



*Original Research*

## VALIDITY AND RELIABILITY TEST OF NIIGATA PERSISTENT POSTURAL PERCEPTUAL DIZZINESS QUESTIONNAIRE INDONESIAN VERSION (NPQ-INA)

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### ABSTRACT

**Introduction:** Postural Persistent Perceptual Dizziness (PPPD) is the most common disorder among chronic-onset vestibular syndromes, accounting for approximately 37% of cases, and is characterized by persistent dizziness, unsteadiness, and non-spinning vertigo exacerbated by movement, complex visual stimuli, and upright posture. The Niigata PPPD Questionnaire (NPQ) assesses these three domains, but an Indonesian version has not been validated.

**Objective:** To conduct cross-cultural adaptation and evaluate the validity and reliability of the Indonesian version (NPQ-Ina).

**Material and methods:** This analytical cross-sectional study included adults diagnosed with chronic-onset vestibular disorders based on ICVD criteria at the Neurology Outpatient Clinic of Dr. Cipto Mangunkusumo National General Hospital (August - December 2025). Cross cultural adaptation followed WHO guidelines, including forward and backward translation, expert committee review, and field testing. Construct validity was assessed using item total correlation, and internal consistency reliability was evaluated using Cronbach's alpha.

**Result:** Of the 36 study participants, the majority were female (91.7%) with a mean age of  $52.2 \pm 10.5$  years, a median symptom duration of 19.5 months (range 3–408 months), and the most common diagnosis was PPPD (47.2%). All NPQ-Ina items showed significant and strong item-total correlations (0.617–0.875), confirming good construct validity. The overall Cronbach's alpha was 0.894, indicating high internal consistency. The visual and postural factors demonstrated high reliability ( $\alpha = 0.818$  and  $0.815$ ), while the movement factor showed moderate reliability ( $\alpha = 0.685$ ).

**Discussion :** The predominance of middle-aged female participants aligns with epidemiological patterns of chronic vestibular disorders. Strong validity and reliability across domains support the conceptual integrity of the NPQ-Ina, while slightly lower reliability in the movement factor may reflect diagnostic heterogeneity.

**Conclusion:** The NPQ-Ina is a valid and reliable instrument for assessing symptom exacerbating factors in chronic onset vestibular disorders in the Indonesian population.

**Keywords:** PPPD; chronic vestibular disorder; Niigata PPPD Questionnaire; NPQ-InaStroke, Cognitive Impairment, Quality Of Life

## INTRODUCTION

The World Health Organization, through the International Classification of Diseases 11th revision (ICD-11), classifies vestibular syndromes into three categories based on symptom onset: acute, episodic, and chronic. Postural Persistent Perceptual Dizziness (PPPD) is the most common disorder within chronic vestibular syndromes, accounting for approximately 37% of cases. Its core symptoms include persistent dizziness, unsteadiness, and non-spinning vertigo that are exacerbated by movement, complex or moving visual stimuli, and upright posture. These three exacerbating factors are also commonly reported in patients with chronic onset vestibular disorders.<sup>1,2</sup>

In general, PPPD is triggered by or emerges concurrently with an acute or episodic vestibular disorder, resulting in overlapping symptoms with other vestibular conditions. However, unlike acute or episodic vestibular syndromes, PPPD does not demonstrate specific findings on vestibular examination. The heterogeneity of symptoms and the

absence of characteristic vestibular findings make the diagnosis of PPPD challenging. The International Classification of Vestibular Disorders (ICVD) has established diagnostic criteria for PPPD based on a comprehensive clinical history and the exclusion of other causes of dizziness. Nevertheless, establishing a diagnosis of PPPD often requires collaboration among neurology, otorhinolaryngology, and psychiatry. This multidisciplinary requirement may contribute to delays in diagnosis and appropriate management.<sup>1-4</sup>

In recent years, efforts have been made to develop more standardized diagnostic tools to improve the reliability and consistency of diagnosing chronic-onset vestibular disorders, including PPPD. One such instrument is the Niigata PPPD Questionnaire (NPQ), a 12-item questionnaire that assesses three exacerbating factors: visual stimuli, movement, and posture. A study by Yagi et al. demonstrated that the NPQ total score has good sensitivity (70%) and specificity (68%) for diagnosing PPPD. The NPQ has also been translated into several

languages and has shown good validity and reliability in assessing PPPD by these three factors. For example, the Tamil version of the NPQ (NPQ-T) demonstrated excellent internal consistency (Cronbach's  $\alpha = 0.907$ ) and good construct validity, with significantly higher scores in PPPD patients compared to non-PPPD groups. It also showed good discriminative validity, with an AUC of 0.870, indicating a strong ability to differentiate PPPD from other dizziness conditions. Similarly, a study in a Western population demonstrated excellent internal consistency (Cronbach's  $\alpha = 0.938$ ), with good reliability across subscales and substantial reproducibility, along with good construct validity characterized by a single-factor structure and strong correlations with other instruments. Furthermore, the French adaptation of the NPQ also demonstrated high internal consistency (Cronbach's  $\alpha > 0.80$  for subscales and 0.92 for the total score), confirming its excellent reliability. It also showed good construct validity, as PPPD patients had significantly higher scores

compared to vestibular patients and healthy controls.<sup>3,4,5,9</sup>

To date, no validated Indonesian version of the NPQ is available. Therefore, developing an Indonesian version is expected to provide a valid and consistent instrument for assessing symptom-exacerbating factors in patients with chronic onset vestibular disorders in Indonesia.

## MATERIAL AND METHODS

This study was an analytical observational study with a cross sectional design. The research subjects were patients aged  $\geq 18$  years diagnosed with chronic-onset vestibular disorders based on the ICVD criteria, who attended the Neurology Outpatient Clinic at RSUPN Dr. Cipto Mangunkusumo between August and December 2025. Subjects were recruited using a consecutive sampling

method. Ethical approval was obtained on September 5, 2025 (protocol number 24-11-1776; approval letter number KET-27/UN2.F1/ETIK/PPM.00.02/2025). All participants were informed about the study objectives and provided written consent prior to enrollment.

The cross cultural adaptation of the questionnaire followed the World Health Organization guidelines, including forward translation, backward translation, expert committee discussion, and pre-final testing. The final version of the questionnaire was subsequently evaluated for validity and reliability. Construct validity was assessed using item total correlation for each exacerbation factor

(visual, movement, and postural). Internal consistency reliability was analyzed using Cronbach's alpha coefficient. Additionally, Cronbach's alpha if item deleted was calculated to evaluate each item's contribution to overall and factor specific internal consistency. Statistical analysis was performed using a predetermined level of significance.

## RESULTS

### *Characteristics of the Study Subjects*

The study was conducted from August to December 2025 at the Neurology Outpatient Clinic of RSUPN Dr. Cipto Mangunkusumo. A total of 36 subjects with chronic onset vestibular disorders were included, the majority of whom were female (91.7%), with a mean age of  $52.2 \pm 10.5$  years. The median duration of symptoms was 19.5

months (range 3 - 408 months), and most participants had a higher education level (69.4%). Based on the ICVD criteria, the most common diagnosis was PPPD (47.2%). Other diagnoses included vestibular migraine (33.3%), BPPV (13.9%), Ménière's disease (2.8%), and presbyvestibulopathy (2.8%). Although vestibular migraine, BPPV, and Ménière's disease are classified as episodic vestibular disorders in the ICVD classification, they were included because the patients experienced recurrent episodes or persistent symptoms lasting more than 3 months, reflecting chronic vestibular symptom onset.

#### ***Translation and Cross-Cultural Adaptation***

Before conducting the validity and reliability testing of the Indonesian version of the NPQ, permission was first obtained from the score developer, Chiriro Yagi, MD, PhD. After approval was granted, the cross cultural validation process was initiated. The translation and cross cultural adaptation of the questionnaire followed the recommendations of the World

Health Organization, consisting of the following steps:

#### **1. Formation of an expert committee**

The expert committee consisted of dr. Ni Nengah Rida Ariarini, Sp.S(K), dr. Freddy Sitorus, Sp.S(K), and dr. Eva Dewanti, Sp.S(K), faculty members of the Neuro-ophthalmology and Neuro-otology (NO-NOT) Division, Department of Neurology, Faculty of Medicine, Universitas Indonesia -RSUPN Dr. Cipto Mangunkusumo.

#### **2. Forward translation into Indonesian**

The original NPQ was translated into Indonesian by two independent certified translators from different language institutions who were not acquainted with each other. The first translator was from the Faculty of Humanities Universitas Indonesia, and the second was from Samudera Translator. A meeting with the expert committee was held to review the forward translations, during which each word and phrase was carefully discussed to select the most appropriate and conceptually equivalent wording to the original

version. At the end of this process, a reconciled Indonesian version of the NPQ was agreed upon.

### **3. Backward translation into the original language**

The Indonesian NPQ (NPQ-Ina) was then translated back into English by two different certified translators who had not been involved in the forward translation. The first translator was from Solusi Translator, and the second from Samudera Translator. Both backward translations were discussed by the expert committee and synthesized into a single version that was considered most consistent with the original questionnaire. The expert committee concluded that the reconciled backward translation was conceptually identical to the original version. Subsequently, the NPQ-Ina was pilot-tested in 10 study subjects.

### **4. Pilot testing of the NPQ-Ina questionnaire**

The finalized Indonesian NPQ was administered to ten patients with chronic onset vestibular disorders who met the inclusion criteria. Based on structured interviews, all participants were able to verbally explain the meaning of each

questionnaire item in their own words without misinterpretation. It was therefore concluded that all ten subjects adequately understood the content of each NPQ-Ina item. The NPQ-Ina was then proceeded to formal validity and reliability testing.

### ***Validity Testing of the NPQ-Ina Questionnaire***

Construct validity was assessed using item total correlation analysis for each NPQ-Ina factor to determine the extent to which each item correlated with the visual, movement, and postural factors. Correlation testing was performed using Spearman's correlation coefficient, given that NPQ-Ina scores are ordinal (Likert scale 0–6) and therefore required a non-parametric statistical approach.

The analysis demonstrated that all items across the three NPQ-Ina factors showed significant item total correlations ( $p < 0.001$ ), with correlation coefficients exceeding the minimum acceptable threshold of 0.30. In the visual factor, all items had significant item total correlations ( $p < 0.001$ ), with  $r$  values ranging from 0.696 to 0.841. The movement factor showed

relatively lower item total correlations compared to the other two factors, with  $r$  values ranging from 0.617 to 0.776. Meanwhile, in the postural factor, all items

demonstrated significant item total correlations ( $p < 0.001$ ), with  $r$  values between 0.718 and 0.875.

**Table 1.** Characteristics Of Patient

| Characteristics                                                        | Number          | %    |
|------------------------------------------------------------------------|-----------------|------|
| Sex n (%)                                                              |                 |      |
| Male                                                                   | 3               | 8,3  |
| Female                                                                 | 33              | 91,7 |
| Age (mean $\pm$ SD) (years)                                            | 52.2 $\pm$ 10.5 |      |
| Education level n (%)                                                  |                 |      |
| Primary education (elementary/junior/senior high school or equivalent) | 11              | 30,6 |
| Diploma/Bachelor's/Postgraduate                                        | 25              | 69,4 |
| Duration of symptoms (median (min-max) (months)                        | 19,5 (3 – 408)  |      |
| Diagnosis n (%)                                                        |                 |      |
| Persistent Postural-Perceptual Dizziness (PPPD)                        | 17              | 47,2 |
| Vestibular migraine                                                    | 12              | 33,3 |
| Benign Paroxysmal Positional Vertigo (BPPV)                            | 5               | 13,9 |
| Meniere Disease                                                        | 1               | 2,8  |
| Presbyvestibulopathy                                                   | 1               | 2,8  |

Petunjuk: Tujuan kuesioner ini adalah untuk mengidentifikasi kesulitan dalam aktivitas kehidupan sehari-hari yang mungkin anda alami akibat pusing.  
Harap nyatakan jawaban Anda dengan melingkari angka yang paling menggambarkan sejauh mana Anda terpengaruh pusing selama seminggu terakhir.  
Jika Anda sepenuhnya menghindari dari melakukan hal-hal berikut ini, lingkari angka 6.

|                                                                            | Tidak ada     | Tidak tertahankan |
|----------------------------------------------------------------------------|---------------|-------------------|
| 1. Gerakan cepat seperti dari duduk ke berdiri atau menoleh                | 0 1 2 3 4 5 6 |                   |
| 2. Melihat rak pajangan di dalam swalayan yang luas                        | 0 1 2 3 4 5 6 |                   |
| 3. Berjalan dengan kecepatan biasa                                         | 0 1 2 3 4 5 6 |                   |
| 4. Menonton TV atau film dengan gerakan intensitas tinggi                  | 0 1 2 3 4 5 6 |                   |
| 5. Naik mobil, bis, atau kereta api                                        | 0 1 2 3 4 5 6 |                   |
| 6. Duduk tegak di kursi tanpa sandaran punggung dan lengan                 | 0 1 2 3 4 5 6 |                   |
| 7. Berdiri tanpa menyentuh benda statis                                    | 0 1 2 3 4 5 6 |                   |
| 8. Menonton layar bergulir di komputer atau ponsel pintar                  | 0 1 2 3 4 5 6 |                   |
| 9. Melakukan aktivitas seperti pekerjaan rumah tangga atau olahraga ringan | 0 1 2 3 4 5 6 |                   |
| 10. Membaca huruf kecil di buku atau koran                                 | 0 1 2 3 4 5 6 |                   |
| 11. Melangkah dengan cepat                                                 | 0 1 2 3 4 5 6 |                   |
| 12. Naik lift atau eskalator                                               | 0 1 2 3 4 5 6 |                   |
| Skor postur tegak/berjalan (Q3+6+7+11)                                     | /24           |                   |
| Skor gerakan (Q1+5+9+12)                                                   | /24           |                   |
| Skor stimulasi visual (Q2+4+8+10)                                          | /24           |                   |
| Skor Total                                                                 | /72           |                   |

**Figure 1.** Niigata Persistent Postural Perceptual Dizziness Questionnaire Indonesian Version (NPQ-Ina)

**Table 2.** Item–Total Correlation for the Visual Factor

| Item                                                   | r-value | p-value | Interpretation |
|--------------------------------------------------------|---------|---------|----------------|
| Melihat rak pajangan di dalam swalayan yang luas       | 0.696   | < 0,001 | Valid          |
| Menonton TV atau film dengan gerakan intensitas tinggi | 0.807   | < 0,001 | Valid          |
| Menonton layar bergulir di komputer atau ponsel pintar | 0.830   | < 0,001 | Valid          |
| Membaca huruf huruf kecil di buku atau koran           | 0.841   | < 0,001 | Valid          |

**Table 3.** Item-Total Correlation for the Movement Factor

| Item                                                                    | r-value | p-value | Interpretation |
|-------------------------------------------------------------------------|---------|---------|----------------|
| Gerakan cepat seperti dari duduk ke berdiri atau menoleh                | 0.684   | < 0,001 | Valid          |
| Naik mobil, bis, atau kereta api                                        | 0.776   | < 0,001 | Valid          |
| Melakukan aktivitas seperti pekerjaan rumah tangga atau olahraga ringan | 0.707   | < 0,001 | Valid          |
| Naik lift atau eskalator                                                | 0.617   | < 0,001 | Valid          |

**Table 4.** Item-Total Correlation for the Postural Factor

| Item                                                    | r-value | p-value | Interpretation |
|---------------------------------------------------------|---------|---------|----------------|
| Berjalan dengan kecepatan biasa                         | 0.718   | < 0,001 | Valid          |
| Duduk tegak di kursi tanpa sandaran punggung dan lengan | 0.817   | < 0,001 | Valid          |
| Berdiri tanpa menyentuh benda statis                    | 0.875   | < 0,001 | Valid          |
| Melangkah dengan cepat                                  | 0.750   | < 0,001 | Valid          |

**Table 5.** Internal Reliability Testing of the NPQ-Ina

| Item                        | Cronbach's Alpha |
|-----------------------------|------------------|
| Total NPQ Score             | 0.894            |
| Total Visual Factor Score   | 0.818            |
| Total Movement Factor Score | 0.685            |
| Total Postural Factor Score | 0.815            |

### ***Reliability Testing of the NPQ-Ina Questionnaire***

Internal consistency reliability of the NPQ-Ina questionnaire was assessed using Cronbach's alpha coefficient to

evaluate the consistency among items in measuring the exacerbation factor constructs of chronic-onset vestibular disorder symptoms.

The analysis showed that the total NPQ-Ina score had a

Cronbach's alpha value of 0.894, indicating high internal reliability. When analyzed by individual factors, the visual stimulus factor demonstrated a Cronbach's alpha of 0.818, reflecting high internal consistency among items related to sensitivity to visual stimuli. Similarly, the postural factor showed a Cronbach's alpha of 0.815, also indicating high internal consistency. The movement factor yielded a Cronbach's alpha of 0.685, which was lower than the other factors but still considered acceptable in the context of questionnaire adaptation and validation studies.

The results of the internal reliability analysis using Cronbach's alpha if item deleted showed that removing item number 1 (gerakan cepat seperti dari duduk ke berdiri atau menoleh) increased the total Cronbach's alpha value to 0.898, whereas deletion of the other items did not increase the overall Cronbach's alpha. In the visual factor analysis, removing item number 2 (melihat rak pajangan di dalam swalayan yang luas) increased the Cronbach's alpha value to 0.892, while deletion of the remaining items

did not improve the reliability coefficient of the visual factor. For both the movement and postural factors, the Cronbach's alpha if item deleted values for all items did not demonstrate any increase in Cronbach's alpha.

## DISCUSSION

The study has a good construct validity and high internal consistency. Construct validity in this study was assessed using item total correlation within each factor. All NPQ-Ina items across the three factors showed significant and strong correlations, ranging from 0.617 to 0.875 according to Cohen's classification. The visual factor demonstrated strong correlations (0.696 - 0.841), indicating that its items effectively capture visual intolerance in patients with chronic onset vestibular disorders, consistent with the known role of moving and complex visual stimuli in symptom provocation. The movement factor showed relatively lower correlations (0.617 - 0.776), likely reflecting heterogeneity in movement responses and stimuli (active and passive movement) due to the

diverse vestibular diagnoses in the study participants. The elevator/escalator item had the lowest correlation ( $r = 0.617$ ), possibly due to limited exposure among some participants. Additionally, in chronic vestibular disorders, symptoms often develop gradually with sustained exposure rather than increasing immediately. Therefore, short-duration activities such as riding an elevator or escalator may produce more variable responses compared to other movement related activities involving longer sensory exposure. The postural factor demonstrated the highest correlations ( $0.718 - 0.875$ ), suggesting that instability during standing or walking is a highly consistent trigger across chronic vestibular disorders. Overall, all NPQ-Ina items adequately represent their respective constructs : visual, movement, and postural triggers, supporting good construct validity. These findings align with evidence that impaired multisensory integration, particularly between the visuo-vestibular and sensorimotor systems, underlies symptoms in chronic vestibular disorders.<sup>5,9,10,11</sup>

The reliability of the NPQ-Ina was assessed using internal consistency analysis with Cronbach's alpha, yielding a total score of 0.894, indicating strong internal consistency in measuring PPPD symptom constructs. Factor based analysis showed high reliability for the visual ( $\alpha = 0.818$ ) and postural ( $\alpha = 0.815$ ) factors, consistent with validation studies of NPQ in other languages. The movement factor demonstrated moderate reliability ( $\alpha = 0.685$ ), likely reflecting heterogeneity in responses to movement provocation due to variations in chronic onset vestibular diagnoses, as also reported by Yagi and Western validation studies. Analysis of Cronbach's alpha if item deleted showed minimal increases in the total score and visual factor after removal of certain items, however these increases were not practically or clinically meaningful. Therefore, all items were retained to preserve the comprehensive conceptual dimensions of PPPD, encompassing visual, movement, and postural components. Overall, the NPQ-Ina demonstrates good internal consistency in assessing factors that

exacerbate symptoms of chronic onset vestibular disorders, namely visual stimuli, movement, and posture. Indicating that this instrument is reliable for use in the Indonesian population with chronic-onset vestibular disorders.<sup>5,9,12</sup>

Various participant characteristics were identified in this study, including a predominance of female, PPPD as the most common diagnosis, and a high proportion of participants with higher education. The majority of female (91.7%) was consistent with epidemiological reports indicating that chronic-onset vestibular disorders are more common in women, possibly related to hormonal regulation, greater sensitivity in symptom perception, heightened vestibular stress responses, and a higher tendency for comorbidities such as anxiety and depression among women. The mean age of the subjects was  $52.2 \pm 10.5$  years, suggesting that chronic onset vestibular disorders are more prevalent in middle aged to older adults. This may be associated with somatosensory dysfunction, visual

impairment, cognitive decline, and reduced physical strength, all of which can affect the sensory integration necessary for maintaining balance in older individuals with vestibular pathology. The predominance of highly educated subjects (69.4%) supported comprehension of the questionnaire items and facilitated semantic, experiential, and conceptual equivalence during the translation and cross-cultural adaptation process. However, the inclusion of nearly one-third of subjects with basic education indicates that the instrument remains understandable across different educational levels, reflecting the use of simple language appropriate to the Indonesian cultural context and contributing to good construct validity and internal reliability. The diverse diagnostic spectrum in this study reflects the clinical population of chronic onset vestibular disorders, and the predominance of PPPD diagnoses also explains the long and widely variable disease duration observed, as reported in previous literature.<sup>6,7,8</sup>

The researchers acknowledge that this study has several limitations.

First, external reliability (test - retest reliability) was not assessed; therefore, the ability of the NPQ-Ina to produce stable scores over time could not be determined. Second, the NPQ was originally developed for patients with PPPD, whereas this study included patients with various chronic-onset vestibular disorders; therefore, the performance of the NPQ-Ina specifically in PPPD patients may not have been fully evaluated.

## CONCLUSION

The NPQ-Ina is a valid and reliable instrument for assessing factors that exacerbate symptoms of chronic onset vestibular disorders, including visual stimuli, movement, and postural changes. Further studies are recommended to evaluate test-retest reliability and conduct

subgroup analyses across different diagnostic categories. Additionally, the NPQ-Ina may be utilized as a standardized instrument for future research examining the proportion and clinical characteristics of PPPD.

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