

Cranial Nerve Examination in Physical Therapy Practice: Survey-Based Insights and Clinical Relevance

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ABSTRACT

Background: Cranial nerves (CN) are essential for sensory and motor functions in the head and neck and are vital in neurological assessments. In musculoskeletal and orthopedic practice, especially among physiotherapists, recognizing CN dysfunction is crucial for safe and accurate diagnosis. A variety of diseases and traumas can cause CN disorders, often requiring imaging and detailed clinical evaluation. CN injuries occur in a significant percentage of craniocerebral trauma cases. While data on CN-related conditions such as trigeminal neuralgia exist, there is limited information on CN assessment practices among physical therapists in Karachi. This study highlights current practices to support evidence-based assessment and improved patient care. **Objective:** This study aims to assess clinical physical therapists' practices regarding cranial nerve examination. **Methods:** A descriptive cross-sectional survey was conducted among 65 physical therapists practicing in Karachi, Pakistan. Participants were recruited through purposive sampling from hospitals, rehabilitation centers, and private clinics. Data were obtained using a structured, self-administered online questionnaire adapted from prior research. Statistical analyses, including descriptive measures, Chi-square tests, independent t-tests, and one-way ANOVA, were performed in SPSS version 21, with significance set at $p < 0.05$. **Results:** The results show that physical therapists most were quite sure (55.4%) or sure (33.8%,) of their ability to conduct a cranial nerve examination, though the examination was used only rarely or occasionally by most (41.5% and 35.4%). Years of experience and CNE training showed no significant association with ability, use, or perceived relevance. Age and clinical experience, however, correlated positively with ability to conduct CNE and with interpreting findings. **Conclusion:** The results of this study showed that the PTs are confident in their ability to assess cranial nerve but they rarely applied it routine clinical assessment of patient. This gap underscores the need to translate knowledge into clinical practice.

KEYWORDS: Peripheral nervous system, cranial nerves, physical therapy, physical examination, neurologic examination.

INTRODUCTION

There are 12 major pairs of cranial nerves, and they originate from the brain and upper spinal cord and innervate the special sense organs in the head (eye, ear, nose, and taste buds), the skin over the face and neck, and muscles that permit us to speak, eat, turn our head, and produce facial expressions. Cranial nerves also provide parasympathetic innervation to the various systems of the body.¹ Examination of the cranial nerves lies at the core of clinical neurological assessment along with the other component of the neurological assessment such balance, sensory system and vestibular system.^{2,3} Forward head posture can cause vertebrobasilar insufficiency or hypoperfusion affects the sensory motor control of the body which includes proprioception and kinesthetic sense⁴ Clinical practice

guidelines recommend cranial nerve examination and specific physical examination for vertebrobasilar pathologies.⁵

Neurological examination in musculoskeletal practice is a key element of safe and appropriate orthopedic clinical practice. With physiotherapists currently positioning themselves as advanced first-line practitioners, it is essential that those who treat patients who present with neck/head/orofacial pain and associated symptoms should have an index of suspicion of cranial nerve (CN) dysfunction. They should be able to examine and determine if CN dysfunction is present, and make appropriate clinical decisions based upon those findings.⁶

There are a wide variety of diseases that can cause cranial nerve (CN) disorders, and imaging is needed to depict the causative pathology, for therapy planning, and to assess response. The clinical examination, medical history, laboratory, and neurophysiological tests will all aid the radiologist in selecting the correct imaging modality or technique and use the best adapted protocol.⁷ cranial nerves involvement may occur as mono-neuropathy or polyneuritis cranialis, unilaterally or bilaterally, together with or without the involvement of peripheral nerves, and with or without CNS involvement.⁸ Injury to the cranial nerves (CN) is not uncommon. The incidence of cranial nerve injury (CNI) in craniocerebral trauma varies between 5 and 23 %.⁹

In Sweden, only Trigeminal neuralgia incidences were estimated to be 5.5 per 100,000 person-years. The incidence was higher for females and increased with older age,¹⁰ remaining all others. In Pakistan, it was found that most of the individuals with trauma of the face have neurosensory problems¹¹, for which proper diagnosis is crucial for timely and efficient management and rehabilitation. Manipulation of cranial nerves can be an exceptional tool for treating the brain and the rest of the body; it allows us to affect sutures, meninges, and encephalon.¹² According to the authors' knowledge, published data still lack information regarding the clinical physical therapists' practices in terms of examining and assessing the cranial nerves in Karachi. This study identified the current practice pattern among physical therapists in Karachi, in turn helping future physical therapists regarding the use of evidence-based clinical assessment, helping patients get better diagnoses and early management.

METHODS

Study Design: A descriptive, cross-sectional survey design was used, following the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.¹³

Study Population/Settings: Physical therapists currently practicing in Karachi, Pakistan, across government and private hospitals, rehabilitation centers, and outpatient clinics were included in the study.

Sampling Technique: A non-probability purposive sampling technique was used.

Sample Size: A total of 65 responses were collected. The sample size was calculated using the OpenEpi online calculator for cross-sectional studies, with a 95% confidence interval and an anticipated prevalence derived from previous studies.¹⁴

Study Duration: The study was conducted from 2025 to 2026.

Inclusion/exclusion Criteria: participants included in this study were Clinical Physical therapists practicing in both the public and private sectors of Karachi with a minimum of one year of clinical experience and physical therapist involve in both clinics and academics. Non-practicing or retired physiotherapists, or the physical therapists in academic settings with no clinical exposure, were

excluded. Internship trainees or physical therapy interns, physical therapy technicians were also excluded.

Data Collection Procedure: After obtaining informed consent, data were collected using a structured, self-administered questionnaire adapted from the previously published study.¹⁵ The questionnaire was distributed electronically via Google Forms and was accessible on any internet-enabled device. IP addresses were not collected to ensure anonymity, and the platform was set to restrict multiple responses from the same device. The estimated completion time for the survey was 10–15 minutes. Completed responses were downloaded and stored on an encrypted, password-protected computer accessible only to the research team. Incomplete surveys were excluded from the analysis.

Data Analysis Procedure: Descriptive statistics (frequencies, percentages, means, and standard deviations) were computed for all variables. The Chi-square test was used to determine associations between categorical variables. Independent t-tests were applied for ordinal variables with two categories, while one-way ANOVA was applied for variables with more than two categories. All analyses were performed using SPSS version 21.0, with statistical significance set at $p < 0.05$.

Ethical Considerations

Ethical approval for this study was obtained from the Institutional Review Board of Indus University, Karachi, Pakistan. Approval No. IERB-01/IU/AHS-DPT/25-26/046, in accordance with the Declaration of Helsinki.¹⁶ Before participation, electronic informed consent was obtained from all respondents. Participation was voluntary, with no financial benefits, and anonymity and confidentiality were strictly maintained throughout the study.

Informed consent: Participation was voluntary; each patient signed a written consent form.

RESULT

In most participants ($n = 48$, 73.8%) had 0–5 years of experience, followed by 14 (21.5%) with 6–10 years, 2 (3.1%) with more than 20 years, and 1 (1.5%) with 11–15 years. Regarding the access regimen, 40 participants (61.5%) practiced under direct access and 25 (38.5%) under a secondary care/physician referral pathway (Table 1).

The mean frequency score was highest for assessing headache (2.80 ± 0.92), Headache and dizziness were assessed occasionally by 26 and 31 participants (40.0%, 47.7%) respectively. For cervical/head trauma and WAD were rarely assessed by most of the participants 33, 29 (50.8%, 44.6%) respectively. (Table 1).

Table 1. Demographic and clinical characteristics of the sample.

<i>Variable / Category</i>	<i>n (%)</i>	<i>Mean $\pm$ SD</i>
<i>Demographic characteristics</i>		
Years of experience		
0–5	48 (73.8)	
6–10	14 (21.5)	

<i>Variable / Category</i>	<i>n (%)</i>	<i>Mean ± SD</i>
11–15	1 (1.5)	
>20	2 (3.1)	
Highest earned degree		
BSc/BSPT/DPT	35 (53.8)	
ADPT/PPDPT/PPTD	1 (1.5)	
MSc/MSAPT/DPTD	29 (44.6)	
Physical therapy settings		
Private practice (primary line care)	12 (18.5)	
Hospital (secondary care line)	23 (35.4)	
Education	29 (44.6)	
Physical therapy access regimen		
Direct access	40 (61.5)	
Secondary care/Physician referral pathway	25 (38.5)	
<i>Clinical practice: frequency of assessment</i>		
Frequency of assessing headache		2.80 ± 0.92
Never	4 (6.2)	
Rarely (1–5 patients yearly)	21 (32.3)	
Occasionally (1–5 patients monthly)	26 (40.0)	
Frequently (1–5 patients weekly)	12 (18.5)	
Daily (> 5 patients weekly)	2 (3.1)	
Frequency of assessing dizziness		2.62 ± 0.78
Never	5 (7.7)	

<i>Variable / Category</i>	<i>n (%)</i>	<i>Mean ± SD</i>
Rarely (1–5 patients yearly)	22 (33.8)	
Occasionally (1–5 patients monthly)	31 (47.7)	
Frequently (1–5 patients weekly)	7 (10.8)	
Frequency of assessing cervical/head trauma		2.34 ± 0.82
Never	8 (12.3)	
Rarely (1–5 patients yearly)	33 (50.8)	
Occasionally (1–5 patients monthly)	18 (27.7)	
Frequently (1–5 patients weekly)	6 (9.2)	
Frequency of assessing WAD		1.75 ± 0.77
Never	27 (41.5)	
Rarely (1–5 patients yearly)	29 (44.6)	
Occasionally (1–5 patients monthly)	7 (10.8)	
Frequently (1–5 patients weekly)	2 (3.1)	

Abbreviations: n, number of participants; SD, standard deviation; WAD, whiplash-associated disorders. ^a One response was missing (n = 1; 1.5%); valid percentages for the remaining 64 responses were 18.8, 35.9, and 45.3, respectively.

Responses to the Questions related to competence and use of CNE as well the perception, concerns and relevance of training are presented in Table 2. The mean score for self-reported ability to conduct a CNE was 3.18 ± 0.75 ; 36 participants (55.4%) were quite sure. As for the confidence in interpreting CNE findings (mean 3.08 ± 0.80), 36 participants (55.4%) were quite sure. For confidence in managing findings (mean 3.54 ± 0.90), 51 participants (78.5%) were sure, and 2 (3.1%) were not confident. The mean frequency of using CNE was 1.60 ± 0.66 .

The mean score for whether concerns about cervical adverse events discouraged the use of manual therapy (MT) was 2.67 ± 1.02 ; The value of cervical disorder guidelines had a mean score of 3.10 ± 0.80 , The relevance of CNE to cervical arterial pathologies had a mean score of 2.70 ± 0.86 , while concern about cervical arterial pathologies had a mean score of 2.72 ± 0.97 .

The relevance of CNE to cranio-cervical pathologies had a mean score of 2.89 ± 0.95 . For concern about serious cervical pathologies (mean 3.07 ± 0.89). The statement that MT to the cervical spine can cause adverse events had a mean score of 2.23 ± 1.02 ; The relevance of training in CNE had a mean score of 3.20 ± 0.87 , with 26 participants (40.0%) sure, 25 (38.5%) quite sure, (Table 2).

Table 2. Responses to clinical practice survey questions.

Survey item / Response category	n (%)	Mean $\pm$ SD
<i>Competence and use of CNE</i>		
Quantify your ability in conducting a cranial nerve examination		3.18 $\pm$ 0.75
Not Confident	3 (4.6)	
Insecure	4 (6.2)	
Quite Sure	36 (55.4)	
Sure	22 (33.8)	
Quantify your confidence in interpreting findings		3.08 $\pm$ 0.80
Not Confident	4 (6.2)	
Insecure	6 (9.2)	
Quite Sure	36 (55.4)	
Sure	19 (29.2)	
Quantify your confidence in managing findings		3.54 $\pm$ 0.90
Not Confident	2 (3.1)	
Insecure	12 (18.5)	
Sure	51 (78.5)	
Frequency of using cranial nerve examination		1.60 $\pm$ 0.66
Rarely (1–5/year)	27 (41.5)	
Occasionally (1–5/month)	23 (35.4)	
Frequently (1–5/week)	5 (7.7)	

Survey item / Response category	n (%)	Mean $\pm$ SD
<i>Perceptions, concerns, and training relevance</i>		
Do cervical adverse event concerns discourage MT use?		2.67 $\pm$ 1.02
Not Confident	10 (15.4)	
Insecure	16 (24.6)	
Quite Sure	22 (33.8)	
Sure	15 (23.1)	
Value of cervical disorder guidelines		3.10 $\pm$ 0.80
Not Confident	3 (4.6)	
Insecure	8 (12.3)	
Quite Sure	31 (47.7)	
Sure	20 (30.8)	
CNE relevance to cervical arterial pathologies		2.70 $\pm$ 0.86
Not Confident	5 (7.7)	
Insecure	19 (29.2)	
Quite Sure	26 (40.0)	
Sure	11 (16.9)	
Concern about cervical arterial pathologies		2.72 $\pm$ 0.97
Not Confident	9 (13.8)	
Insecure	12 (18.5)	
Quite Sure	27 (41.5)	
Sure	13 (20.0)	

Survey item / Response category	n (%)	Mean $\pm$ SD
Relevance of CNE to cranio-cervical pathologies		2.89 $\pm$ 0.95
Not Confident	8 (12.3)	
Insecure	7 (10.8)	
Quite Sure	30 (46.2)	
Sure	16 (24.6)	
Concern about serious cervical pathologies		3.07 $\pm$ 0.89
Not Confident	4 (6.2)	
Insecure	10 (15.4)	
Quite Sure	25 (38.5)	
Sure	22 (33.8)	
MT to cervical spine can cause adverse events		2.23 $\pm$ 1.02
Not Confident	18 (27.7)	
Insecure	19 (29.2)	
Quite Sure	16 (24.6)	
Sure	8 (12.3)	
Relevance of training in cranial nerve examination		3.20 $\pm$ 0.87
Not Confident	4 (6.2)	
Insecure	6 (9.2)	
Quite Sure	25 (38.5)	
Sure	26 (40.0)	

Abbreviations: n, number of participants; SD, standard deviation; CNE, cranial nerve examination; MT, manual therapy.

Chi-square analysis showed no statistically significant association between years of experience and self-reported ability ($\chi^2 = 3.515$, $df = 9$, $p = 0.940$). Likewise, training in CNE was not significantly

associated with the frequency of CNE use ($\chi^2 = 5.733$, $df = 4$, $p = 0.220$) or with its perceived relevance to cranio-cervical pathologies ($\chi^2 = 1.142$, $df = 3$, $p = 0.767$) (Table 3).

Table 3. Associations between clinical experience, training, and cranial nerve examination practices (chi-square analysis).

Association tested	Chi-square value (χ^2)	df	p-value
Years of experience			
Self-reported ability	3.515 ^a	9	0.940
Training in cranial nerve examination			
Frequency of use	5.733 ^a	4	0.220
Relevance to cranio-cervical pathologies	1.142 ^a	3	0.767

Abbreviations: df, degrees of freedom. ^a

One-way ANOVA showed no significant differences in ability to conduct CNE (between-groups sum of squares 0.261, mean square 0.087; within-groups sum of squares 35.524, mean square 0.582; total sum of squares 35.785; $p = 0.930$) or in confidence in interpreting CNE findings (between-groups sum of squares 0.196, mean square 0.098; within-groups sum of squares 40.420, mean square 0.652; total sum of squares 40.615; $p = 0.861$) (Table 4).

Table 4. One-way ANOVA for ability and confidence in cranial nerve examination (N = 65).

Outcome variable / Source	Sum of squares	Mean square	p-value
Ability to conduct a cranial nerve examination			
Between groups	0.261	0.087	0.930
Within groups	35.524	0.582	—
Total	35.785	—	—
Confidence in interpreting cranial nerve examination findings			
Between groups	0.196	0.098	0.861
Within groups	40.420	0.652	—
Total	40.615	—	—

Abbreviations: ANOVA, analysis of variance.

Correlation Analysis of Age showed a moderate positive correlation with ability to conduct CNE ($r = 0.35$, $p = 0.01$) and a weak-to-moderate positive correlation with interpretation of CNE findings ($r = 0.28$, $p = 0.03$). Clinical experience showed a moderate positive correlation with ability to conduct CNE ($r = 0.41$, $p = 0.002$) and a weak-to-moderate positive correlation with interpretation of CNE findings ($r = 0.30$, $p = 0.02$) (Table 5).

Table 5. Correlation between demographic factors and cranial nerve examination competence.

Variable 1 / Variable 2	Correlation (r)	p-value	Interpretation
Age			
Ability to conduct CNE	0.35	0.01	Moderate positive relationship
Interpretation of CNE	0.28	0.03	Weak-moderate positive relationship
Clinical experience			
Ability to conduct CNE	0.41	0.002	Moderate positive relationship
Interpretation of CNE	0.30	0.02	Weak-moderate positive relationship

Abbreviations: CNE, cranial nerve examination; r, Pearson correlation coefficient.

DISCUSSION

This survey examined physical therapists' exposure to presentations that may warrant cranial nerve screening, self-rated competence in cranial nerve examination (CNE), its frequency of use, perceptions of serious cervical pathology and manual therapy (MT) safety, and the associations of age, experience and training with these practices. In this study 4 findings stand out. Headache and dizziness were assessed most often, but mostly only occasionally or rarely. Self-rated ability was high (89.2% quite sure or sure of conducting a CNE), yet 41.5% used it only rarely and 7.7% frequently. Concern about serious cervical pathology was common (72.3%), and 56.9% reported that concern about adverse events discouraged MT, although only 36.9% endorsed that cervical MT can cause adverse events. Finally, age and experience correlated with competence positively ($r = 0.28$ to 0.41), whereas experience and training were not significantly correlated. We compare these results with the survey of 396 PTs by Mourad et al.¹⁵ and the international survey of 774 PTs by Hutting et al.¹⁷ which the similar results in demographic presentation of the participants and their frequency of assessing headache but WAD was less assessed in our participants may be due to different care pathways as compared to this study, results also suggest that direct access raises the stakes of screening. Donato et al. described the aim of screening in primary contact care as deciding whether a patient is suitable for physical therapy or needs referral, a role carrying greater accountability.¹⁸ A referral pathway does not remove this duty, working in secondary care was the reason for not using CNE.¹⁵

systematic screening is expected for complains like Headache and dizziness according to guidelines. The concussion guideline gives a grade A recommendation to screen for emergency and cervical pathology. unexplained cranial nerve dysfunction is among the findings that warrant referral, and recommends cervical and vestibulo-oculomotor examination for patients with headache or dizziness.¹⁹ However, 63.1% of our participants met head or cervical trauma rarely or never, so the situations in which CNE is most clearly indicated may arise infrequently. Headache is also where a

musculoskeletal explanation is most tempting. Cuthbert et al. reported prominent muscle and joint findings in 52 headache patients and a fall in mean pain from 6.75 to 0.49 after treatment.²⁰ However, their study focuses on skull articular dysfunctions rather than cranial dysfunctions, and the abstract describes a retrospective single-setting series with no comparison group.

Self-rated competence was far higher than in previous studies. Here 89.2%, 84.6% and 78.5% were quite sure or sure of conducting, interpreting and managing findings.¹⁵ In the international sample, 61% were fairly or completely confident.¹⁷ even though in confidence in managing cranial nerve pathologies is highest, if the referral is low, it raises the concerns regarding patient's proper follow up care.¹⁵ High confidences did not translate into frequent use. The distribution of use among those who gave a rating (49.1% rarely, 41.8% occasionally, 9.1% frequently, is similar to the previous studies.¹⁵ Limited exposures can be the reason for this. Infrequent use is not necessarily a deficiency, as examination should follow the history, but Hutting et al. noted that a test regarded as important is very unlikely never to be indicated, so complete non-use questions competence.¹⁷

Participants valued guidelines (78.5%) and training in CNE (78.5%), considered CNE relevant to cranio-cervical (70.8%) and arterial pathology (56.9%), and were concerned about arterial (61.5%) and serious cervical pathology (72.3%). Results are similar to previous study but due to differences in measurement scales the results cannot be directly compared, only rank order is comparable. In both studies training and guidelines were among the highest-rated items and the statement that MT causes adverse events was the lowest.¹⁵

CNE should not be treated as a stand-alone test: Mourad et al. cited poor sensitivity (0.22) but high specificity (0.95) for isolated cranial nerve findings,¹⁵ and Hutting et al. cautioned that reported test use is not evidence of valid vascular screening.¹⁷

The gap between concern and belief are also similar with studies conducted before, where 67.4% were discouraged from using MT although agreement that it causes adverse events was low.¹⁵ Caution here seems to arise from uncertainty rather than a firm belief in harm. Hutting et al. found that 48% agreed manipulation increases dissection risk versus 15% for mobilization, and argued that dissections relate more to pre-existing vascular vulnerability than to technique, so emphasis should fall on risk assessment and patient selection.¹⁷ in this study manipulation is not considered separately from mobilization. Taken together, high concern, discouraged MT and infrequent CNE suggest that fear of the intervention may be replacing systematic screening. This is an inference that cross-sectional data cannot test.

Categorical experience was unrelated to ability ($\chi^2 = 3.515$, $df = 9$, $p = 0.940$) and ANOVA showed no differences in ability ($p = 0.930$) or interpretation ($p = 0.861$). Training was unrelated to frequency of use ($p = 0.220$) or relevance to cranio-cervical pathology ($p = 0.767$). Yet age and experience correlated positively with ability ($r = 0.35$ and 0.41) and interpretation ($r = 0.28$ and 0.30). The direction matches previous study, where the least experienced used CNE rarely in 80% of cases and were less sure in interpretation. However, the study found no experience effect on ability ($p = 0.1237$), so the domain showing the gradient is inconsistent.¹⁵ Age and experience are also collinear, and Pearson coefficients on four-point ratings are a cautious choice at best.

IMPLICATIONS

Education should include skill-based assessment for CNE with supervised practice rather than relying on self-reported confidence with particular attention to decisions about monitoring, referral and emergency assessment. Case-based learning focus on headache, dizziness and trauma may be particularly useful. In practice, CNE should be selective, history-led and combined with other findings, and direct access clinicians need clear referral pathways.^{18, 19} Regulators should include screening competencies in entry-level standards. Future research needs to assess actual clinical skills, use larger

multi-center samples, comparisons by access regimen, clinical setting and specialties, and studies of the reliability and diagnostic value of CNE in clinical setting.

LIMITATIONS AND CONCLUSION

The sample is relatively small, early-career and academic in composition, and self-selected, which limits precision and generalizability. In conclusion, participants considered CNE and its training important and felt competent in performing it. However, they rarely used the examination and expressed widespread concerns about possible cervical adverse events, while one in five were unsure how to manage the findings. Greater experience was slightly associated with higher perceived competence. Future research should involve larger studies and objective assessments of clinical skills, alongside improved education and clear guidelines for clinical decision-making when using CNE.

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