RESEARCH PAPER

Development And Validation Of A Questionnaire On Neurophobia Among Physiotherapy Students

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ABSTRACT

Background: Globally, 22.6 million people require neurological care, with traumatic brain injury and stroke as major yet underrecognized causes of disability in India. Neurology's complexity, coupled with gaps between theory and practice, often leaves students overwhelmed. Early detection of neurophobia in physiotherapy students can help overcome these barriers, fostering confident therapist and improving patient outcomes. Hence, current study aims to develop and validate a questionnaire for assessing Neurophobia among physiotherapy students.

Method: Study consisted of two phases: A self-constructed questionnaire assessing knowledge, teaching in neurology subject, clinical assessment and exposure among the BPT students was developed followed by content validation by a panel of experts. Content Validity Index was used to validate the questionnaire domains. Pilot testing was conducted on 30 students in which the developed questionnaire was administered. The validity and reliability of the questionnaire were analysed using the Item-Total Correlation and Cronbach's alpha, respectively.

Results: The questionnaire demonstrated strong measurement properties, with a content validity index of 0.90 and a reliability coefficient (Cronbach's alpha) of 0.911. Item-total correlations across all domains exceeded 0.30, meeting established validation criteria. These results confirm its validity and reliability for assessing neurophobia among physiotherapy students.

Conclusion: The questionnaire exhibited robust psychometric properties, confirming its validity and reliability as an effective instrument for evaluating neurophobia among physiotherapy students.

Keywords: Neurophobia; Neuro-physiotherapy; neurology education; pedagogical approaches; knowledge; clinical examination...

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INTRODUCTION

Neurophobia is defined as "a fear of neural sciences and clinical neurology that is due to the student's inability to apply their knowledge of basic sciences to clinical situations, leading to a paralysis of thought or action." Isolating foundational science from clinical application can make science seem trivial and clinical skills appear enigmatic.(1)

Students consistently perceived neurology as the most formidable discipline, a view that intensifies their neurophobia early in their preclinical years and persists throughout their academic course. This developing apprehension often leads to avoidance in clinical settings, which, in turn, may contribute to diagnostic inaccuracies and diminished patient care.(2–6) Reported plausible determinants responsible for genesis of neurophobia includes: Complex and abstract subjects, a deficiency of clinical reasoning exercises, hyposkilia, challenging clinical exams, and a lack of comfort and confidence in managing bedside neurology patients.(2,7) The intensive neurology curriculum frequently causes undergraduates to become disenchanted with the field, leading to a decline in their interest in pursuing neurology as a career. This effect is often compounded by students' particular concerns about their grasp of neuroanatomy and neurophysiology, as well as their apprehension regarding clinical examination skills.(8,9)

With the progressive aging of the global population, the prevalence and impact of neurological disorders have escalated, positioning them as principal contributors to morbidity and mortality especially in low- and middle-class countries. According to the World Health Organization, neurological conditions constitute approximately 6.3% of the worldwide health burden, while neurological and psychiatric disorders collectively account for 28% of all disability-adjusted life years.(2,7,10) In 2021, neurological disorders afflicted over three billion individuals, constituting approximately 43% of the world's population and 10-20% of acute hospital admissions. Neurological conditions, encompassing both neurodevelopmental disorders and pathologies affecting the nervous system, accounted for 168 million years lived with disability in 2021, thereby becoming the preeminent cause of disability on a global scale.(11,12) Neurologic physical therapy supports people with neurological conditions or injuries in

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enhancing their health and overall wellbeing. It does so by helping them navigate and overcome obstacles not only on a personal level, but also within their relationships, communities, and the broader society. Developing an effective protocol requires a strong understanding of fundamental concepts as well as proficient assessment skills.(13)

Several scales exist in literature. However, they lack in assessing the clinical and physiotherapy aspects of neurology. Given the evidence of Neurophobia and its implication in public health, we are sought to assess Neurophobia among physiotherapy students and their perception towards neuro physiotherapy.

As a result, the current study focuses on developing questionnaire on Neurophobia and assessing the same in physiotherapy students.

Methodology

Ethical approval was secured from the Institutional Ethical Committee (Reference/Serial No. 857) prior to initiating the study. The research was conducted over the period from October 2024 to March 2025 and comprised two distinct phases: the first phase involved the development of the questionnaire, while the second phase focused on validation of the questionnaire.

Phase I: Development of questionnaire

The principal focus of this phase was the systematic identification of pertinent domains and the subsequent generation of items corresponding to each domain. A meticulous review of the existing literature was undertaken to identify scales and questionnaires designed to evaluate neurophobia among physiotherapy students. However, the review revealed a significant gap in the literatures addressing the assessment of neurological knowledge, pedagogical approaches within neurology, clinical examination competencies, and practical exposure in clinical ward settings. In response to these identified lacunae, four definitive domains were identified: (a) Knowledge, (b) Teaching in neurology subject, (c) Clinical assessment and application, and (d) exposure. The knowledge domain was crafted to evaluate student's understanding of neuroanatomy, neurophysiology, neuropharmacology, and neuropathology. The "teaching in neurology subject" domain encompassed inquiries related to both theoretical and practical teaching, incorporating approaches such as PBL, CBL, TBL and the integration of 3D models within the curriculum. The "assessment and clinical application" domain comprised questions addressing the comprehensive clinical evaluation process, from patient history taking through to diagnosis and treatment planning based on assessment findings. Upon completion, the questionnaire was finalized by calculating both domain-specific scores and an overall cumulative score.

Phase II: Validation of questionnaire

Validation of questionnaire included two stages: content validation and sample size validation.

Content validation: Content validity was assessed through a systematic expert validation process involving quantitative measures such as the Content Validity Index (CVI). A panel of ten experienced physiotherapy professionals—five specializing in neuro-physiotherapy and five non-neurophysiotherapists, each with a minimum of ten years of experience—was selected to review the questionnaire. The experts received an online content validation form with detailed instructions to evaluate the relevance, clarity, and representativeness of each item. Their ratings were then analysed using formal scaling and statistical methods to quantify agreement and ensure the questionnaire accurately reflected the intended content domains. Evaluation of the clarity and relevance of items was done using 4-point Likert Scale, ranging from 1 to 4 where, 1= not relevant; 2= somewhat relevant; 3= quite relevant; 4= highly relevant. The Content Validation Index (CVI) was calculated for each item by dividing the number of experts who rated the items as 3 or 4 by the total number of experts. The average CVI across all items was computed to determine the overall content validity of the questionnaire. The finalized questionnaire comprised 44 items categorized into four domains. The Knowledge domain included 17 items scored on a scale from 0 to 3, where 0 represented "fully unaware" and 3 indicated "fully aware." The Teaching in Neurology Subject domain contained 15 items, also scored from 0 ("not satisfied") to 3 ("completely satisfied"). The Assessment and Clinical Application domain consisted of 10 items scored from 0 to 3, with seven questions rated from "not confident" to "completely confident" and three questions from "unaware" to "completely aware," depending on the nature of each item. The Exposure domain included 2 items scored similarly from 0 ("not satisfied") to 3 ("completely satisfied"). Overall, the questionnaire's total score ranged from 1 to 130, with scores interpreted as follows: 0–32 indicating neurophobia, 33–64 borderline neurophobia, 65–97 no neurophobia but reduced confidence, and 98–130 reflecting confidence. The questionnaire has been officially copyrighted.

Pilot study: A pilot study was conducted to validate the KNEURO-P questionnaire using a sample of 30 physiotherapy students from institutions in Belagavi City, selected through convenience sampling. Participants included final-year physiotherapy students of both genders aged 20 to 24, with those unwilling to participate excluded. Prior to data collection, the study objectives were explained to the participants, and written informed consent was obtained. Detailed demographic data—such as age, gender, inclusion of neurology in their curriculum, and presence of a neurologist or neuro-physiotherapist in their family—were recorded. The questionnaire was then administered face-to-face to ensure accurate completion and interaction. This pilot phase aimed to assess the feasibility and clarity of the questionnaire before broader application.

Statistical analysis: Statistical analysis was performed using Microsoft Excel 2016 to determine the content validity index following expert review, with descriptive statistics summarizing the findings. Validity and reliability were assessed via item-total correlation and Cronbach's alpha, respectively, and all data were further analysed using SPSS version 23.

Results: The domain validity of the questionnaire was evaluated using the item-level content validity index (I-

CVI), yielding scores of 0.90 for Knowledge, 0.87 for Teaching in Neurology Subject, 0.91 for Assessment and Clinical Application, and 0.92 for Exposure. The overall content validity index (CVI) for the questionnaire was calculated at 0.90, exceeding the accepted cut-off value of 0.78. Subsequently pilot study was conducted including 30 BPT final year students. The age of the subjects lied between 20-22 years. The study confirmed the questionnaire's strong content validity and reliability for assessing neurophobia-related constructs.

***Item reliability*:** KTAE among physiotherapy students was evaluated using a comprehensive 44-item questionnaire spanning four distinct domains. Reliability analysis, conducted via Cronbach's Alpha, yielded a coefficient of 0.911, signifying exceptional internal consistency.

Table I: Reliability analysis of NeuroP

Questionnaire	Cronbach's alpha scores
KNEURO-P	0.911

***Item total correlation of the domains*:** The validity analysis was carried out using Item- Total Correlation.

Table II: Item-Total Correlation for "KNOWLEDGE AND TEACHING IN NEUROLOGY" domain

Knowledge			**Teaching in neurology subject**		
Questions	CITC	CAID	Questions	CITC	CAID
Q1	0.406	0.909	Q18	0.649	0.907
Q2	-0.273	0.914	Q19	0.644	0.907
Q3	0.268	0.911	Q20	0.519	0.908
Q4	0.313	0.910	Q21	0.701	0.906
Q5	0.029	0.913	Q22	0.755	0.905
Q6	0.396	0.909	Q23	0.616	0.906
Q7	0.330	0.910	Q24	0.675	0.906
Q8	0.325	0.910	Q25	0.653	0.907
Q9	0.105	0.912	Q26	0.556	0.908
Q10	0.322	0.910	Q27	0.556	0.908
Q11	0.441	0.909	Q28	0.728	0.905
Q12	0.525	0.908	Q29	0.755	0.904
Q13	0.276	0.911	Q30	0.414	0.909
Q14	0.196	0.914	Q31	0.587	0.907
Q15	0.060	0.913	Q32	-0.066	0.913
Q16	0.166	0.911			
Q17	-0.088	0.912			

Table III: Item-Total Correlation "ASSESSMENT AND CLINICAL APPLICATION AND EXPOSURE" domain

Assessment and clinical application			**Exposure**		
Questions	CITC	CAID	Questions	CITC	CAID
Q33	0.132	0.912	Q43	0.499	0.908
Q34	0.124	0.912	Q44	0.377	0.910
Q35	0.405	0.909			
Q36	0.625	0.906			
Q37	0.639	0.906			
Q38	0.638	0.906			
Q39	0.665	0.906			
Q40	0.346	0.910			
Q41	0.480	0.909			

Q42	0.483	0.908

(CITC - Corrected Item-Total Correlation, CAID - Cronbach's Alpha if Item Deleted, Q – Question)
As seen in the above table, all statements have suggested medium to strong correlation and have recorded correlation value higher than 0.30 which is a standard for validation.

Discussion

Among the few scales that exists in the literature there is a dearth with regards to assessment of the knowledge, satisfaction about the teaching in the subject of neurology, clinical application and exposure. Thus, this study aimed to develop and validate a questionnaire to assess the same. As neurophysiotherapy stands at the forefront of rehabilitation, offering vital interventions to enhance the lives of individuals with neurological disorders. However, for an effective development of the treatment protocol the physiotherapist needs a kin knowledge of neurology subject as well as the application of the same in assessment and diagnosis. The primary objective of present study was to develop a questionnaire that evaluates the KTAE related to neuro-physiotherapy and determine the validity and reliability of the NeuroP questionnaire. In terms of knowledge the results of the validation demonstrated that the questionnaire can effectively assess neuroanatomy, neurophysiology, neuropharmacology and neuropathology knowledge among the physiotherapy students.

The reported incidence of neurophobia stands at 1:2, affecting males and females equally and displaying a bimodal distribution with onset typically emerging during the course of medical curriculum. This phenomenon largely arises from a persistent failure to synthesize basic knowledge with its clinical counterparts, leading to inability among students to reason effectively through neurological problems. Consequently, this disconnect fosters anxiety, dislike, and ultimately leads to a waning interest in neurology. It often arises from confusion caused by teaching neuroanatomy, neurophysiology, neuropharmacology, and neuropathology as separate, unintegrated subjects.(1) These subjects are typically taught by different specialties in isolation, without interlinking them or relating them to clinical practice, which leads to a fundamental deficiency in students' basic neuroscience knowledge.(14,15)

Studies consistently highlight that limited patient exposure and inadequate teaching, compounded by the inherent complexity of neurology, are central challenges in neurology education; the moderate ranking of neurology teaching reflects persistent gaps, especially during the crucial transition from preclinical to clinical years, and aligns with evidence that neurophobia arises from insufficient integration of basic science with clinical application and a lack of opportunities to view foundational concepts through a clinical lens and clinical aspect with a sound basis. (7,16)

Studies have demonstrated that following ways of teaching have more impact on the students understanding neurology subjects : team based learning that consists of small group discussions and collaborative problem-solving, significantly enhances student's understanding of neurology by fostering teamwork and enabling the recently acquired theoretical knowledge to real clinical cases.(17) Controlled trials have shown that students taught neurology through team-based learning (TBL) report significantly higher engagement, which is associated with greater self-directed learning and supports the growing emphasis on active learning approaches in neurology education(18) Case-based learning, which involves assessing clinical cases from patient history through evolving symptoms under expert guidance, enables students to integrate new and prior knowledge more effectively and enhances learner engagement, with both case-based and team-based approaches collectively termed small group active learning techniques(5,19). Combining lecture-based learning (LBL) with hybrid methods improves neurology education outcomes more than either alone; while LBL breaks complex topics into clear, organized segments essential for foundational knowledge, hybrid approaches like TBL enhance engagement and integration, making traditional lectures still indispensable alongside active learning techniques.(18) Multiple studies have demonstrated that three-dimensional learning-using both physical and virtual 3D brain models-significantly enhances students' knowledge, motivation, and long-term retention of neuroanatomy, while also improving their understanding of spatial relationships between brain structures.(20) Studies indicate that in neurological diagnosis, clinical history carries the greatest weight at 78.6%, followed by neurological examination at 8.2%, and laboratory or ancillary tests at 13.2%. Despite technological advances, the cornerstone of accurate diagnosis remains the anatomy to clinical method, which emphasizes correlating clinical findings with anatomical knowledge.(21)

By systematically integrating these evidence-based determinants into the assessment framework, our questionnaire not only facilitates a nuanced understanding of the multifactorial origins of neurophobia, but also enables the identification of specific educational gaps and barriers faced by learners. Validation results confirm its effectiveness in assessing various dimensions of neurophobia, highlighting its value in medical education and clinical practice. The questionnaire provides key insights into knowledge, teaching methods, and clinical experience in neurophysiotherapy among physiotherapy students, guiding the creation of targeted training programs. Ultimately, it supports the development of innovative educational strategies aimed at enhancing neurology education and improving student confidence and competence in neurophysiotherapy.

The study recognized limitations, notably the omission of hybrid teaching methods such as DCT, bedside teaching, and flipped classrooms in assessing neurophobia. Including

these approaches could offer deeper insight into how different pedagogical strategies shape students' learning experiences. Additionally, tracking changes in knowledge, teaching, clinical aspects and exposure (KTAE) among physiotherapy students over time would help evaluate the true impact of educational methods and highlight areas for improvement.

Conclusion:

This study marks a pivotal advancement in the early detection of neurophobia among physiotherapy students and offering an understanding of its complex dimensions. The validated questionnaire provides a robust framework for assessing knowledge, pedagogical approaches, and clinical aspects related to neurology. By highlighting specific educational gaps, the research emphasizes the value of integrating innovative hybrid and traditional teaching approaches. Such strategies not only enhance learning but also help develop more confident and capable therapists, ultimately benefiting patient care for neurological disorders.

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REFERENCE

1.Jozefowicz RF. Neurophobia: the fear of neurology among medical students. Archives of Neurology. 1994 Apr 1;51(4):328-9. - Google Search [Internet]. [cited 2025 Mar 24]. 10.1001/archneur.1994.00540160018003.

2. Shelley BP, Chacko TV, Nair BR. Preventing "Neurophobia": Remodeling Neurology Education for 21st-Century Medical Students through Effective Pedagogical Strategies for "Neurophilia." Ann Indian Acad Neurol. 2018;21(1):9–18. 10.4103/aian.AIAN_371_17.

3. McGovern E, Louapre C, Cassereau J, Flamand-Roze C, Corsetti E, Jegatheesan P, et al. NeuroQ: A neurophobia screening tool assesses how roleplay challenges neurophobia. J Neurol Sci. 2021 Feb 15;421:117320. 10.1016/j.jns.2021.117320

4. Kamour AH, Han DY, Mannino DM, Hessler AB, Kedar S. Factors that impact medical student and house-staff career interest in brain related specialties. J Neurol Sci. 2016 Oct 15;369:312–7. 10.1016/j.jns.2016.08.046

5. Shiels L, Majmundar P, Zywot A, Sobotka J, Lau CSM, Jalonen TO. Medical student attitudes and educational interventions to prevent neurophobia: a longitudinal study. BMC Med Educ. 2017 Nov 21;17(1):225. 10.1186/s12909-017-1055-4.

6. Conway S, Tubridy N. "Neurophobia": More Nurture than Nature? Ir Med J. 2018 Mar 14;111(3):710.

7. Neurophobia and its implications: evidence from a Caribbean medical school | BMC Medical Education | Full Text [Internet]. [cited 2025 Mar 24]. Available from: https://bmcmededuc.biomedcentral.com/articles/10.1186/1472-6920-9-39. https://doi.org/10.1186/1472-6920-9-39

8. Abkur T, Satti Z, Di Luca DG, Alhashyan I, Algethami H. Neurophobia: challenges and solutions. Neurosciences (Riyadh). 2024 Apr;29(2):144–5. 10.17712/nsj.2024.2.20230127

9. Lambea-Gil Á, Saldaña-Inda I, Lamíquiz-Moneo I, Cisneros-Gimeno AI. Neurofobia entre los estudiantes de medicina de una universidad española: experiencias más allá de la anglosfera. Rev Neurol. 2023 Jun 1;76(11):351–9. 10.33588/rn.7611.2023102

10. Han F, Zhang DD, Zhang Y, Zhou LX, Zhu YC, Ni J. Prevalence of neurophobia among medical students and young doctors: a systematic review and meta-analysis. BMC Med Educ. 2024 Nov 9;24(1):1286. https://doi.org/10.1186/s12909-024-06303-3

11. Harris E. Neurological Conditions Are Leading Cause of Disability Worldwide. JAMA. 2024 May 7;331(17):1440. 10.1001/jama.2024.5160.

12. Neurology for the masses. BMJ. 1999 Aug 7;319(7206):0.

13. Rafferty MR, Bradford ECH, Fritz S, Hutchinson KJ, Miczak K, Resnick A, et al. Health Promotion and Wellness in Neurologic Physical Therapy: Strategies to Advance Practice. J Neurol Phys Ther. 2022 Apr 1;46(2):103–17. 10.1097/NPT.0000000000000376.

14. Fantaneanu TA, Moreau K, Eady K, Clarkin C, DeMeulemeester C, Maclean H, et al. Neurophobia inception: a study of trainees' perceptions of neurology education. Can J Neurol Sci. 2014 Jul;41(4):421–9. 10.1017/s0317167100018436.

15. Pakpoor J, Handel AE, Disanto G, Davenport RJ, Giovannoni G, Ramagopalan SV. National survey of UK medical students on the perception of neurology. BMC Medical Education. 2014 Oct 21;14(1):225. 10.1186/1472-6920-14-225

16. Zinchuk AV, Flanagan EP, Tubridy NJ, Miller WA, McCullough LD. Attitudes of US medical trainees towards neurology education: “Neurophobia” - a global issue. BMC Med Educ. 2010 Jun 23;10:49. 10.1186/1472-6920-10-49.

17. McColgan P, McKeown PP, Selai C, Doherty-Allan R, McCarron MO. Educational interventions in neurology: a comprehensive systematic review. Eur J Neurol. 2013 Jul;20(7):1006–16. 10.1111/ene.12144.

18. Yang LH, Jiang LY, Xu B, Liu SQ, Liang YR, Ye JH, et al. Evaluating team-based, lecture-based, and hybrid learning methods for neurology clerkship in China: a method-comparison study. BMC Medical Education. 2014 May 20;14(1):98. 10.1371/journal.pone.0154250 .

19. Hudson JN. Linking neuroscience theory to practice to help overcome student fear of neurology. Medical Teacher. 2006 Jan 1;28(7):651–3. 10.1080/01421590600726409

20. Ekstrand C, Jamal A, Nguyen R, Kudryk A, Mann J, Mendez I. Immersive and interactive virtual reality to improve learning and retention of neuroanatomy in medical students: a randomized controlled study. CMAJ Open. 2018 Feb 23;6(1):E103–9. 10.9778/cmajo.20170110.

21. Roshan M, Rao AP. A study on relative contributions of the history, physical examination and investigations in making medical diagnosis. J Assoc Physicians India. 2000 Aug;48(8):771–5.