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CLINICAL REABILITATION OF UPPER LIMB IN CHRONIC STROKE IN PORTUGAL – A CROSS SECTIONAL SURVEY

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ABSTRACT

Background: More than 77% of stroke survivors have upper limb dysfunction. The scientific evidence for interventions in upper limb rehabilitation in stroke has shown variable results. To improve health care treatments in this domain it is needed to know what modalities are actually being used by physiotherapists.

Methods: A national web-based survey focused in characterizing the profile of Portuguese physiotherapists working in post-stroke upper limb rehabilitation was conducted in 237 health institutions (n= 462 physiotherapists). The recruitment was conducted from August to December 2014. Analytic and descriptive analysis were used.

Results: A total of 179 physiotherapists from 64 different locations from Portugal answered the survey, with a rate of response of 38.7%. The average age of respondents was 29.25±6.4 years old and predominantly finished the graduation or bachelor degree between 2001 and 2010. More than half hadn't carried out any specialization in neurologic rehabilitation area. The top 5 modalities most used in the rehabilitation of upper limb in acute stroke are Goal Oriented Tasks (93.4% n=141), Motor Learning (89.4% n=135), Passive Mobilization (88.7% n=134), Task Repetition (87.4% n=132) and Bobath/Neurodevelopmental Therapy (86.9% n=131).

Conclusions: The main modalities used for physiotherapists in upper limb rehabilitation in acute stroke have sparse levels of evidence. It is important to alert teachers, formers, physiotherapists and students for interventions with supported scientific results.

Keywords: Upper Limb Rehabilitation, Physiotherapy, Survey, Portugal

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INTRODUCTION

Stroke incidence in Portugal was about 207.3/100 000 patients/year in 2012 [1]. The mortality due to a stroke decreased between 1990 and 2010 [2], but Portugal has one of the highest Disability-Adjusted Life Years due to cerebrovascular diseases among western European countries [3]. About 77% of patients with an acute stroke will have motor impairments in the upper limb, and about 60% of those will not achieve all the functional movements at 6 months post-stroke [4,5]. (4) The Rehabilitation of Upper Limb Post-Stroke (RULPS) has been studied previously, showing interventions with sparse levels of evidence to regain function [6,7].

RULPS has shown to be a challenge to all health care providers, with a large portion of interventions resulting in poor outcomes on function [8]. In the last decades, efforts to develop new interventions were notable, through new technologies and by applying the new insights from neuroscience to practice. Still, evidences for all techniques and approaches are essential to do the best care for this population [9].

Physiotherapy was officially recognized in Portugal in 1966, when the first certified school opened [10]. In the last three decades, schools graduating physiotherapists have increased exponentially, all teaching a lot of different techniques and approaches to students of physiotherapy. Stroke rehabilitation centers have variable models of organization, and models of work. This can help to lead to practices too different between partners of same occupation. Of course, if the level of evidence supporting different approaches to the same goal is equal, that should be acceptable [11]. Despite this, evidence-based practice has been well accepted as one of the most important factors that should influence the therapeutic choice for physiotherapists, rather than anecdotal testimonials or opinion-based practices [12]. Nevertheless, no studies were found about the state of art of physiotherapist's current practice in the field of neurological rehabilitation.

To establish patterns of work and professionals methods, this study is based on a survey trying to obtain information about what physiotherapists do in Portugal to one same problem.

The main objective of this study is to characterize the profile of Portuguese physiotherapists working in RULPS in chronic populations.

METHODS

Study Design

A cross-sectional study was used through data collected via an online self-administered questionnaire.

Participants

The sample in this study was physiotherapists working in stroke rehabilitation at Hospitals and Health Centers in Portugal. It was not possible to calculate the sample size due to the impossibility to know how many physiotherapists work in this field of rehabilitation in Portugal. The

study was approved by the Commission of Ethics of the Hospital Pedro-Hispano.

Instrument

It was not found any valid instrument for this propose in literature. This pioneer study in neurologic physiotherapy in Portugal was based in an original questionnaire based on similar surveys [13,14], developed using the online software tool *esurv*. The questionnaire is available to consultation upon request to the author of this study. This questionnaire aimed to get 4 types of information from the physiotherapists involved: Personal and professional profile of physiotherapists who work in rehabilitation, post stroke users rehabilitation procedures in acute stroke (< 6 months post-stroke); rehabilitation procedures in chronic stroke (> 6 months post-stroke); goals and beliefs in rehabilitation. In this article we will only discuss the profile of physiotherapist and rehabilitation procedures in chronic stroke. There was a mixed type of questions (open- and closed-questions, along with 5 point Likert scale). For this purpose, the first 12 questions (open, closed and with 5 point Likert Scale) were used to obtain the professional and personal profile. To collect information about physiotherapy sessions for RULPS in chronic stage consider the questions 25 to 36 (open and closed). For specify the severity of stroke to intervention, it was defined as a moderate stroke patient. The face validity of the questionnaire was established through a panel of 4 experts in neurologic physiotherapy (2 physiotherapists working over 10 years in neurological rehabilitation field and 2 physiotherapists who are academic instructors post-graduated in the neurological rehabilitation field) plus one academic instructor not related to the stroke rehabilitation area. Prior to disseminating the survey online, it was asked to 10 physiotherapists to read and fill the questionnaire till the end, temporizing it and registering possible changes to make the interpretation of questions easier. The questionnaire required about 12-15 minutes to be completed.

Procedure

Data collection from the questionnaires took place from August 2014 to December 2014. At March 2014 was asked to the Central Administration of the Health System of Portugal a list of contacts of all Health Units and Hospitals. Then, an email explaining the study was sent to all institutions in August 2014, inviting them to participate in the study. In the same email was asked how many physiotherapists were working in stroke rehabilitation, in that institution. After receiving that information, a second email would be sent to share a link through the suitable physiotherapists. In October 2014, the same procedure was performed to all institutions who didn't answer the email. In December 2014, all institutions remaining without any response were contacted by phone by the researcher.

Data Analyses

All data was analyzed through PASW Statistics 22. Descriptive and analytical statistics were applied. Frequency, relative frequency, cumulative frequency and mean were

calculated for descriptive data analyses.

RESULTS

There were contacted 237 institutions. One hundred and twenty-eight responded to the first email. The survey link was sent to 462 physiotherapists working with patients with stroke. This is the number of physiotherapists referred by the institution that worked with stroke patients. A total of 179 physiotherapists working in 64 different locations of Portugal Continental answered the survey, giving an approximate rate of response of 38.7%. Of these, 21 didn't work with chronic patients. There was 1 questionnaire excluded because the respondent didn't work with stroke patients, performing a total of 157 questionnaires for statistical analysis. All information of data collection is shown in more detail in the flowchart present in figure 1.

Figure 1: Flowchart of data collection

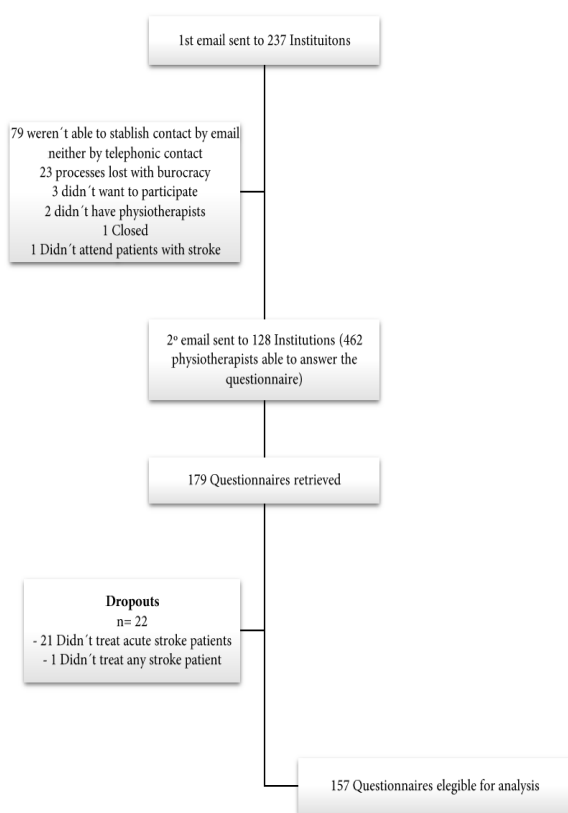


Table 1 presents the basics characteristics for the whole sample. More than a half (61.1%) didn't perform any specific postgraduate course in stroke rehabilitation, but about 70% of participants made training in Bobath. In Figure 2 we can see the distribution of respondents by age.

Table 1: Socio-Demographic data

Socio-Demographic Data	
Age (years) (n=157)	≈29.25 ± 6.45
Academic Degree (n=157)	
<i>Bacharel</i>	3.8% (n=6)
<i>Licenciature</i>	89.8% (n=141)
<i>Master</i>	6.4% (n=10)
<i>Doctor</i>	0% (n=0)

Year of Graduation (n=154)	
<i>1981-1990</i>	3,2% (n=5)
<i>1991-2000</i>	4.5% (n=7)
<i>2001-2010</i>	64.3% (n=99)
<i>2011-2015</i>	27.9% (n=43)
Work Sector (n=157)	
<i>Public</i>	24.8% (n=39)
<i>Private</i>	67.5% (n=106)
<i>Social</i>	19.7% (n=31)
<i>Private and Social</i>	6.4% (n=10)
<i>Public and Private</i>	10.8% (n= 17)
<i>Public, Private and Social</i>	0.6% (n=1)
How many years treat patients with stroke (years) (n=157)	≈6.28 ± 5.97
Post-formation related to stroke rehabilitation (n=157)	
<i>Yes</i>	61 (36.7%)
<i>No</i>	96 (61.1%)

Figure 2: Distribution of physiotherapists by age (n=157)

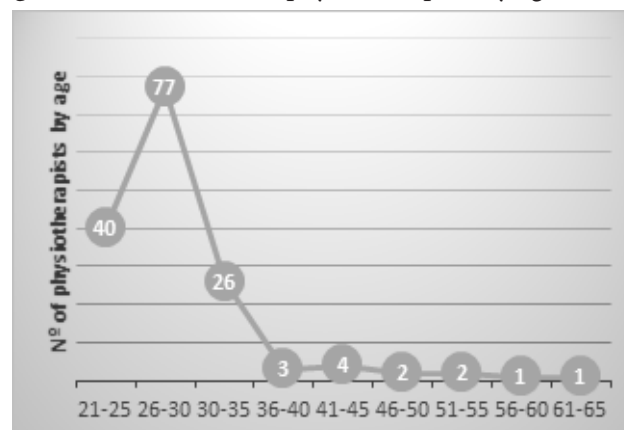


Table 2: Physiotherapists profile

	%	n
Perception of preparation for stroke rehabilitation		
Very Bad	0	0/157
Bad	0.6	1/157
Enough	42.7	67/157
God	52.2	82/157
Very Good	4.5	7/157
Articles read in last 3 years of stroke rehabilitation		
0 articles	0	0/157
0-5 articles	26.7	42/157
6-10 articles	31.8	50/157
11-15 articles	16.6	26/157
+15 articles	24.8	39/157

<i>Proximity of goals of rehabilitation with patient (1-5 ; 1 Not close at all, 5 Very close)</i>		
1	0	0/157
2	2	3/157
3	30	47/157
4	57.3	90/157
5	10.8	17/157
<i>Suitability of her/his practice (1-5 ; 1 Not suitable at all, 5 Very suitable)</i>		
1	0	0/157
2	0.6	1/157
3	40	63/157
4	54.1	85/157
5	5.1	8/157

Table 2 describes the professional profile of respondents. Almost 94.9% of them referred to feel sufficiently prepared or well prepared to treat patients with stroke. All participants read at least one article related to stroke rehabilitation in the last 3 years, being the interval 6-10 articles the dominant. Similar response patterns can be seen in the proximity of therapeutic goals with the patient and suitability of their intervention regarding the current scientific knowledge, with participants mainly answering grade 4 or 5. In this question it was also asked what main barriers could exist if they percept their suitability as low. The given reasons were lack of time, cost of postgraduate courses, lack of experience, lack of more physiotherapists to participate in the rehabilitation process of one patient, division of patients with other therapists from other professions, lack of material, obligation to comply physiatrist prescription, high number of patients to treat, recognition of the profession, space suitability or poor potential to recover.

In Table 3 is expressed the average duration of treatments, week frequency and the total of different patients treated in a week related to rehabilitation of stroke patients.

Table 3: Characteristics of sessions spent with chronic stroke patients

	<i>Time spent per session (minutes) n=149</i>	<i>Number of sessions per patient/week (days) n=150</i>	<i>Number of different patients/week (days) n=152</i>
Average	52.7 ± 21.5	3.64 ± 1.24	7.70 ± 7.89
Minimum	10	1	1
Maximum	180	7	60

Figures 3 and 4 show the rationale used for RULPS and the amount of active, passive and educational time used in sessions of treatment.

Figure 3: Rationale for intervention in chronic stroke patients (n=149)



Figure 4: Type of modalities used to improve function of upper limb in chronic stroke (n=148)

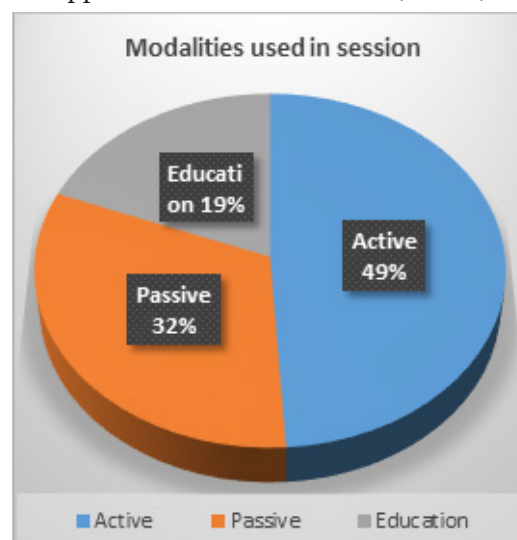


Table 4 shows the current use of several modalities. There is also data about which modalities they'd use if they had more time, material or knowledge. The level of agreement about using that modality to gain function in RULPS is also mentioned.

Table 4: Distribution of therapeutic modalities used in physiotherapy sessions for RULPS

	n=151		
	Use in current practice	Would use if could to	Agreement to use
<i>Methods/Concepts</i>			
Bobath/Neurodevelopmental Therapy	86.8%	6.6%	93.4%
PNF/Brunnstrom	82.1%	3.3%	85.4%
Margaret Jonhstone	24.5%	25.8%	50.3%
Motor Learning	89.4%	0.0%	89.4%
Carr & Shepperd	19.9%	25.2%	45.1%

Thermal Modalities			
Ice packs	44.4%	6.6%	51%
Hot packs	74.2%	6.0%	80.2%
Electrotherapy			
Ultrasound	39.1%	10.6%	49.7%
Neuromuscular Electrical Stimulation (NMES)	39.7%	12.6%	52.3%
Functional Electrical Stimulation (FES)	24.5%	15.2%	39.7%
Transcutaneous Electrical Neuromuscular Stimulation (TENS)	62.3%	7.3%	69.6%
Transcranial magnetic stimulation (TMS)	6%	21.2%	27.2%
Electromyography/Bio-feedback	2.6%	44.4%	47%
Movement Therapy			
Task Repetition	87.4%	2%	89.4%
Constraint-Induced Movement Therapy	37.1%	16.6%	53.7%
Goal-Oriented Tasks	93.4%	0,7%	94.1%
Trunk Restraint	40.4%	10.6%	51%
Strengthening Exercises	81.5%	1.3%	82.8%
Aerobic Exercise	67.5%	2%	69.7%
Hydrotherapy	13.2%	47%	60.2%
Manual Therapy			
Massage	71.5%	4%	75.5%
Passive Joint Mobilization	88.7%	11.3%	100%
Manipulation	27.2%	17.9%	45%
Sensory Training	64.9%	6.6%	71.5%
Vibration	15.9%	22.5%	38.4%
Mental Therapy			
Motor Imagination	39.7%	17.9%	57.6%
Mirror Therapy	55%	16.6%	71.5%
Virtual Reality	4.6%	37.1%	41.7%
Robotics	0.7%	37.7%	38.4%
Phototherapy/Laser	13.2%	15.9%	29.1%
Orthosis/Slings	58.3%	9.9%	68,2%
Neuromuscular Bands	43%	21.2%	64.2%
Education	79.5%	3.3%	82.8%

The top 5 modalities most used in the RULPS are Goal Oriented Tasks (93.4% n=141), Motor Learning (89.4% n=135), Passive Mobilization (88.7% n=134), Task Repetition (87.4% n=132) and Bobath/Neurodevelopmental Therapy (86.9% n=131). There weren't found two identical sessions of treatment for RULPS for chronic stroke in all 151 answers. The 5 most wanted modalities were Hydrotherapy (47% n=71), EMG/BF (44.4% n=67), Robotics (37.7% n=57), Virtual Reality (37.1% n=56), and Margaret Jonhstone (25.8% n=39). If all modalities were available, and assuming that the physiotherapist that responded

to use a certain modality wanted to, the top 5 modalities performed in general practice would be Passive Mobilization (100% n=151), Goal Oriented Tasks (94.1% n=142), Bobath/Neurodevelopmental Therapy (93.4% n=141) and Motor Learning and Task Repetition (89.4% n=135 each). There was an open field in the questionnaire where participants were able to write more modalities that they use in their practice. In this field, 1 participant referred Busquets, 1 participant referred Magnetotherapy, 1 participant referred Accessory Mobilization, 1 participant referred Mulligan and 1 participant referred Treadmill with Weight-Bearing Support.

DISCUSSION

These data suggest the existence of a young population of physiotherapists in Portugal who work in rehabilitation of post-stroke chronic stages. It was found in this study a variety of methods and combinations used by physiotherapists for the same purpose. This may be due to lack of knowledge of the best techniques to use, policies of institutions, specific characteristics of patient or a combination of these factors. It's important to mention that it was not given a specific case of a patient with chronic stroke to recover upper limb with special features to choose the best therapeutic options, instead, the request was to identify which clinic options he/she usually uses or would use in clinical practice with the goal of improve function in such patients.

Physiotherapist sample characteristics

In this study only were admitted physiotherapists working at Hospitals and Health Units. A young population of physiotherapists prevail in this neurological rehabilitation field, counting more than half having less than 5 years of experience. One survey in Deutschland found an average age of physiotherapists working with stroke of 40.8 years and 17.8 years of employment as physiotherapist, versus 29.25 and 6.28 years in this study, respectively [15]. In another study from UK, all of inquired physiotherapists working with stroke patients made postgraduate courses, with 55% on Bobath Concept [16]. In this study, about 61% didn't have any postgraduate course related to the neurological field.

Despite this, in general, it seems that Portuguese physiotherapist's think they're performing good methods and interventions to their patients, with their goals close to the patient's goals. This is interesting. It's known that the primary goal to patients post stroke is to recover gait, followed by hand and cognition [17]. It is beyond of scope of this article to explore the following idea, but it is also known that rehabilitation in acute time post-stroke can compromise long term results of function [18]. It would be important to understand if, associated to the complexity of recovering the cortico-spinal tract for hand function, the lack of investment of physiotherapist and patient, when defining primary goals, could boost those poor results in upper limb recovery.

Characteristics of therapeutic sessions in RULPS

It seems that physiotherapist's value more their person-

al experience rather than scientific evidences, theory fundamentals and patients preferences. In fact, the most unimportant item was the patient's preference. Studies highlighted the need for the patient-centered goal-setting practice in stroke rehabilitation [19, 20]. Although this sample referred to have similar goals with their patients, the patient's preference was the part less taken into account to intervention. A systematic review shows some barriers that prevent this practice in stroke and can try to explain this incongruence [20].

Another conclusion of this study was that almost half of the time of the therapeutic session was spent using active modalities. One systematic review found that no neurophysiological intervention over musculoskeletal intervention (passive or active) was superior in term of motor function gains [21].

Intervention Modalities

Several systematic reviews aimed to achieve the best treatments for the rehabilitation of upper limb post-stroke [6,22, 23]. Of course we have to take into account that for this study it was not selected specific areas of stroke, neither specifies age, existence of pain or relapse of stroke.

It was beyond of scope of this study to know the purposes of the modalities applications, but it seems that physiotherapists in this study preferred to use a mixed model of interventions than a few or isolated techniques. Of course, some of this techniques can overlap, like strengthening and PNF for example. In one survey in UK, 67% of physiotherapists also agree to use different techniques regarding a combination of principles [16]. One systematic review from Cochrane released in 2014 for interventions for RULPS found therapies with moderate-quality evidence were Constraint Induced Movement Therapy, Repetitive Task Training, Mental Imagery, Mirror Therapy, Intervention for Sensory Impairment and Virtual Reality [6]. Despite this systematic review includes all chronicity stages of stroke, it was the most appropriate to discuss the results of this study, according to its purpose. Constraint Induced Movement Therapy is an inexpensive therapy that has been wide studied in rehabilitation of motor function in upper limb, showing supported results for chronic stages of stroke [23-26]. This approach isn't found in priority options of Portuguese physiotherapists, neither in their current practice nor if they could use it. This findings are pretty much similar to studies done in UK and Kansas [13,27]. Mental therapies are probably poorly known by Portuguese physiotherapists. Virtual Reality has been reported to be a promising intervention for upper limb function after stroke, as well as Motor Imagination and Mirror Therapy [28-31]. All this interventions were referred to have a fair degree of evidence to use in practice, but they were not reported on the top rated modalities of this study, although Virtual Reality was one of the most wished therapies to put in practice if they could to. One review of literature performed a model for intervention taking into consideration the time post-stroke and the degree of severity [22].

The authors of that study, for moderate stroke impairment, suggested Functional Training and Constraint-Induced movement therapy or Functional rehabilitation training (in a virtual environment setting or with verbal feedback on the performance) plus Mental Imagery.

In this study, 4 of 5 of the most used modalities can be related to Functional Training, like Goal Oriented Tasks, Motor Learning, Task Repetition and Bobath/Neurodevelopmental Therapy.

The effects of Passive Range of Motion are poorly known and need robust studies to its practice, although being the third most reported modality used [32]. The hydrotherapy appears to be the most modality required by physiotherapists for RULPS, however, scientific information about its validity to regain motor function is downright scarce [33].

There are several evidences to argue that "stroke survivors should have the intensity and duration of clinically relevant therapy defined in their individualized rehabilitation plan and appropriate to their needs and tolerance levels", requiring the use most appropriate therapeutic modalities in each case [34]. However, this process requires specialized training, as reported in recent guidelines [35]. For the clinical practice of health professionals might be changed and improved, a Canadian study has shown that physiotherapists prefer in-person educational group approaches with opportunity to discuss case studies and improve their manual dexterity [36].

LIMITATIONS

There were some limitation in this study. Speaking of his own practice can be misleading, since it comes to subjective data about yourself [27]. Also, it was not possible to estimate how many therapists are actually working in Portugal with chronic strokes, so extrapolation of these findings is impossible to confirm. However, a comfortable number of respondents to do it was not possible to achieve due to difficulty in contact institutions. The results from such a few sample may not be a true indicator of practices across the country, even some results showed similarities with other surveys. It appeared that some modalities were probably referred to decrease pain if it was present, but pain was never mentioned in the questionnaire and the purpose was always referred to motor arm recovery.

CONCLUSIONS

State of art of health professions in countries are needed to know to improve health care services. The RULPS practiced by the sample of physiotherapists in this study included is diverse, with wide dispersion of modalities and combinations of procedures used in treatment sessions. Due to the youth of physiotherapists that work in this, it will be important investment in specialized training content, in order to standardize the practice of this profession. In light of the current scientific evidence, does not seem to exist interventions given as justifiably superior to others, limiting the selection criteria of certain modalities therapies over others. However, it is requires a constant updating of

treatments that may be more effective for the rehabilitation of certain conditions and, accordingly, there appears to be a lack of information and specialization, at least as regards the included sample in this study. There is an urgent need to establish guidelines to standardize the base training and specialization in physical therapy according to current scientific evidences to this practice in Portugal.

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