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Clinical evaluation and treatment preferences of physiotherapists working in neurorehabilitation: A cross-sectional study from Turkey

Physiotherapists' clinical preferences

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Abstract
Aim: The study aimed to investigate the evaluation and treatment preferences of physiotherapists specializing in neurorehabilitation in Turkey.
Material and Methods: The questionnaire was sent to 546 physiotherapists (PTs), and 94 of them responded (17 %). The average duration of working years was 9.80 ± 9.31. The survey included questions about professional experience and the patient population they treat. It also inquired about the evaluation and treatment methods commonly used by physiotherapists.
Results: The results showed a predominance of stroke survivors (S, 70.21%), followed by Parkinson's disease (PD, 14.89%) and Multiple Sclerosis (MS, 14.89%). Standardised scales such as Brunnstrom for S, EDSS for MS and Hoehn and Yahr for PD were commonly used for the disease stage. PTs working with S frequently used the Berg balance test or Timed Up and Go (TUG) Test in dynamic balance assessment (31.81%). PTs working with MS prefer TUG or Minibest Test, while PTs working with PD prefer TUG or technology-based assessment for dynamic balance. Task-oriented approaches were preferred for MS (78.6%) and PD (92.9%). The Bobath was preferred for S (92.9%). Virtual reality was preferred for MS (64.3%), robotic systems for S (68.2%) and exergames for PD (42.9%). Postural exercises focusing on balance and coordination were commonly preferred for PD.
Discussion: The findings highlight the importance of standardised assessment tools and treatment guidelines to promote evidence-based practice. Although the low response rate of our study limits the generalizability of the findings, we believe that this study may be a preliminary idea for cross-cultural studies with multiple participants to establish standard evaluations or treatment preferences of PTs in neurorehabilitation.

Keywords
Physiotherapist, Neurorehabilitation, Assessment, Treatment

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Introduction

Rehabilitation is an important part of health care. It is applied to many conditions and specific areas [1, 2]. These are to prevent, ameliorate, treat, and protect (World Health Organization, 2030 Action Plan). The primary goal of rehabilitation programmes is to improve the patient's quality of life and social adjustment by maintaining independence in activities, minimising pain, and disability, and improving the ability to adapt to changing conditions [3]. Neurological problems are one of the most common areas requiring rehabilitation. Millions of people worldwide are affected by neurodegenerative diseases [4]. According to the World Health Organization (WHO), many neurological disorders are chronic and progressive, creating a global and diverse functional problem [5]. Neurological problems have a negative impact on an individual's health in many ways. To improve the physical and emotional functioning, quality of life and level of social participation of people with neurological conditions, it is necessary to understand the limitations they experience due to neurological conditions [6]. The causes which are genetic disorders, congenital abnormalities or disorders, infections, poor diet, brain injury, spinal cord injury, nerve damage, as well as lifestyle or environmental health issues, can vary from person to person. [7, 8]. Additionally, a neurological problem can also originate in another system that directly or indirectly interacts with the nervous system. For example, Stroke(S) includes brain damage caused by problems in the blood vessels that supply the brain (cardiovascular system); autoimmune disorders involve damage caused by the body's own immune system [9]. Neurological diseases bring along with them secondary problems and deformities that limit an individual's independence by negatively affecting the basic components of daily life activities, functionality, productivity, and participation. Problems related to the motor and sensory systems seen in neurological diseases are often accompanied by cognitive, behavioural, sensory, communication, and perceptual disorders [10]. Participation in daily life activities is known to increase individuals' creativity, improve their skills, and enable them to integrate and adapt to social life [11]. The primary goal of rehabilitation is to determine the limitations that individuals experience due to neurological diseases to improve their quality of life and social participation levels [1]. The most common neurological diseases are S, Multiple Sclerosis (MS), and Parkinson's Disease (PD). Neurorehabilitation is a process that aims to improve the quality of life by minimizing functional disorders caused by motor and sensory impairments in the nervous system [12]. Successful neurorehabilitation requires a detailed and accurate evaluation process and planning an effective treatment programme [12, 13]. The International Classification of Functioning, Disability and Health (ICF) should be used in the evaluation and preparation of the treatment programme for proper documentation in clinical practice and research projects with a common language. Neurorehabilitation protocols are not like orthopaedic rehabilitation protocols, where the methodology is well established. Treating a variety of neurological conditions with a wide range of symptoms has challenged us to develop unique and individual programmes [14]. However, it may still be a good idea to create a unique protocol with guidelines that include specific assessment and treatment protocols. There is no common perspective on the assessment procedure and treatment methods used in the field of neurorehabilitation in Turkey. The extent of ICF-based assessment and treatment in this area in Turkey, as in the rest of the world, is still unclear. Four-year Physiotherapy and Rehabilitation curriculum (Bachelor of Science) includes neuroanatomy, neurology and neurophysiological approaches and neurological rehabilitation courses. In addition to that, evaluation and treatment methods based on ICF are integrated into neurological rehabilitation and evaluation in undergraduate courses of that curriculum. Physiotherapists (PTs) are trained based on these educational strategies. PTs are fulfilled to work in this field. After graduation, PTs working in neurorehabilitation field may become a member of the Neurological Physiotherapy Working Group, which is a subgroup of the Turkish Physiotherapists Association since the 2000's.

As far as we know, there are more PTs working in adult neurorehabilitation field in private settings, rehabilitation centres or hospitals than the number of participants of this study. The pragmatic aims of the study were to; (1) find out which assessment tools or evaluation techniques and treatment approaches are most preferred by PTs working in the field of neurorehabilitation in Turkey. (2) To create a common perspective based on PTs' preferences in this field (3) To establish standards in this field to create guidelines in neurorehabilitation for PTs working in Turkey. With this study, it will be possible to encourage PTs' working in this field to use and to consider evidence-based neurorehabilitation practice as well.

Material and Methods

Study Design

The present study was a cross-sectional and descriptive design study and was conducted from May 2023 and June 2023. The rights of subjects were protected, and they were asked to sign an informed consent form. This study has been registered on ClinicalTrials.gov with the registration number NCT05855096.

Participants

Ninety-four physiotherapists (64F, 30M) with a mean age of 33.94 ± 9.73 years were included in the study. Inclusion criteria were determined as to have at least 3 years of experience in patient follow-up in neurorehabilitation, to be actively working PTs, to be willingness to participate, and to speak and understand Turkish (for foreign nationals). Participants were excluded from the study if they do not answer or partially answer the sections of the survey (Figure 1. Flowchart of this study).

"Sample Size Calculators" is an online sample size calculation web service that was used to calculate the sample size (https://www.sample-size.net/). The calculations were based on an alpha level of 0.05, a β level of 20%, the expected correlation coefficient is 0.30 and the desired power of 80% [15]. These parameters generate a necessary sample size of at least 85 participants.

Study Protocol

Data collection was carried out using the online survey. The online survey was prepared by researchers with at least ten years of neurorehabilitation clinical practice experience. Before completing and distributing the survey, it was sent to more three PTs who have been working in this field for a long time. The online survey link was delivered via corporate e-mail to PTs. The questionnaire created through Google Forms was delivered to the participants via the link. The link had been active within a month for the data collection process. The participants were informed about the fact that the study was carried out for scientific purposes, and the information was not shared with third parties. Before they started the questionnaire, they were asked whether they were willing to participate. All participants answered "yes" to the question "Do you agree to participate in the survey?". All participants agree to participate in the survey included in study. The Google Forms questionnaire was sent to the members registered in the Turkish Physiotherapists Association and its neurorehabilitation subgroup members.

A demographic data form was prepared by the researchers and a form prepared via Google Forms to determine evaluation and treatment methods. In the structured questionnaire, we aimed to choose the most preferred assessment tool and evaluation techniques and treatment approaches for their patients suffering from neurological disorders. In addition to this, the physiotherapist's demographic data, including age, gender, years of experience in the profession, years of experience in the field of neurorehabilitation, and postgraduate education level.

Data Analysis

In this cross-sectional study, descriptive parameters belonging to participants were computed and calculated as mean, standard deviations (mean +SD) and numbers, percentages (% (n)).

Ethical Approval

This study was approved by the Ethics Committee of Biruni University Non-Interventional (Date: 2023-04-17, No:2023/80-12).

Results

The questionnaire was sent to five hundred forty-six PTs working in this field in Turkey. Only 94 physiotherapists met the inclusion criteria in the study. Response rate is 17%. Ninety-four physiotherapists (63F, 31M) with a mean age of 33.84 ± 9.73 years who were included in the study (Figure 1. Flowchart of this study). PTs included in this study have been working for 9.80 ± 9.31 years in neurorehabilitation field. While 59.6 % of PTs have been working at university or university hospitals 20% of them have been working in private hospitals or clinics. 70.21% of them work with S 14.89 % of them work with PD and 14.89 % of them work with MS. While the disease stages were expressed as UPDRS in 29% and Hoehn and Yahr Scale in 71%

Table 1. Assessment Preferences of Physiotherapists

Variables		MS (n=14) % (n)	PD (n=14) % (n)	S (n=66) % (n)
*Evaluation Methods	Be evidence-based method	85.7 (12)	92.9 (13)	74.2 (49)
	Inexpensive and accessible method	50 (7)	57.1 (8)	56.1 (37)
	A method I know	50 (7)	57.1 (8)	53 (35)
	Easy to apply method	64.3 (9)	64.3 (9)	75.8 (50)
Muscle Tone	Measurement of Rigidity	-	92.86 (13)	1.51 (1)
	Isokinetic Test	-	7.14 (1)	1.51 (1)
	Ashworth/ Modified Ashworth Scale	100 (14)	0 (0)	96.96 (64)
Static Balance	Single Leg Stance (Eyes closed/open)	28.57 (4)	57.14 (8)	48.48 (32)
	Romberg's Test	21.42 (3)	14.28 (2)	27.27 (18)
	Functional Reach Test (FRT)	14.28 (2)	28.57 (4)	16.66 (11)
	Technological Balance Assessment Methods (Balance master etc.)	35.71 (5)	0 (0)	7.57 (5)
Dynamic Balance	The Timed Up & Go (TUG) Test	42.85 (6)	21.42 (3)	33.33 (22)
	Five Times Sit to Stand Test	7.14 (1)	7.14 (1)	9.09 (6)
	Mini Balance Evaluation Systems Test (Mini-BESTtest)	21.42 (3)	14.28 (2)	12.11 (8)
	Fullerton Advanced Balance (FAB) Scale	0(0)	7.14 (1)	0(0)
	Technological Balance Assessment Methods (Biodex, Prokin, Wee etc.)	21.42 (3)	21.42 (3)	9.08 (6)
	Tinetti Balance and Gait Test	0 (0)	7.14 (1)	0(0)
	Berg Balance Test	0 (0)	21.42 (3)	31.81 (21)
	Stair Climbing Test	7.14 (1)	0 (0)	0(0)
Mobility	Tinetti Balance and Gait Test	7.14 (1)	21.42 (3)	12.12 (8)
	Functional Ambulation Classification	7.14 (1)	14.28 (2)	9.09 (6)
	Twelve Item MS Walking Scale (MSWS-12)	21.42 (3)	-	-
	10 Meter Walk Test (10MWT)	14.28 (2)	0(0)	0(0)
	Dynamic Gait Index	14.28 (2)	0(0)	0(0)
	Observational Gait Analysis	21.42 (3)	21.42 (3)	53.03 (35)
	Six minute walking test	7.14 (1)	0(0)	0(0)
	Timed 25 foot walk Test	7.14 (1)	0(0)	0(0)
	Rivermead Mobility Index	0(0)	21.42 (3)	24.23(16)
	Technological Balance Assessment Methods	0(0)	21.42 (3)	1.51(1)

n: number, %: percentage, S: Stroke, MS: Multiple Sclerosis, PD: Parkinson's Disease
*Participants had the right to choose more than one option in these items

Table 2. Assessment Preferences of Physiotherapists- continued

Variables		MS n=14 %(n)	PD n=14 %(n)	S n=66 %(n)
Activity of Daily Living (ADL)	Functional Independence Measures (FIM)	35.71 (5)	21.42 (3)	62.11 (41)
	Barthel Index for Activities of Daily Living (ADL)	50 (7)	7.14 (1)	34.84 (23)
	Brody Instrumental Activities of Daily Living Scale (IADL)	0(0)	0(0)	3.03 (2)
	Symptom screen	14.28 (2)	-	-
	Parkinson Activity Scale (PAS)	-	21.42 (3)	-
	Schwab and England ADL Scale	0(0)	28.57 (4)	0(0)
	Parkinson's Disease Activities of Daily Living Scale	-	21.42 (3)	-
Emotional Status	Beck Depression Inventory (BDI)	85.72 (12)	71.42 (10)	66.69 (44)
	Beck Anxiety Inventory (BAI)	14.28(2)	7.14(1)	15.14 (10)
	Hamilton Anxiety Rating Scale	0(0)	7.14(1)	1.51 (1)
	Hospital Anxiety and Depression Scale (HADS)	0(0)	14.28(2)	16.66 (11)
Quality of Life (QOL)	Multiple Sclerosis International Quality of Life questionnaire	28.57 (4)	-	-
	Multiple Sclerosis Quality of Life-54 (MSQOL-54)	50 (7)	-	-
	Short Form-36	14.28 (2)	7.14 (1)	33.33 (22)
	The Preference-Based Multiple Sclerosis Index	7.14 (1)	-	-
	Parkinson's Disease Quality of Life Questionnarie -39 (PDQ-39)	-	92.86 (13)	-
	Short Form-12	0(0)	0(0)	15.15 (10)
	Stroke Specific Quality of Life Scale (SS-QOL)	-	-	25.75 (17)
	WHOQOL-Bref	0(0)	0(0)	6.06 (4)
	Nottingham Health Profile	0(0)	0(0)	15.15 (10)
	Speaking with the Patient	0(0)	0(0)	4.54 (3)
Use of ICF in assessment	Yes for Research Purposes	21.42 (3)	50 (7)	34.84 (23)
	Yes for Clinic Routine	78.57 (11)	35.71 (5)	34.84 (23)
	No	0(0)	14.28 (2)	30.30 (20)

n: number, %: percentage, S: Stroke, MS: Multiple Sclerosis, PD: Parkinson's Disease WHOQOL-Brief: World Health Organization Quality of Life Brief, ICF: International Classification of Function

Table 3. Treatment Preferences of Physiotherapists

Variables		MS % (n)	PD % (n)	S % (n)
*Rehabilitation Program	Task-oriented Approach	78.6 (11)	92.9 (13)	1.5 (1)
	Dual Task Based Approach	0	85.7 (12)	1.5 (1)
	Motor imagery	35.7 (5)	28.6 (4)	23.9 (16)
	Cue Training	0	57.1 (8)	0
	Yoga	14.3 (2)	7.1 (1)	0
	Tai Chi	0	0	0
	Pilates	71.4 (10)	42.9 (6)	0
	Otago	0	14.2 (2)	0
	Body awareness therapy	28.6 (4)	28.6 (4)	0
	PNF	71.4 (10)	42.9 (6)	3 (2)
	Johnstone	0	0	31.8 (21)
	PANAT	0	0	10.4 (7)
	Mirror Therapy	0	0	41.8 (28)
	CIMT	0	0	29.9 (20)
	Bobath	0	0	92.5 (62)
*Technologically supported approaches	Virtual Reality	64.3 (9)	28.6 (4)	37.9 (25)
	Exergames	57.1 (8)	42.9 (6)	25.8 (17)
	Robotic System	28.5 (4)	14.2 (2)	68.2 (45)
*Exercise types	Aerobic Exercises	92.9 (13)	71.4 (10)	47.8 (32)
	Strengthening Exercises	92.9 (13)	71.4 (10)	77.6 (52)
	Balance and Coordination Exercises	100 (14)	100 (14)	92.5 (62)
	Postural Exercises	50 (7)	100 (14)	28.7 (19)
	Respiratory Exercises	57.1 (8)	64.3 (9)	15.1 (10)
Use of ICF in treatment	Yes for Research Purposes	21.4 (3)	50 (7)	31.8 (21)
	Yes for Clinic Routine	78.6 (11)	35.7 (5)	39.4 (26)
	No	0	14.2 (2)	28.7 (19)

*Participants had the right to choose more than one option in these items

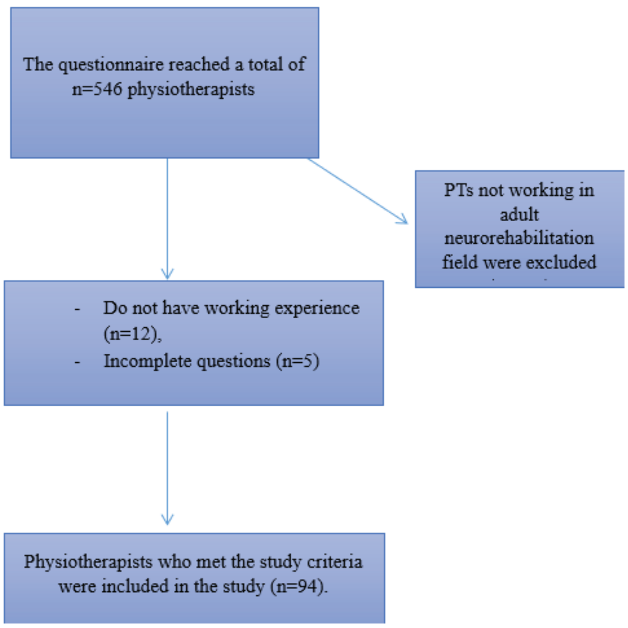

Figure 1. Flowchart of this study

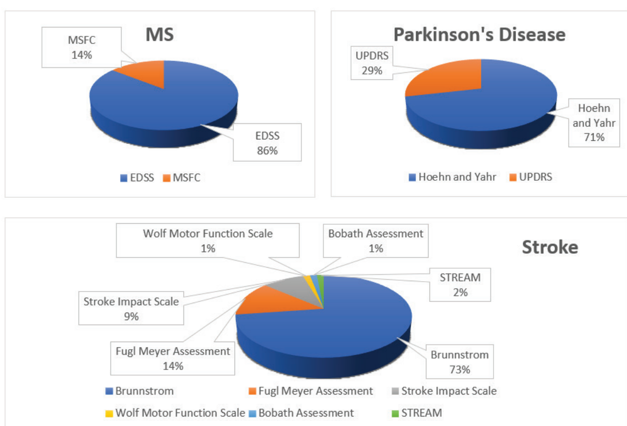

Figure 2. Assessment Preferences of Disease Stages

for PD; it was expressed as 86% EDSS and 14% MSFC for MS patients. PTs working with S prefer to express disease stage as 73% Brunnstrom, 14% Fugl Meyer Assessment (Figure 2). Table 1 and Table 2 represent the assessment preferences of physiotherapists according to findings. Although most of the PTs working with MS and PD prefer to evaluate according to the evidence-based method, only half of PTs working with S prefer to evaluate according to the ease of application. While the Ashworth or Modified Ashworth Scale is the most preferable standardized scale for PTs working with MS and S, PTs working with PD prefer to measure rigidity for muscle tone. PTs working with S (35.7%) stated that using technological based methods for assessing static balance, % 42.85 of them stated that used Timed up and Go Test for dynamic balance. Although PTs working with S (53.03 %) prefer to use observational gait analysis, PTs working with PD prefer to use observational gait analysis (21.42 %), Rivermead mobility index (21.42%) and technological based gait analysis (21.42%). Besides, PTs working with MS (21.42 %) prefer to use the Twelve Item MS Walking Scale (MSWS-12) and observational gait analysis.

PTs working with MS (35.71%) and PTs working with S (62.11 %) preferred to use Functional Independence Measurement (FIM), while half of PTs working with MS preferred to use Barthel Index for Activities of Daily Living (ADL). Most of the PTs working with MS (85.72%), PTs working with PD (71.42%) and PTs working with S (66.69%) prefer to use the Beck Depression Inventory to assess emotional status.

To measure quality-of-life, Multiple Sclerosis Quality of Life-54(MSQOL-54) was preferred by 50 %, the Parkinson's Disease Quality of Life-39 (PDQ-39) was preferred by the 92.86%, the SF-36 was preferred by PTs working with S by 33.33 %.

PTs working with MS (78.57%) reported using ICF-based assessment in clinical routine, and PTs working with PD (50%) reported using ICF-based assessment for research purposes. However, PTs working with S (34.84%) emphasised using ICF-based assessment both clinically and for research purposes.

The treatment preferences of physiotherapists working in this field are presented in Table 3. Although the 78.6% of PTs working with MS and 92.9% of PTs working with PD prefer to use task-oriented approach, 92.9% of PTs working with S prefer to use Bobath concept PTs working with MS (64.3 %) prefer to use Virtual Reality, PTs working with S (68.2 %) prefer to use robotic systems and PTs working with PD (42.9 %) prefer to use exergames. Although all the PTs working with MS and PD prefer Balance and Coordination exercises, PTs working with S (92.5 %) also prefer Balance and Coordination exercises. All the PTs working with PD prefer to add postural exercises in a treatment program. During treatment programme planning, PTs working with MS (78.6%) and S (39.4%) use ICF in clinical routine, while PTs working with PD (50%) use ICF for research purposes.

Discussion

The results of the study showed that the group of patients encountered by PTs had the highest prevalence of Stroke, followed by Parkinson's Disease and Multiple Sclerosis. Most of the PTs working in neurorehabilitation field in Turkey prefer and use standardised scales for assessment. For example, Brunstrom scale for PTs working with S, EDSS for working with MS, Hoehn and Yahr scale for working with PD. Aligning with established clinical practice guidelines, the Berg Balance Test emerged as a widely utilized assessment tool for neurologic conditions, as substantiated by the relevant literature (16). In our study, it was observed that PTs working with S, frequently used the Berg balance test or TUG in the assessment of dynamic balance (31.81%). PTs working with MS prefer TUG or Minibest Test, while physiotherapists working with PD prefer TUG or technology-based assessment for dynamic balance. Only half of the PTs working with S prefer to use observational gait analysis, PTs working with PD prefer to use the Tinetti Gait Scale or observational analysis, and PTs working with MS prefer to use the Twelve Item MS Walking Scale (MSWS-12) or observational gait analysis. There was no consensus on the assessment of dynamic balance and mobility according to the results obtained from our study.

PTs specialising in stroke rehabilitation often prefer to use the FIM as their primary ADL assessment tool because it provides a comprehensive assessment of functional abilities relevant to stroke recovery. For patients with MS, the Barthel Index is often favoured by PTs for its ability to assess functional limitations and guide rehabilitation interventions tailored to the needs of MS patients. The Schwab and England Activities of Daily Living

Scale is widely used by PTs working with PD and is recognised for its sensitivity in capturing the unique challenges faced by patients and guiding therapeutic strategies aimed at improving functional independence.

The Beck Depression Inventory appears to be a common scale for all three groups of illnesses to assess emotional status. While PTs working with MS and PD prefer disease-specific assessment scales for the Quality-of-Life scale because it includes more disease-specific conditions, PTs working with stroke prefer the SF-36, which is a general quality of life scale. Moving beyond assessment tools, the study illuminated distinctive therapeutic approaches employed by PTs based on the nature of the neurological condition. PTs expressed that they prefer to use task-oriented approach for MS and PD, Bobath concept for S survivors. It appears that PTs working with MS and PD are incorporating functional and goal-directed contemporary approaches into their treatment, while those working with S cannot abandon the Bobath concept.

PTs preferred virtual reality and exergames for MS and PD patients respectively and they stated that robotic systems are generally used for S survivors, which may be since mobilisation is more difficult in patients with S. In the related literature, the study about PTs working with S reported that they use Bobath concept for rehabilitation process (17). Balance and coordination exercises are the most preferred type of exercise in neurorehabilitation in our study. A meta-analysis recommended that therapists should implement a regular exercise programme, including aerobic exercise, physical activity, stabilisation exercises, and balance exercises to improve balance for patients with MS, PD, or S (18). Similarly, PTs expressed that aerobic exercise, balance and coordination exercises, strengthening exercises were important when implementing the neurorehabilitation treatment program. The implementation of postural exercises was higher among therapists working with PD than other patient groups. International studies in the literature support our results in the treatment part of the neurorehabilitation field. It has been observed that the ICF perspective in neurorehabilitation is generally used mostly in clinical routine in PTs working with MS, mostly for research purposes in PTs working with PD, and that the use for clinical and research purposes is similar in PTs working with S. However, this study was conducted in Turkey and showed that there are very few standardised tests used for evaluation in the neurorehabilitation field, especially in gait. On the other hand, treatment options preferred by the PTs working in this field are the same as similar studies in the related literature.

Conclusion

In conclusion, the results of our survey suggest that PTs should plan new studies to reach many more PTs working in the neurorehabilitation field. Moreover, PTs would plan cross-cultural studies to compare the findings obtained from the study in the future. We believe that this study could be a preliminary idea for cross-cultural studies with many participants to establish standard assessment or treatment preferences in neurorehabilitation field. Briefly, the study showed that PTs do not actually spend much time on assessment, and the specific equipment facilities in clinics may also negatively influence this condition.

Limitation

The response rate of our study was low because there are very few centres focusing on neurorehabilitation in Turkey. As expected, the number of participants was small in this study. This can be accepted as a limitation of our study.

Scientific Responsibility Statement
The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and Human Rights Statement
All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or compareable ethical standards.

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Conflict of Interest
The authors declare that there is no conflict of interest.

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