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KNOWLEDGE AND PERCEPTION OF PHYSICAL THERAPIST TOWARDS THE USE AND BARRIERS OF FUNCTIONAL ELECTRICAL STIMULATION IN STROKE REHABILITATION

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Article Info

Abstract

Background: Clinical guidelines for stroke rehabilitation recommend the use of Functional-Electrical-Stimulation (FES) to enhance gait and upper extremity function. However, it is unclear whether these guidelines are being effectively implemented in clinical practice.

Aims/objective: This survey aims to achieve two main objectives: (1) Determine the frequency with which physical therapists employ FES to address common therapeutic goals for stroke patients. (2) Assess the level of knowledge among physical therapists regarding the scientific evidence supporting the use of FES in post-stroke rehabilitation and identify the barriers and also the facilitators that influence the utilization of FES.

Methods: A valid and well founded survey was administered to physical therapists working in various clinical settings in Karachi. The survey included numerous questions related to demographic characteristics, FES usage, familiarity with FES literature, and perceived barriers and facilitators. Closed-ended questions were also analyzed by using descriptive statistics and index scoring to generate summary scores. The Wilcoxon non-parametric test and independent t-test were employed to assess the relationship between FES usage and demographic variables.

Conclusion: The utilization of FES in stroke rehabilitation is not widespread among the majority of physical therapists. Approximately half of the respondents have access to FES devices and express a desire to increase their use in their healthcare settings..

Keywords:
Functional Electrical Stimulation, Stroke , Knowledge , Use, Barrier, Facilitator.

Introduction

Stroke ranks as third in the world in terms of disability and is the second most common cause of death. One every three seconds, 12.2 million new strokes occur worldwide each year. There are 101 million stroke survivors in the world. Throughout the past 30 years, this number has almost expanded. One stroke will occur in every four people in their lifespan. This sum up has increased by 50% in the past 17 years (Owolabi et al., 2022). People often experience sensorimotor shortfalls after a stroke, for example paresis and irregular muscle tone, which substantially reduce their range of motion and capacity to engage in daily performances (Bleyenheuft and Gordon et al., 2014). Bring back function and movement while delivering these deficiencies is the aim of physical rehabilitation. One method for stroke rehabilitation suggested by numerous best practice principles is functional electrical stimulation, or FES (Martin, Rebecca et al.,2012)

This simplistic apparatus established a brand-new field of improved rehabilitation known as FES in 1960.In order to induce muscular contraction and produce a movement that is functionally useful, FES applies artificial electrical stimulation to limb muscles that have lost nerve control as a result of injury (Martin, Rebecca et al, 2012).

Based on the functions it performs, FES can be further classified into three classes: sensory function restoration, skeleto-motor function restoration, and autonomic function restoration (Martin, Rebecca et al,. 2012).

The 19th century saw the first attempts at artificial electrical stimulation of nerve tissues, and interest in functional electrical stimulation (FES) has increased recently (Trontelj and Stalberg et al., 1983).

The FES apparatus employs electrical current to initiate muscle contraction, hence restoring function to the paralyzed muscles. The goal is to cause a motor response, or contraction of the muscles, by activating a certain set of nerve fibers, usually peripheral nerve fibers. The motor efferent nerve fibers may be activated to do this. (Trontelj and Stalberg et al., 1983).

It also lessens the chance of falls and makes people feel more self-assured and autonomous when they walk In order to enhance physiotherapy exercises and help individuals increase their strength and range of motion, FES is utilized to enable fresh motions in weaker muscles (Cole and Gardiner et al., 1984).

According to the American Stroke Association's latest standards, clients with reduced muscular contraction should undergo FES for upper extremity training, involving shoulder subluxation and gait. In stroke rehabilitation, for instance, the evidence-based review notes that there is level 1a evidence (i.e., results backed by a meta-analysis or at least randomized controlled trials) that FES decreases spasticity, improves upper extremity function, and delays the onset of shoulder subluxation. When paired with gait retraining, this evidence can be applied to improve gait performance (Amir K Vafadar et al., 2015).

Even though the overwhelming data supporting FES's therapeutic benefits, this evidence does not mean that FES is better than other possible therapy modalities for physical therapists. FES has been suggested for stroke rehabilitation, although in actual practice, physical therapists might not always employ it. Not all clinical settings have access to functional electrical stimulation equipment, and not all physical therapy curricula incorporate FES. Thus, physical therapists might not be using FES to its full potential. We conducted a FES survey with physical therapists in Karachi to find out how FES is used to achieve common therapeutic goals in stroke recovery.

Materials and Methods

The research employed a cross-sectional design. Data was gathered from rehabilitation centres and physical therapy clinics in Karachi. The study focused on physical therapists. The study spanned one year, from November 2024 to April 2025. The sample size of 195 was determined using RAOSOFT software, with a 95.00% confidence interval and 5.00% margin of error. Comprised of n= (73) male, n= (122) female from physical therapist population. Non probability convenient sampling was utilized for sample selection. Male and female of aged-grouped between 22-60 years involved.

To maximize respondent participation and ensure the generalizability of findings, the survey incorporated inclusive criteria. Given that the survey was conducted anonymously, potential respondents were entrusted with self- screening against the following inclusion criteria: 1) Physical Therapists actively engaged in clinical setups or hospitals and in stroke rehabilitationsettings.2) Physical Therapist who provided informed consent to participate in study. 3) Physical Therapists who had knowledge about Functional Electrical Stimulation and it use. Data was collected through the distribution of questionnaire at various rehabilitation centers and clinics in Karachi. A modified questionnaire named the functional electrical stimulation survey questionnaire (Modified)*, was used. This tool was adapted from Nolan Auchstaette et.al 2016 study to evaluate knowledge and perception among physical therapist towards the use and barriers of functional electrical stimulation in stroke rehabilitation. SPSS Version 25th was employed for data analysis. descriptive statistics were reported, and the Wilcoxon non - parametric independent t-test was utilized.

Results

A total 195 surveys collected from different heath care settings of Karachi. The mean respondent age was 27.62+5.349 years. The minimum age of participants is 22 and maximum age is 60 year. Out of 195 respondents 37.4% were male and 62.6% were female.

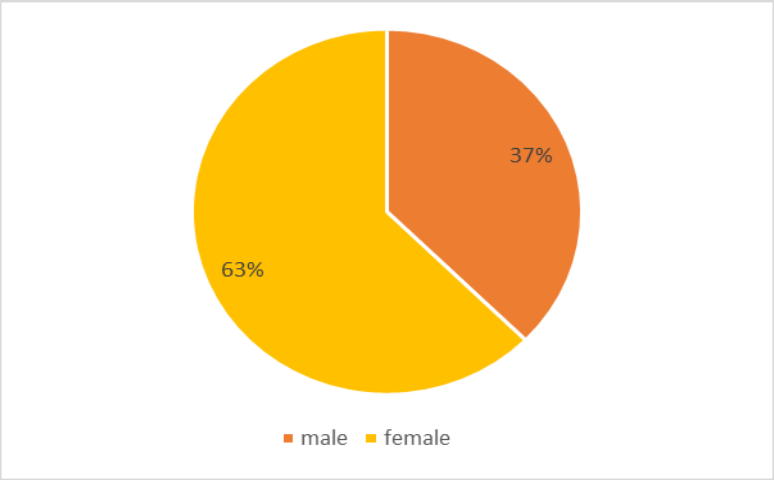


Figure 1: Age of participants

The highest degree obtained by 79.0% of respondent was DPT. Other was BSPT (1.0%), MSPT/MPhil (19.5%), and PhD (0.5%). Respondents working in variety of health care settings, acute care (6.2%), inpatient rehabilitation (21.0%), outpatient rehabilitation (56.9%), private practice (10.8), and home/community care (5.1%). 50.8% of respondents' primary area of working is neurological, orthopedic 69.2% ,cardiorespiratory 23.6 % (table VII). Other areas of practice includes mixed/all (10.3%), gynecology (1.5%). Pediatrics (4.1%) and sports (0.5%). The Majority (76.4%) of the respondents had been workings as a physical therapist were in between 1-5 years and 78.5% had been working with stroke

patient for 1-5 years. 67.7 percent of respondents receive FES education in their entry-level program but only 28.7% of respondents' continuing education course in FES.

Most of the respondents marked "most of time" and "frequently" for all 6 therapeutic goals. The total mean index score of FES use was 12.5 + 10.7. in the scale of 0 to 30. (Table #1). Highest mean index score (2.34+ 1.83) was calculated for reducing hypertonicity/spasticity and lowest mean index score for improving sensation (1.73+ 1.76). (Figure #1)

Table 1: Use of Functional Electrical Stimulation (FES) to address therapeutic Goals

Goals	Most of the time	Frequently	Sometimes	occasionally	Rarely	Never	Index score Mean (SD)
Prevent shoulder subluxation	12.3%	10.8%	24.6%	14.9%	13.8%	23.6%	2.78 (1.68)
Improve arm function	24.6%	22.1%	23.1%	23.1%	8.7%	13.3%	1.89 (1.60)
Improve walking function	21.0%	22.1%	24.6%	10.8%	10.8%	10.8%	2.01 (1.60)
Increase muscle strength, endurance	27.2%	27.7%	17.4%	7.2%	10.3%	10.3%	1.76 (1.65)
Reduce hypertonicity/spasticity	20.5%	20.5%	16.9%	9.7%	11.3%	21.0%	2.34 (1.83)
Improve sensation	32.8	25.6	11.8	7.2	10.3	12.3	1.73 (1.76)

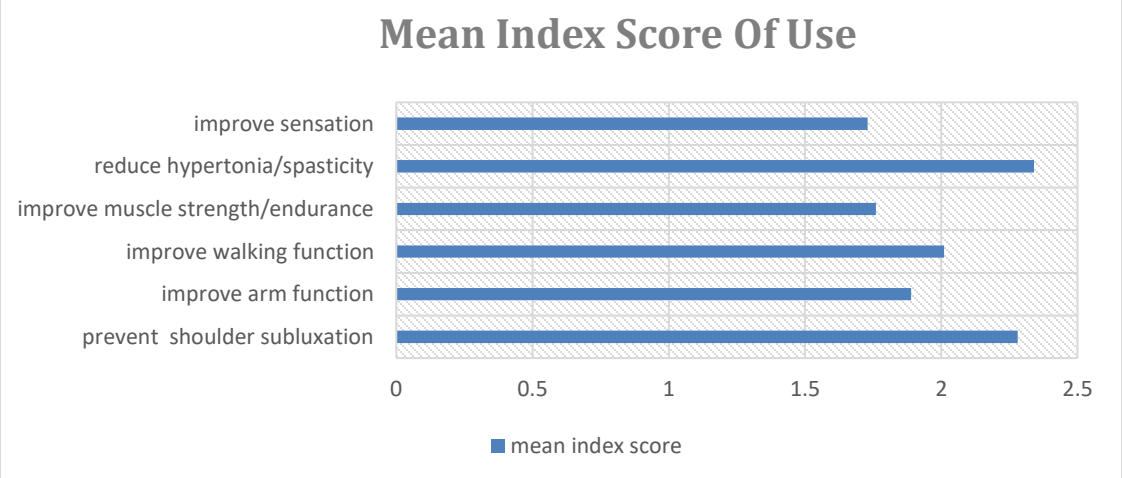


Figure 2: Mean Index Score of each therapeutic goals

Table 2: Knowledge of Evidence of Functional Electrical Stimulation among Physical Therapists

Strong Evidence That FES Can…	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Index Score Mean (SD)
Improve arm function after stroke	7.7%	57.9%	27.7%	2.6%	4.1%	0.63 (0.83)
Prevent shoulder subluxation after stroke	4.6%	39.5%	39.0%	12.8%	4.1%	0.28 (0.89)
Improve walking function after stroke	6.7%	51.8%	32.3%	5.1%	4.1%	0.52 (0.85)
Reduce hemiplegic shoulder pain after stroke	11.8%	47.2%	36.9%	3.1%	1.0%	0.66 (0.76)

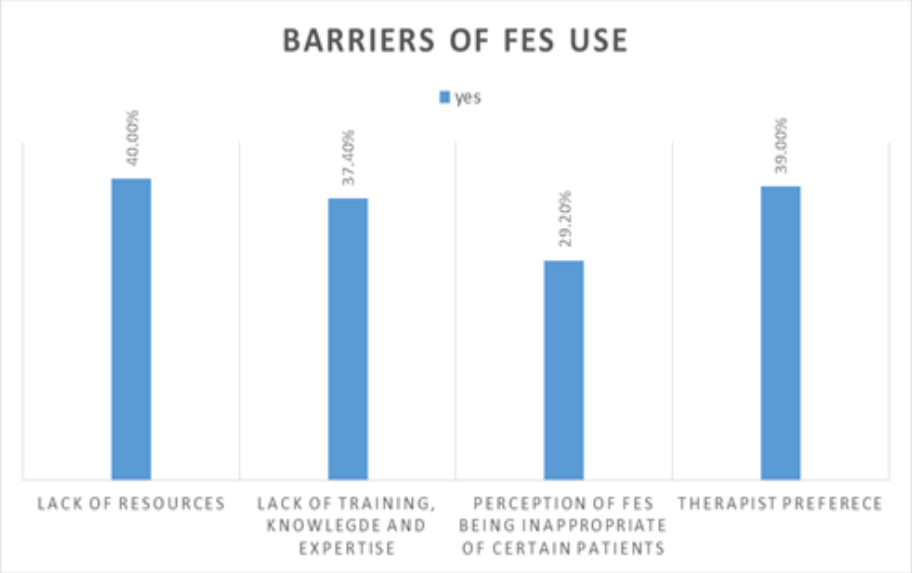
Approximately half of the respondents were aware regarding the strong evidence to support the use FES in stroke rehabilitation and in remaining half, ¾ of the respondents were unsure about the strong evidence. The total mean index score for overall knowledge was 2.09 + 3.33 on the scale of -8 to 8. The mean index score was positive for all 4 therapeutic goals, denotes that majority of the respondents were had knowledge about the clinical evidence and practice guidelines. (Table # 2).

The mean index score of use correlated with demographics, reported that moderately strong correlation found between mean index score of use and continuing education course in FES (p=0.004). Weaker correlation found between entry-level program (p=0.059) and primary area of practice orthopedic (p=0.09). Remaining variables did not show any significant correlation with index score of FES use: Age (0.457), gender (0.623), practice as a physical therapist (0.345), and years of practicing client with stroke (0.642).

The close-ended survey questions reported few barriers and facilitators that were common to the most of the participants (Figure #2). Issues that majority of the respondents seems it as a major barriers included: preference to use other treatment options (52.3%), clients are apprehensive about using FES (40.5%), and FES does

not benefit patients with chronic stroke (31.8%). Most prominent facilitators reported by respondents were accessibility of FES (63.6%), knowledge about application of FES (68.8%), and practical hands on training would increase the use of FES (53.8%). Approximately, half of the respondents would like to increase the use of FES in their clinical practice.

Another two closed ended questions allowed respondents to clearly identifies what themes of barriers and facilitators impede or facilitates the use of FES most. (figure #3). Majority of the respondents reports comfortable and confident in applying FES (40.5%) and identifying therapeutic goals (46.2%) are the clear facilitators themes. Most marked barriers theme were lack of resources (40%) and therapist own preference to not use (39%).



Figure#3: Themes of Barriers and Facilitators. Respondents respond to close ended questions. Multiple themes were listed. Respondents were asked whether it is a facilitator/barrier or not.

Discussion

We collected data form 195 physical therapist to determine the use and knowledge of FES in stroke rehabilitation. Our results showed that majority of the physical therapist frequently use FES for all 6 therapeutic goals, by realizing the guidelines supported the use of FES. Furthermore, FES use was low for improve walking performance (e.g. gait training). We also found that majority of physical therapists were aware of the high-quality evidence and best practice guidelines but still notable proportion were still unaware of the evidence and guidelines for FES use in stroke rehabilitation. Hypothesis regarding barriers and facilitators supported the use of FES for stroke rehabilitation. Accessibility of resources was most cited facilitator or barrier in the use of FES.

We found moderately strong correlation between continuing education course and FES use. Interestingly, approximately 50% of the physical therapist would like to increase the use of FES in their clinical practice.

FES use and age, gender, neurological area of practicing and year of working as physical therapist or working with stroke patients. Previous study showed that physical therapist involved in stroke rehabilitation and less likely to focus on this area of practice, only 22% of physical therapist reports being primarily engaged in neurological area of practice, which shows in our results also that most of the physical therapists were engaged in multiple area of practice which affects the use and knowledge. Specialization could make it easier to stay update with current best practice guidelines.

Prior work showed that advance technology usage was common is younger clinicians who recently graduated from university. However, results of our study showed similar trends. Moreover, physical therapists acknowledge the significance of scientific evidence for clinical judgement. We found in our study that many of the physical therapists were aware about the evidence supporting the use of FES. Earlier research showed the FES was not widely used in reducing hemiplegic shoulder pain but our results did not show similar trends. In our study FES is widely used by reducing hemiplegic shoulder pain.

The reported barriers and facilitator were not surprising. Past studies also reports similar impeding and facilitating factors such as some barriers were lack of resources, time and therapist preference, and facilitators were knowledge and confidence in the application of FES. Same as in our study reports barriers and facilitators.

This study also emphasized that typical passive approaches to knowledge translation that increases awareness, but not the use of research results. The gap between awareness and use closed by initiating training programs, community practice approaches, and solving the issues that causes hindrance in practice of modern technologies.

Conclusion

It is concluded that FES is widely used by majority of the physical therapists in stroke rehabilitation. Approximately half of the physical therapists have access to FES device and they would like to increase the use of FES in their health care settings. Most of the physical therapist believes that FES is time efficient and user friendly, which facilitates the use of FES in stroke rehabilitation. Majority of the physical therapist have sufficient training in FES but one fourth of the respondent continuing education in FES which fluctuates the use of FES in different health care settings.

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Conflict of Interest: The authors declare no conflict of interest.

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