Reliability

**Internal consistency.** The Cronbach's alpha coefficient was 0.888. Table 2 shows the values of alpha when each item was eliminated and the corrected item-total correlations. High correlations were observed between the scores of all items with the total scale, except for item 7 that correlated in a significantly lower manner than the rest.

**Table 2** – Items of the PND-7-SV, mean scores of the items with standard deviations, results of reliability tests and factor loadings of principal components analysis

Items of the PND-7-SV	Mean	Standard deviation	Item-total correlation	Alpha if item is deleted	Factor loadings
01 Meaningless-Meaningful	5.38	1.35	0.70	0.862	0.81
02 Unrealistic-Realistic	5.11	1.50	0.73	0.858	0.83
03 Hindering-Helpful	5.36	1.40	0.70	0.863	0.79
04 Invalid-Valid	5.49	1.46	0.78	0.852	0.87
05 Irrelevant-Relevant	5.46	1.42	0.76	0.855	0.84
06 Unrewarding-Rewarding	5.27	1.33	0.73	0.860	0.80
07 Routine-Creative	4.36	1.65	0.37	0.907	0.47

**Test-retest reliability.** The ICC for the total score of the scale reached the value of 0.92 (95% CI=0.88 -0.95, n=101) evaluated between the first and second administration of the PND-7-SV. The ICC for each one of the items ranged between 0.74 and 0.90.

### Validity

#### Construct validity

**Exploratory factor analysis.** The significance of the test of sphericity ( $X^2=1797.24$ ,  $df=21$ ,  $p<0.001$ ) and the size of the measure of sampling adequacy ( $KMO=0.91$ ) revealed a common variance of items suitable for performing the EFA. The PCA revealed the presence of a unique factor with an eigenvalue greater than 1.00 (4.28), which explained 61.1% of the variance. Table 2 shows the elevated factor loadings of the items on said factor.

**Technique of known groups.** Participants who reported having a positive opinion about nursing diagnosis obtained scores higher on the scale ( $=37.96$ ;  $SD=6.42$ ;  $n1=417$ ) than those manifesting a negative or neutral opinion ( $=25.63$ ;  $SD=7.89$ ;  $n2=59$ ), confirming the previous hypothesis. This difference was highly significant ( $U=2792.50$ ;  $p<0.001$ ).

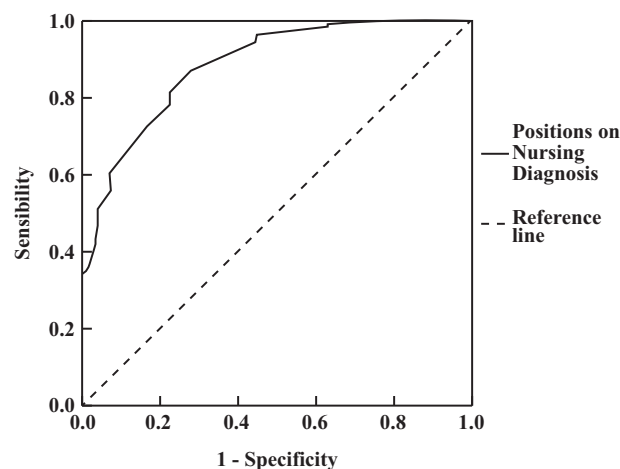
**Discriminant validity.** Figure 1 shows the ROC curve obtained for the PND-7-SV. The AUC reached a value of 0.89 ( $SE=0.02$ ;  $95\% CI=0.84 -0.93$ ) it was, also, significantly distinct from that obtained the condition of zero discrimination ( $p<0.05$ ). The cutoff point of 30 points had a sensitivity of 86.1% and a specificity of 72.9%.

#### Criterion validity

**Concurrent validity.** The reduced form correlated in an excellent manner and highly significantly with the complete version of the scale ( $r_s=0.93$ ;  $p<0.001$ ).

#### Sensitivity to change

The difference in mean score on the scale between baseline and the the completion of the educational activity reached a value of 5.68 ( $SD=4.97$ ;  $95\% CI=3.63 -7.73$ ;  $n=25$ ). It was also highly significant ( $t=5.71$ ;  $p<0.001$ ). The SMR for the scale was 1.14 ( $95\% CI=0.694 -1.589$ ).



**Figure 1** – ROC curve for the total scores of the PND-7-SV. Note: PND-7-SV: Positions on Nursing Diagnosis-7-Spanish Version; Linea de referencia: Reference line; Especificidad: Specificity; Sensibilidad: Sensibility.

#### Efficiency

The time of completion of the abbreviated form ( $=1.67$  minutes;  $SD=1.14$ ) was reduced by 2.08 minutes on average over the complete form ( $=3.75$  minutes,  $SD=2.84$ ).

### DISCUSSION

The development of the PND-7-SV utilized a dual approach, empirical and theoretical. The reduction of those items sought to maintain better psychometric properties demonstrated in sufficient number to appropriately represent the construct. The seven items that were retained, based on statistical performance, were reviewed by a committee of experts who confirmed the suitability of the set as an independent instrument.

The elevated internal consistency and repeatability demonstrated by the PND-7-SV in this study supported the reliability of the instrument. The results obtained in this sense are comparable to those described for the complete scale, both in its original version<sup>(6)</sup> and its adaptations to Spanish<sup>(9)</sup> and Brazilian Portuguese<sup>(8)</sup>. The

alpha coefficient value of the PND-7-SV was situated at the range that indicates an adequate consistency of the items without any redundancy. All items showed a high correlation with the total score of the scale and decreased alpha coefficient if they were removed, except for item 7 (routine-creative) that showed an item-total correlation slightly lower than 0.40 and an increase in alpha above 0.90 if it was excluded. Although, in terms of reliability, it can be stated that this item had a lower performance than others, this might be due to the characteristics of the sample on which this study was conducted. One of the adjectives that compose the item 7 is *routine*, which refers to the quality of an activity that is conducted out of custom, by mere habit and without rationale. For an act to convert to a custom it is required to be repeated on an ongoing basis, however, the vast majority of participants acknowledged having little or no contact with the nursing diagnosis in clinical practicum. The fact that the nursing diagnosis is not an habitual activity among students who participated in the study may be a distorting factor that could have influenced the results obtained by this item in reliability testing. The item is considered to achieve a better performance in a future psychometric validation of the PND-7-SV in graduate nurses because the diagnostic activity is part of their daily practice. The data with respect to the test-retest reliability of the scale support the stability of their scores in a two-week interval, and is also comparable to that of the complete form<sup>(6,9)</sup>.

Adequate construct, discriminant and criterion validity demonstrated by the PND-7-SV in this study endorsed its general validity. The EFA results obtained in this study are similar to those obtained for the complete scale, both in its original version<sup>(6)</sup> and in the Spanish<sup>(9)</sup>. The PND-7-SV is composed of a unique factor that explains a significant variance with high factor loadings of all items. The results derived from the technique of known groups supported the usefulness of the abbreviated scale to distinguish subjects with a favorable attitude towards the concept from those with an unfavorable or neutral attitude. Similarly, the PND-7-SV demonstrated an AUC indicative of good accuracy for discriminating correctly between the groups of attitude and 30 points seems to be the cutoff point with a sensitivity and specificity adequate for that purpose. The score achieved by the participants in the abbreviated form correlated with that obtained in the complete scale, which supports their equivalence.

The sensitivity to change of a scale is the degree to which one obtains different results in repeated applications of the instrument when there has been a real change in the phenomenon it purports to measure<sup>(20)</sup>. The PND-7-SV demonstrated excellent detection of relevant changes in attitudes mediated by an intervention implemented with that objective. The change in the attitude detected by the scale in the students who attended the educational activity, supports the results of previous studies<sup>(8,18)</sup> that found an association between having received education

in nursing diagnosis and having a more favorable attitude towards it.

The reduction in the time of application of the abbreviated form compared to the complete form facilitates the use of the scale in research contexts in which there is a limited time and it may reduce the losses.

The previous findings presented some potential limitations. The item reduction was based on classical psychometric properties, with possible approaches from different theoretical perspectives. The use of a convenience sample limits the generalizability of the results, so additional studies are needed with different representative samples to strengthen them. Despite the effort made to reproduce the original format of the scale in the electronic version used in this study, this can be considered as a potential confounding factor when interpreting the results. However, although there are different views on the effect of the format of the questionnaires on the measurement error, there is not sufficient empirical evidence in either direction<sup>(21)</sup>. For its technical difficulty the order of administration of long and short scales is not balanced, despite the general recommendation to do so from one participant to another to avoid the order effect<sup>(22)</sup>. The absence of other measures of the same construct with proven evidence of their validity, that may have been used as the gold standard, forced to resort to the self-assessment of the participants about their general attitude to the concept as a reference criterion, for both the technique of known groups as for discriminant validity tests.

We have identified several potential uses of the scale in research. The PND-7-SV can be useful to identify the students' attitudes toward nursing diagnosis and to determine whether there is an association between them and academic factors, as they could be learning styles. Likewise, the scale would be useful as a measurement of the change response and, therefore, the effectiveness of motivational interventions. In that sense it could help provide evidence to support the effectiveness of education in changing attitudes and determine which teaching methods are most effective in achieving this objective. The PND-7-SV, developed based on the Spanish version of the PND, could be validated in other languages in which the instrument is available. Furthermore, by making linguistic adjustments and completing the pertinent studies, the PND-7-SV could be used in other Spanish-speaking countries. Finally, additional studies are needed aimed at assessing its psychometric properties in nursing professionals to enable their use in this collective.

## CONCLUSION

The results of this study support the reliability, validity and sensitivity of the change of the PND-7-SV for the measure of attitudes towards the concept of nursing diagnosis in Spanish nursing students in a manner equivalent to the complete form of the scale and in a shorter time.

## REFERENCES

1. North American Nursing Diagnosis Association International (NANDA-I). Nursing diagnoses: definitions and classification 2009-2011. 8th ed. Philadelphia: NANDA-I; 2009.
2. Lunney M. Razonamiento crítico para alcanzar resultados de salud positivos: estudio de casos y análisis de enfermería. Barcelona: Elsevier; 2011.
3. España. Ministerio de Ciencia e Innovación. Orden CIN/2134/2008, de 3 de julio, por la que se establecen los requisitos para la verificación de los títulos universitarios oficiales que habiliten para el ejercicio de la profesión de Enfermero. BolOficialEstado [Internet]. 2008 [citado 2012 jul. 01];(174). Disponible en: <http://www.boe.es/buscar/doc.php?id=BOE-A-2008-12388>
4. Fishbein M. Readings in attitude theory and measurement. New York: Wiley; 1967.
5. Jensen R, Lopes MHBM, Silveira Paulo SP, Ortega Neli RS. The development and evaluation of software to verify diagnostic accuracy. Rev Esc Enferm USP [Internet]. 2012 [cited 2012 July 01];46(1):184-191. Available from: [http://www.scielo.br/pdf/reeusp/v46n1/en\\_v46n1a25.pdf](http://www.scielo.br/pdf/reeusp/v46n1/en_v46n1a25.pdf)
6. Lunney M, Krenz MA. An instrument to measure attitudes toward nursing diagnosis. En: Carroll-Johnson RM, Paquette M, editors. Classification of nursing diagnoses: proceedings of the Tenth Conference of North American Nursing Diagnosis Association. San Diego: Lippincott; 1992. p. 389-90.
7. Nunnally JC, Bernstein IH. Psychometric theory. New York: McGraw-Hill; 1994.
8. Cruz DALM, Hayashi AAM, Oliva APV, Corrêa CG. Adaptação e validação do instrumento "Positions on Nursing Diagnosis" para a língua portuguesa. Rev Bras Enferm. 2006;59(2):163-7.
9. Romero-Sánchez JM, Paramio-Cuevas JC, Paloma-Castro O, Pastor-Montero SM, O'Ferrall-González C, Gabaldón-Bravo EM, et al. The Spanish version of the Position on Nursing Diagnosis scale: cross-cultural adaptation and psychometric assessment. J AdvNurs. 2013 Mar 21. [Epubahead of print].
10. Halberstadt SM, Schmitz KH, Sammel MD. A joint latent variable model approach to item reduction and validation. Biostat. 2012;13(1):48-60.
11. Dillman DA, Sinclair MD, Clark JR. Effects of questionnaire length, respondent-friendly design and a difficult question on response rates for occupant-addressed census mail surveys. Public Opinion Quart. 1993;57(3):289-304.
12. Kline P. An easy guide to factor analysis. Newbury Park: Sage; 1994.
13. Polit DF. Statistics and data analysis for nursing research. 2<sup>nd</sup>ed. Upper Saddle River: Pearson; 2010.
14. Streiner DL, Norman, GR. Health measurement scales: a practical guide to their development and use 4<sup>th</sup>ed. New York: Oxford University Press; 2008.
15. Hair J, Anderson RE, Tatham RL, Black WC. Multivariate data analysis. 4<sup>th</sup>ed. New Jersey: Prentice-Hall; 1995.
16. Swets JA. Measuring the accuracy of diagnostic systems. Science. 1988;240(4857):1285-93.
17. Colton T. Statistics in medicine. Boston: Little Brown; 1974.
18. Oliva APV, Cruz DALM, Volpato MP, Hayashi AAM. Atitudes de alunos e enfermeiros frente ao diagnóstico de enfermagem. Acta Paul Enferm. 2005;18(4):361-7.
19. Husted JA, Cook RJ, Farewell VT, Gladman DD. Methods for assessing responsiveness: a critical review and recommendations. J ClinEpidemiol. 2000;53(5):459-68.
20. De Vet HC, Bouter LM, Bezemer PD, Beurskens AJ. Reproducibility and responsiveness of evaluative outcome measures: theoretical considerations illustrated by an empirical example. Int J Technol Assess Health Care. 2001;17(4):479-87.
21. Granello DH, Wheaton JE. Online data collection: strategies for research. J Couns Dev. 2004;82(4):387-93.
22. Dillman DA. Mail and telephone surveys: the total design method. New York: John Wiley and Sons; 1978.

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