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Trans-adaptation and validation of dizziness handicap inventory in Telugu version (DHI-t)

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Abstract
Objective: The current study aimed to evaluate the impact of dizziness on quality of life by translating, adapting, and validating the Dizziness Handicap Inventory (DHI) among Telugu-speaking individuals.
Methods: The DHI in English was translated into Telugu language with the help of qualified and expert professionals, who use Telugu as their mother tongue. After following content validation, the final DHI-Telugu was administered to 136 participants (62 males and 74 females) aged between 21 to 70 years with complaints of dizziness /vertigo. Statistical analysis was performed in which Cronbach Alpha, internal consistency, and test-retest reliability were assessed among the psychometric properties of the DHI-Telugu.
Results: The overall Cronbach's alpha is 0.92 for the total score. The internal consistency of three subscales i.e. physical (0.77), emotional (0.77), and functional (0.84) respectively. The overall ICC (Cronbach's Alpha) value is 0.92 to 0.93 for pre-and post-database, demonstrating high internal consistency and reliability of the DHI-Telugu questionnaire.
Conclusion: The excellent psychometric properties of the Dizziness Handicap Inventory in the Telugu version?

Keywords: Physical, Function, Emotional, Telugu version, Vestibular Disorder/Dizziness, Vestibular neuritis, Labyrinthitis

1. Introduction

Vertigo is an erroneous perception of self or object motion or an unpleasant distortion of static gravitational positioning that is a result of a mismatch between the three sensory systems i.e. vestibular, visual, and somatosensory [1]. Vertigo disorders are a group of conditions that cause a sensation of spinning or movement, even when a person is stationary. These disorders can significantly disrupt daily life, leading to difficulties in balance, coordination, and overall functioning. Common causes include benign paroxysmal positional vertigo (BPPV)-which is triggered by specific head movements, and Meniere's disease (MD)-a chronic condition affecting the inner ear [2]. Other causes include vestibular neuritis, labyrinthitis, head injuries, and migraines. Vertigo can be accompanied by symptoms such as sensation of spinning or movement, nausea, vomiting, abnormal eye movements, and hearing loss [3].

Although vertigo affects both sexes, women experience it around two to three times more frequently than men. It has been linked to several comorbid medical conditions, such as depression and heart disease. The prevalence fluctuates based on the underlying diagnosis and rises with age. Vertigo has a yearly incidence of 1.4% and a 1-year frequency of around 5%, according to a general population survey. Every year, 15% to 20% of individuals experience dizziness, including vertigo [4].

Universally, about 1 in 10 people will comprehend vertigo at some point in their lives, with an estimated 0.71% prevalence in India, impacting over 9 million individuals. Effective diagnosis and treatment are crucial, involving physical examinations, hearing tests, and sometimes imaging studies, along with medications, physical therapy, or specific maneuvers to alleviate symptoms. Understanding and addressing vertigo is essential for improving patient care and enhancing the quality of life for those affected by this debilitating condition [4-6]. Vertigo and balance disorders are common clinical issues that can severely impact an individual's ability to perform daily activities.

These conditions often lead to significant social, physical, emotional, and functional activity impairments, affecting the overall quality of life. The Dizziness Handicap Inventory (DHI-E) scale is a specialized tool designed to assess the extent to which vertigo affects a person's daily functioning. It includes 25 questionnaires that evaluate three primary domains: Physical, Functional, and Emotional activities [7].

Originally developed in English, the DHI-E scale has been translated and validated in several languages to ensure its applicability across different cultural and linguistic contexts. Some of the languages into which the DHI has been translated include Argentina [8], French [9], Chinese [10], Italian [11], Brazilian [12], Sweden [13], Arabic [14], Japanese [15], Dutch [16], Persian [17], Greek [18], Hebrew [19], Thai [20] German [21] and Bulgarian [22]. It is now only accessible for Hindi [23], Kannada [24], Malayalam [25], and Gujarati [26], leaving out a large number of other regional Indian languages. This presents a challenge to regular clinical practice as India is a multilingual country with diverse cultures, and a significant portion of the population relies on regional languages for communication.

Although the DHI Questionnaires are not yet available in the Telugu version, which is spoken by 83 million people in the Indian states of Telangana and Andhra Pradesh [27]. This study aims to fill this gap by translating and validating the DHI into Telugu, providing a reliable and culturally relevant tool for assessing the impact of vertigo on daily living among Telugu-speaking individuals.

The Trans-Adaptation and validation process will follow established guidelines for cross-cultural adaptation [28]. The psychometric properties of the Telugu version of the DHI, including its reliability and validity, will be thoroughly evaluated to ensure that it meet the standards required for clinical and research use [7, 11, 16, 18, 21, 26, 30].

By making the DHI-Telugu accessible to Telugu-speaking populations, this study seeks to enhance the questionnaire assessment and management of vertigo and balance disorders. The availability of a validated Telugu version of the DHI will facilitate accurate diagnosis, treatment planning, and evaluation of therapeutic outcomes, ultimately improving patient care and quality of life for individuals affected by vertigo in Telangana and Andhra Pradesh (Telugu Speaking Population).

2. Methods and Materials
This research is to translate, validate and verify the reliability of the questionnaire. The translation and transcultural adaptation of the Telugu was carried out with the authorization of Manipal Hospital. The questionnaire was then translated to Telugu with the help of qualified Telugu-speaking professors of linguistics and audiologists and speech-language therapist department using the standard translation-back-translation method.

The translated questionnaire was distributed to 8 native Telugu speakers who were thorough in reading and writing the Telugu language for content validity. These speakers were asked to rate individual questions using a three-point rating scale from very familiar to non-familiar. The standard translation-back-translation method was utilized where two professors in the Telugu language performed a forward translation of the questionnaire. For content validation, the translated version of the Dizziness Handicap Inventory-Telugu (DHI-T) language was then administered to 8 native

literate Telugu speakers (1 teacher, 5 audiologists, and 2 linguists).

2.1 Study Design
The Dizziness Handicap Inventory (DHI) will be translated into Telugu and validated using a cross-sectional approach in this study. The study will follow established guidelines for cross-cultural adaptation of self-report measures, ensuring both linguistic and cultural relevance.

2.2 Participants
A total sample of 136 subjects participated i.e. 62 (45.58%) were male and 74 (54.42%) were female as shown in Table 1, who are native Telugu speakers. The study took place between June to October 2024 in the healthcare settings in Andhra Pradesh (Manipal Hospital Tadepall, Guntur-, A.P.). Participants will include individuals diagnosed with vertigo or balance disorders, which include Normal Hearing, Tinnitus, Post-lingual hearing loss, Conductive Hearing Loss (Chronic), sensorineural hearing loss (SNHL), benign paroxysmal positional vertigo, meniere's disease and participants with any psychological, traumatic injury, and neurological problems excluded from the study.

Table 1: Distribution of gender and distribution of total no. of male and female

Gender	Total no of subject
Male	62
Female	74
Total	136

2.3 Translation Procedure
The recommendations made by Beaton *et al*. (2000) for cross-cultural adaptation and translation were followed by us.[28] We divided this process of translation and cultural adjustment into 6 phases, which included the following as shown procedure of translation of DHI-T Table 2.

Table 2: Shows Procedure of Translation of DHI
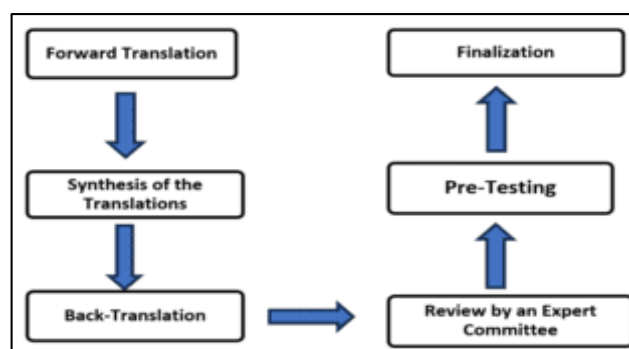
Forward Translation
The scale was first translated from English, the target language Telugu, the source language. At least two separate translators worked on this project. The questionnaire was ideally translated into the native tongue of these multilingual translators.

Synthesis of the Translations
Two native Telugu-speaking experts in audiology and linguistics independently translated the Dizziness Handicap Inventory (DHI) questionnaires. Their translations were then compared and synthesized into a unified version of DHI-T. Any discrepancies or confusion regarding the translated

items were thoroughly discussed and resolved among the raters, ensuring clarity and accuracy in the final version.

Back-Translation
To ensure the accuracy of the translation, the translated text was independently back-translated by two bilingual translators. This process involved translating the text back from the target (Telugu) language into the original (English) language. To avoid any potential bias, the back-translators were kept completely unaware of the original version. This method confirmed the fidelity and accuracy of the translation, ensuring that the final version accurately reflected the original content.

Review by an Expert Committee
To create the final draft of the translation, a group of experts were formed. This group included people who understand the topic well, 5 Audiologists, 2 linguistics and one teacher who worked on the initial and back translations, and if possible, the original creators of the questionnaire. The main job of this expert group was to review all the different versions of the translation and make sure they matched the original in terms of meaning, expressions, experiences, and concepts. Their work resulted in a final draft of the questionnaire, which was then ready for testing in the field.

Test of the pre-final version
The pre-final version of the DHI-T questionnaire and the prefinal version of the translated questionnaire were filled by the patients, preferably 11 from a targeted setting. After completing the questionnaire, patients were asked to explain their understanding of each question and their responses.
This approach ensured that the translated questions retained the same meaning as the original, with no confusion. This process may be repeated, and patients were selected based on inclusion criteria to confirm the final translated version.

Finalization
Based on the feedback from the pre-test, necessary modifications were made to the DHI-Telugu. The final version was then approved by the expert committee of five experts in the field of audiology (experience 5-10 years), one teacher, and two linguists, who use Telugu as their first language.
The final translated questionnaire (DHI-T) was given to 8 validators for content validation. These validators are fluent in both English and Telugu. The translated DHI (Telugu version) content was verified in different aspects, such as grammar of the sentences, sentence structures, socio-cultural aspects, and reader friendliness. The validated DHI (Telugu version) was then administered to participants, who were instructed to read each question thoroughly and respond based on their perception of their condition. The first part of the questionnaire consisted of demographic details about the participants' names, ages, gender, and general complaint. They were questioned about their drug history, blood pressure, diabetes, tinnitus, and other conditions. Most participants, having basic educational qualifications, completed the questionnaire independently and some with the help of the clinician.

2.4 Documentation
After the DHI-Telugu Version questionnaire was validated, the results were documented and included in Table 3. This validated translation was then implemented across various clinical settings and private hospitals. The use of the DHI-Telugu in these diverse environments allowed for a comprehensive assessment of its effectiveness and reliability in real-world conditions.
Data collected from these different settings provided valuable insights about the questionnaire's performance, helping to ensure its robustness and applicability for Telugu-speaking patients experiencing dizziness or vertigo.

2.5 Questionnaire
The Dizziness Handicap Inventory (DHI) questionnaire comprises 25 items designed to evaluate the impact of vertigo on a patient's daily life. These items are divided into three subscales: Functional: This assesses the impact of dizziness on everyday physical activities and the ability to perform tasks. These tasks include walking, bending, quick head movements, and daily routines. Emotional: This evaluates the emotional impact of dizziness, including feelings of frustration, fear of falling, anxiety, and depression. Physical: This subscale focuses on the physical symptoms of dizziness and vertigo, including how certain movements or positions exacerbate these symptoms[7].

Table 3: DHI Telugu Version of Questionnaires

Dizziness Handicap Inventory
మైకము/ తలతిప్పుట యొక్క ప్రభావం: సూచిక

ఈ ప్రశ్నావళిని జాకబ్సన్ GP మరియు న్యూమాన్ CW 1990లో రూపొందించి, ధృవీకరించారు. దీని ఉద్దేశ్యం వ్యక్తుల జీవితంపై మైకము/ తలతిప్పుట ప్రభావాన్ని అంచనా వేయడం. ఈ ప్రశ్నావళి ద్వారా మైకము/ తలతిప్పుట వ్యక్తుల జీవితంపై ఏ విధంగా ప్రభావం చూపుతుందో కొలవడం జరిగింది.

వివరాలు   పేరు:   వయసు/లింగం:   ఫోన్ నంబర్:
    C/O:

నిర్దేశాలు

మైకము/ తలతిప్పుట కు కారణాలు : సూచిక (DHI) 25 ప్రశ్నలతో కూడిన ప్రశ్నావళి. ఇది మూడు ఉపవర్గాలుగా విభజించబడింది: భౌతిక, భావోద్వేగ, మరియు క్రియాత్మక. ఈ ప్రశ్నలు మైకము/ తలతిప్పుట వివిధ అంశాలపై దాని యొక్క ప్రభావాన్ని అంచనా వేయడానికి ఉద్దేశించబడినవి. ప్రతి ప్రశ్నకు "అవును," "కొన్ని సార్లు," లేదా "కాదు" అని సమాధానం ఇవ్వాలి. మీ సమస్య కారణంగా మీరు ఏదైనా పరిస్థితిని నివారించినా, దయచేసి అన్ని ప్రశ్నలకు సమాధానం ఇవ్వండి

S.N.	సబ్ స్కేల్	ప్రశ్నలు	అవును	కొన్ని సార్లు	కాదు
1.	భౌతిక (P):	పైకి చూడటం మీ సమస్యను పెంచుతుందా?			
2.	భావోద్వేగ (E):	మీ సమస్య కారణంగా మీరు నిరుత్సాహానికి గురవుతారా?			
3.	క్రియాత్మక (F):	మీ సమస్య కారణంగా మీరు వ్యాపారానికి లేదా విశ్రాంతి కోసం ప్రయాణాన్ని పరిమితం చేస్తున్నారా?			
4.	భౌతిక (P):	సూపర్ మార్కెట్లో అనివార్యంగా నడవటం మీ సమస్యను పెంచుతుందా?			
5.	క్రియాత్మక (F):	మీ సమస్య కారణంగా పడక నుండి లేచేందుకు లేదా పడకలోకి వెళ్ళేందుకు ఇబ్బందిగా ఉందా?			
6.	క్రియాత్మక (F):	మీ సమస్య కారణంగా భోజనానికి వెళ్ళటం, సినిమా చూడటం, నృత్యం చేయటం లేదా పార్టీలకు వెళ్ళటం వంటి సామాజిక కార్యకలాపాల్లో మీ పాల్గొనడం గణనీయంగా తగ్గిందా?			
7.	క్రియాత్మక (F):	మీ సమస్య కారణంగా చదవటానికి ఇబ్బంది పడుతున్నారా?			
8.	భౌతిక (P):	క్రీడలు, నృత్యం, గృహ పనులు (మోపడం లేదా పాత్రలను సర్దటం) వంటి ముఖ్యమైన పనులను చేయటం మీ సమస్యను పెంచుతుందా?			
9.	భావోద్వేగ (E):	మీ సమస్య కారణంగా మీరు ఎవరి సహాయం లేకుండా ఇంటి నుండి బయటకు వెళ్ళేందుకు భయపడుతున్నారా?			
10.	భావోద్వేగ (E):	మీ సమస్య కారణంగా మీరు ఇతరుల ముందు చింతిస్తున్నారు?			
11.	భౌతిక (P):	తేలికగా తల తిప్పటం మీ సమస్యను పెంచుతుందా?			
12.	క్రియాత్మక (F):	మీ సమస్య కారణంగా మీరు ఎత్తైన ప్రదేశాలను నివారిస్తున్నారా?			
13.	భౌతిక (P):	మంచంలో తిరుగటం మీ సమస్యను పెంచుతుందా?			
14.	క్రియాత్మక (F):	మీ సమస్య కారణంగా కష్టమైన గృహ పనులు లేదా తోట పనులు చేయటం మీకు కష్టంగా ఉందా?			
15.	భావోద్వేగ (E):	మీ సమస్య కారణంగా మిమ్మల్ని ఇతరులు మద్యం సేవించినట్లు అనుకుంటారా?			
16.	క్రియాత్మక (F):	మీ సమస్య కారణంగా మీరు ఒంటరిగా నడవటం కష్టంగా ఉందా?			
17.	భౌతిక (P):	పాదచారుల మార్గం మీద నడవటం మీ సమస్యను పెంచుతుందా?			
18.	భావోద్వేగ (E):	మీ సమస్య కారణంగా మీకు ఏకాగ్రత తగ్గుతున్నదా?			
19.	క్రియాత్మక (F):	మీ సమస్య కారణంగా మీరు ఇంటిలో చీకట్లో నడవటం కష్టంగా ఉందా?			
20.	భావోద్వేగ (E):	మీ సమస్య కారణంగా మీరు ఒంటరిగా ఇంట్లో ఉండటానికి భయపడుతున్నారా?			
21.	భావోద్వేగ (E):	మీ సమస్య కారణంగా మీరు వికలాంగునిగా భావిస్తున్నారా?			
22.	భావోద్వేగ (E):	మీ సమస్య మీ కుటుంబ సభ్యులు లేదా మిత్రులతో ఉన్న సంబంధాలను ప్రభావితం చేసిందా?			
23.	భావోద్వేగ (E):	మీ సమస్య కారణంగా మీరు డిప్రెషన్‌కు గురవుతున్నారా?			
24.	క్రియాత్మక (F):	మీ సమస్య మీ ఉద్యోగం లేదా గృహపనులను చేయటంలో అంతరాయంగా ఉందా?			
25.	భౌతిక (P):	వంగటం మీ సమస్యను పెంచుతుందా?			

DHI స్కోరింగ్ సూచనలు

మొత్తం స్కోర్ 0 నుండి 100 వరకు ఉంటుంది. స్కోర్ ఎక్కువగా ఉంటే, మైకము/ తలతిప్పుట ప్రభావం ఎక్కువగా ఉంటుందని సూచిస్తుంది. ప్రతి అంశానికి కింది విధంగా స్కోర్లు ఇవ్వాలి:

కాదు	0
కొన్ని సార్లు	2
అవును	4

స్కోర్లు:

10-16 పాయింట్ల కంటే ఎక్కువ స్కోర్లు ఉన్నవారిని సమతుల్యత నిపుణులకు మరింత పరీక్ష కోసం సూచించాలి.

తీవ్రత:-

1.	లఘు వైకల్య వైకల్యం	16-34 పాయింట్లు
2.	మధ్యమ వైకల్యం	36-52 పాయింట్లు
3.	తీవ్రమైన వైకల్యం	54+ పాయింట్లు

2.6 Scoring

The translated Dizziness Handicap Inventory (DHI) was evaluated for content validity by assigning each of its 25 questions with a scoring range between 0 and 100, divided into three subscales: Physical (DHI-P, 7 questions), Emotional (DHI-E, 9 questions), and Functional (DHI-F, 9 questions). Respondents answer "Yes" (4 points), "Sometimes" (2 points), or "No" (0 points) for each question, with a total score ranging from 0 to 100. A score above 10-16 suggests the need for further balance

assessment. Scores of 0-16 reflect no dizziness impairment, 16-34 indicate mild impairment, 36-52 moderate impairment, and 54 or higher indicate severe impairment [7].

2.7 Statistical Analysis

The total scores and mean scores of each subscale (Physical, Functional, and Emotional) were acquired using SPSS version 30.0 software following the administration of the translated Questionnaire (DHI-T) to patients complaining of vertigo or dizziness. Results were presented as percentages for categorical variables and as means and standard deviations (SD) for continuous variables. Overall Cronbach alpha value, and individually for functional, physical, and emotional Cronbach alpha value, mean, Standard Deviation, Test-retest reliability for the DHI-Telugu scores, and its sub-scales (functional, physical, and functional) were analyzed using the intraclass correlation coefficient (ICC).

3. Results

A total sample of 136 participants in the study, 62 (45.58%) were male (mean 12.40, SD 3.78) and 74 (54.42%) were female (mean 14.80, SD 3.83) Table 4, The participants in this study were categorized based on their age. The classification of the number of individuals in each age group is provided below in Table 4.

Table 4: Distribution of age group according to gender

Gender			
Age Range	Male	Female	Total
21 to 30	15	13	28
31 to 40	7	12	19
41 to 50	10	16	26
51 to 60	14	21	35
61 to 70	16	12	28
Total	62	74	136
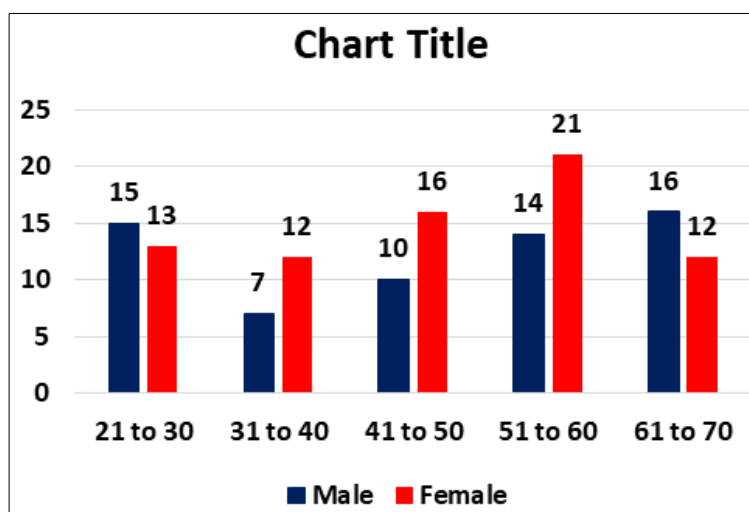
Graph 1 - Total no. of subjects, each group

3.1 Reliability of overall score of DHI-T (1-25 Questioners):

To assess the internal consistency of the Dizziness Handicap Inventory (DHI)-Telugu Version, Cronbach's alpha test and item-total correlation were conducted. The DHI-Telugu demonstrated excellent reliability, achieving an overall Cronbach's alpha score of 0.918 (0.92) and a Cronbach alpha score of 0.917 based on standardized items. These scores indicate a high level of internal consistency, as shown in Table 5.

Table 5: Internal consistency of Cronbach's alpha score

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No of Items
.918	.917	25

3.2 Analysis of the mean scores, Std. Deviation and Cronbach's Alpha for three subscales of the DHI-Telugu questionnaire

The Dizziness Handicap Inventory (DHI)-Telugu questionnaire was administered to patients experiencing dizziness or vertigo symptoms. For the physical subscale, the mean score was 16.79, SD of 6.54 and Cronbach Alpha (0.772). The emotional subscale had a mean score (14.87), SD (7.61) and Cronbach Alpha (0.775). The functional subscale showed a mean score (20.72), SD (8.26) and Cronbach Alpha (0.835). These scores indicate the varying impact of dizziness on different aspects of the patients' lives.

Table 6: Internal consistency of particular subscale score, mean, and std. deviation

Item Statistics			
Item	Mean	Std. Deviation	No of Subjects
PQ (Physical)	16.79	6.54	136
EQ (Emotional)	14.87	7.61	136
FQ (Functional)	20.72	8.26	136

3.3 Analysis of the mean if item deleted, scale variance if item deleted, the corrected item-total correlation, and Cronbach's alpha if Item Deleted for each set of 25 questions in the DHI-T (Telugu Version) Questionnaire

Table 7: The scale mean if the item was deleted, scale variance if the item was deleted, the corrected item-total correlation, and Cronbach's alpha if the item was deleted for each set of 25 questions in the DHI-Telugu questionnaire

Item Statistics				
Scale mean if item deleted	Scale variance if item deleted	Corrected item-total correlation	Squared multiple correlation	Cronbach's alpha if item deleted
PQ = 1	49.5662	391.047	.543	.699	.915
EQ = 2	49.9044	385.154	.607	.722	.914
FQ = 3	50.0074	382.111	.625	.744	.913
PQ = 4	50.6691	382.371	.577	.643	.914
FQ = 5	49.7353	380.255	.699	.658	.912
FQ = 6	49.5662	404.707	.251	.477	.920
FQ = 7	50.7279	380.688	.653	.764	.913
PQ = 8	49.6544	396.450	.436	.611	.917
EQ = 9	50.6103	378.328	.632	.742	.913
EQ = 10	51.0956	392.132	.476	.575	.916
PQ = 11	49.3897	399.099	.390	.615	.917
FQ = 12	50.5809	378.275	.692	.772	.912
PQ = 13	49.7868	386.776	.544	.652	.915
FQ = 14	49.7426	395.081	.548	.557	.915
EQ = 15	51.5221	411.985	.159	.436	.921
FQ = 16	50.4044	388.317	.601	.689	.914
PQ = 17	51.0662	385.588	.579	.673	.914
EQ = 18	49.8162	404.122	.316	.514	.918
FQ = 19	50.0809	385.542	.638	.608	.913
EQ = 20	51.2868	385.599	.623	.686	.913
EQ = 21	51.3309	391.201	.555	.697	.915
EQ = 22	50.6250	398.962	.369	.450	.918
EQ = 23	50.3162	381.773	.643	.636	.913
FQ = 24	49.8162	397.722	.477	.509	.916
PQ = 25	49.6985	385.249	.636	.596	.913

3.4 Test-Retest Reliability

Table 8: Mean, standard deviation and Cronbach's Alpha score (Test and Retest) for three subscales of the DHI-T questionnaire

50% of Data (68 Patient Data)	Subscale	Mean	Std. Deviation	SEM	Minimum	Maximum	ICC
	Physical	17.65	6.32	0.76	6	28	0.772
Over All ICC (Cronbach Alph Value-0.923)	Emotional	15.44	7.78	0.95	2	30	0.797
	Function	21.22	7.98	0.97	4	36	0.836

Table 9: Mean, standard deviation, and Cronbach's Alpha score (Test and Retest) for three subscales of the DHI-T questionnaire

Post (136 Patient Data)	Subscale	Mean	Std. Deviation	SEM	Minimum	Maximum	ICC
	Physical	16.79	6.54	0.56	6	28	0.772
Over All ICC (Cronbach Alph Value-0.918)	Emotional	14.87	7.61	0.65	2	30	0.775
	Function	20.72	8.26	0.71	4	36	0.835

Note:-SEM-Standard error of Mean, Std. Deviation-Standard Deviation, ICC Interclass Coefficient correlation.

The Dizziness Handicap Inventory-Telugu (DHI-T) questionnaire's three subscales are examined more thoroughly in Table 4.4, which also includes the mean, standard deviation, standard error of the mean (SEM), minimum, maximum, and intraclass correlation coefficient (ICC). Two groups are created from the data: one has 68 patients, or 50% of the total, and the other contains 136 patients or the whole dataset. Regarding the 50% dataset, the Physical shows a mean score of 17.65, an SD of 6.32, an SEM of 0.76, with scores ranging from 6 to 28, and an ICC of 0.772, indicating good reliability. The Emotional has a mean score of 15.44, an SD of 7.78, an SEM of 0.95, with scores ranging from 2 to 30, and an ICC of 0.797, also indicating good reliability. The Functional reports a mean score of 21.22, an SD of 7.98, an SEM of 0.97, with scores ranging from 4 to 36, and an ICC of 0.836, indicating excellent reliability. Regarding the full database, the Physical subscale has a mean score of 16.79, an SD of 6.54, an SEM of 0.56, with scores ranging from 6 to 28, and an ICC of 0.772, showing good reliability. The Emotional shows a mean score of 14.87, an SD of 7.604, an SEM of 0.65, with scores ranging from 2 to 30, and an ICC of 0.775, indicating good reliability. The Functional has a mean score of 20.72, an SD of 8.259, an SEM of 0.71, with scores ranging from 4 to 36, and an ICC of 0.835, indicating excellent reliability. A DHI-Telugu questionnaire with an ICC (Cronbach's Alpha) value between 0.918 (0.92) and 0.923(0.93) demonstrates high internal consistency and reliability. This shows that the questionnaire is a valid and trustworthy method for determining the handicap caused by dizziness on various subscales.

3.5 Cronbach's alpha coefficient of DHI-Telugu version being compared with another country's different versions of DHI

Table 10: Internal consistency (Cronbach's Alpha in another country) of different Versions of DHI

Version	Total	Physical	Functional	Emotional
Original (English, US)	0.91	0.78	0.85	0.72

Arabic	0.92	0.81	0.87	0.79
Chinese	0.75	0.79	0.87	0.84
German	0.90	0.71	0.80	0.82
Italian	0.92	0.75	0.82	0.84
Norwegian	0.95	-	-	-
Persian	0.79	0.83	0.90	0.82
Polish	0.93.	0.81	0.84	0.85
Bulgarian	0.88	0.72	0.75	0.81
Japanese	0.93	0.82	0.87	0.83

Table 11: Internal consistency Cronbach's Alpha in Indian Languages of different Versions of DHI

Version	Total	Physical	Functional	Emotional
Telugu	0.92	0.77	0.77	0.84
Malayalam	0.93	-	-	-
Kannada	0.73	-	-	-
Gujarati	0.92	0.84	0.81	0.82
Hindi	0.78	-	-	-

4. Discussion

A common symptom of Oto-neurological problems is dizziness, which can have an undesirable impact on one's social, emotional, and professional well-being. Thus, an evaluation of a symptom-specific questionnaire is necessary to determine the severity of the ailment and its effect on quality of life. Additionally, the symptom-specific self-administering inventory helps with assessment and possible rehabilitation by offering insight into the patient's perception of the issue.

Therefore, the present study aimed at developing and standardizing the DHI-Telugu, which is the native language of Andhra Pradesh and Telangana which is situated in the southern part of India. The authors observed in the study center that, which was administered to individuals with the complaint of dizziness/vertigo. Due to their dizziness, several of the patients reported having a lower quality of life and finding it difficult to concentrate on their daily lives, both personal and professional.

At this point, it was essential to administer some inventories to understand how severely the dizziness is affecting an individual and what aspects of an individual are getting affected because of dizziness. This was the primary motive behind translating DHI into Telugu language. The original DHI quantifies the handicap due to dizziness on the physical, emotional, and functional aspects of an individual. Questions in the physical part assess various physical activities that induce dizziness such as looking up, walking down the aisle, quick movements of the head, etc. Questions in the emotional part assess various emotional problems the patients suffer because of dizziness such as frustrations, isolation from family members, difficulty concentrating on work, etc. The questions in the functional section evaluate the functional elements that are impacted by dizziness, including travel limitations, trouble falling asleep, social interaction, etc.

This can be understood from the results of Cronbach's alpha results and the Item-Total Correlation results. The Telugu version of DHI has a global Cronbach's alpha score of 0.917 based on standardized items and a Cronbach's alpha score of 0.918 (0.92). These scores indicate a high level of reliability according to the statistics. Any scale with an alpha score of greater than 0.9 has an excellent internal consistency, an alpha score between 0.8-0.9 has a good internal consistency, 0.7-0.8 has an acceptable internal consistency, 0.6-0.7 has a questionable internal consistency,

0.5-0.6 has a poor internal consistency and any score less than 0.5 is unacceptable [29].

Other Indian regional languages such as Hindi, Gujarati, Kannada, and Malayalam revealed overall Cronbach's alpha scores of 0.78, 0.92, 0.73, and 0.93 respectively, which were accepted with the present findings [23-26]. Moreover, the current study made an effort to comprehend the impact of dizziness on the physical, emotional, and functional subscales.

The DHI-Telugu scores of 0.77, 0.77, and 0.84 were achieved on each subscale of physical, functional, and emotional correspondingly. The DHI-English and other DHI versions created in different languages showed comparable results to ours (alpha scores for functional, physical, and emotional domains were 0.85, 0.78, and 0.72, respectively) [7]. DHI-Arabic version (alpha scores for functional, physical, and emotional as 0.87, 0.81 and 0.79 respectively), [14] and DHI-Italian version (alpha scores for functional, physical and emotional as 0.82, 0.75, and 0.84 respectively), [11] DHI-Chinese version (alpha scores for functional, physical and emotional as 0.87, 0.79 and 0.84 respectively), [10] DHI-German version (alpha scores for functional, physical and emotional as 0.80, 0.71 and 0.82 respectively), [21] DHI-Persian version (alpha scores for functional, physical and emotional as 0.90, 0.83 and 0.82 respectively), [17] DHI-Polish version (alpha scores for functional, physical and emotional as 0.84, 0.81 and 0.85 respectively), [30] DHI-Bulgarian version (alpha scores for functional, physical and emotional as 0.75, 0.72 and 0.81 respectively) [22], DHI-Japanese version (alpha scores for functional, physical and emotional as 0.87, 0.82 and 0.83 respectively) [15], as given in Table 10. As a result, it was discovered that the current research had strong internal consistency and reliability, with alpha values that were comparable to those of the original DHI in both English and other languages.

5. Conclusion

Since many people in India, a multicultural and multilingual nation, communicate primarily in their native tongue, it is not feasible to use the DHI-E to measure the degree of dizziness. Therefore, to evaluate the impact of the condition on day-to-day functioning, native Telugu speakers experiencing dizziness can self-administer the created and standardized DHI-Telugu. The present study verified that, in comparison to the original English version and other recognized variants, the DHI-Telugu exhibits exceptional internal consistency and reliable to administer to the Telugu-

speaking community. Following the publication of this study, the DHI-Telugu may be used to better understand dizziness patients throughout the states of Andhra Pradesh and Telangana.

6. Ethics approval and consent to participate

This study received ethical approval from the relevant institutional review board. Data collection permission was granted by Manipal Hospital Tadepall, Guntur-522501 (A.P.). Informed consent was obtained from all participants before their involvement in the study.

Availability of data and material

The datasets and materials used in this study are available upon request.

Authors' contributions

All the authors have important contributions and participation in this research.

8. List of condensations

BPPV-Benign Paroxysmal Positional Vertigo, MD-Meniere's disease, SD-Standard deviation.

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