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## KNOWLEDGE AND PERCEPTIONS OF GREEK PHYSIOTHERAPISTS REGARDING THE FUNCTIONAL TESTS USED IN PATIENTS WITH POST-COVID-19 SYMPTOMATOLOGY

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### SUMMARY

*Aim:* To investigate the knowledge and attitudes of Greek physiotherapists regarding functional assessment tests used in the rehabilitation of post-COVID-19 patients.

*Methods:* Based on the literature, a specific 27-question questionnaire was designed and divided into 3 sections: a) sources of information about the management of patients with post-COVID-19 symptomatology, b) functional assessment tests most commonly used in clinical practice, c) willingness for further knowledge on performing functional tests. Inclusion criteria for completing the questionnaire were: a) physiotherapy profession, b) involvement with post-COVID-19 patients' treatment in the last year. The completion of the questionnaire was anonymous. It was shared in Google Forms format, via personal email invitations and public sharing on social media by all researchers, with republishing ability by each user. Sharing was conducted over two periods, lasting 16 and 13 days, respectively.

*Results:* The study included 82 physiotherapists (28 men and 54 women), 56.1% of whom were less than 39 years old and 50% had more than 10 years of professional experience. The main sources of information on rehabilitation in post-COVID-19 patients were journal publications (69.6%). Among the most well-known and frequently used tests were the six-minute walk test (85.4%), the one-minute sit-to-stand test (86.6%), and the timed up-and-go test (76.9%). A large percentage of physiotherapists used functional assessment tests before initiation (80.5%) and at the end (70.8%) of the treatment program. The 91.5% expressed the willingness for further education on practicing functional tests.

*Conclusions:* Greek physiotherapists get information from the recent literature and use well-known functional tests for assessing functional capacity in post-COVID-19 patients.

*Keywords:* functional assessment, 6-minute walk test, 1-minute sit-to-stand test, post-COVID-19, physiotherapy, knowledge, rehabilitation

## INTRODUCTION

In Europe, approximately 270 million people were infected with SARS-Cov-2 virus, and about 2% of them died after infection (Conor, 2023). The elderly and people with comorbidities are considered most vulnerable (Guan et al., 2020). The rate of hospitalization due to COVID-19 in people younger than 40 years of age, the rate is 0.4%, while for people older than 60 years of age the hospitalization rate is about 9.2% (Menachemi et al., 2021). In addition, severe disease, age, and the presence of comorbidities are also factors for incomplete recovery. Hospitalized patients recover at a slower rate than those who did not require hospitalization (Evans et al., 2021).

Of all patients infected with the virus, a percentage of 10-20% may experience persistent symptomatology after the initial infection, regardless of whether or not they were hospitalized (WHO, 2023). When this symptomatology lasts from 4 to 12 weeks, the syndrome is classified as post-COVID-19. When this symptomatology persists for more than 12 weeks or new symptoms appear, this syndrome is classified as Long-COVID-19 (Boutou et al., 2021). There are also cases where even in mild disease (without hospitalization) some patients have persistent symptoms that last for a long time, affecting their quality of life, their muscle strength, and their functionality in daily activities (Montes-Ibarra et al., 2022). The main symptoms reported by patients to remain 12 weeks after the disease are dyspnea and fatigue, at 60-71% and 60-87% respectively (WHO, 2023). These symptoms affect the physical function and quality of life of patients, who avoid carrying out daily activities due to fatigue (McFann et al., 2021).

Globally, scientific societies have published clinical guidelines on the rehabilitation of patients in each of the stages of the disease (Singh et al., 2020; Spruit et al., 2020). Physical therapists use various functional tests focusing on functional capacity, muscle strength, balance and activities of daily living to assess post-COVID-19 and Long-COVID-19 patients (Postigo-Martin et al., 2021). In a recent systematic review by Simonelli and colleagues (2021), appears that the most well-known functional assessment tests used in patients with COVID-19 disease are the 6-minute walk test (6MWT), the 1-minute sit-to-stand test (1-MSTS) and the Short Physical Performance Battery (SPPB). In parallel, to assess the physical performance on daily activities, physiotherapists use the Barthel Index and the Functional Independence Measure (FIM) scale (Pizarro-Pennarolli et al., 2021). These two scales are used to assess post-COVID-19 patients after discharge, at the beginning and at the end of a rehabilitation program.

To the best of our knowledge, there is no information whether Greek physiotherapists use functional assessment tests in the rehabilitation of post-COVID-19 and Long-COVID-19 patients. This study aimed to investigate whether Greek physiotherapists are familiar with the use of functional assessment tests in the rehabilitation of post-COVID-19 and Long-COVID-19 patients.

## METHODS

### *Participants*

A total of 89 participants agreed to participate in this observational study, of whom 82 met the inclusion criteria: a) possession of a bachelor's degree in physiotherapy and b) experience in treating post-COVID-19 patients. To participate, they were asked to sign an informed consent form, after being informed about the aims of the study, the confidentiality of their data, and the conditions of data processing. This observational study was conducted over two time periods with a total duration of one month. The first period was from 10/12/2021 to 26/12/2021 and the second from 2/1/2022 to 15/1/2022.

### *Study Design*

For the purpose of the research, a special questionnaire was designed with a total of 27 questions. At first, two physiotherapists (M.K. and A.M.) with clinical experience in managing patients with post-COVID-19 symptomatology, composed a 32-question questionnaire, for which the entire writing team agreed. The questionnaire was divided into 3 sections: a) sources of information and amount of involvement with post-COVID-19 patients, b) use of functional assessment tests for post-COVID-19 patients and, c) willingness for further education on practicing functional tests. Then, it was distributed to a convenience sample of 20 physical therapists to verify the questions' clarity and completeness. Questions with similar meanings were removed, minor editorial corrections were made, and ultimately, 27 questions remained for the final version of the questionnaire. The final questionnaire was shared digitally using Google Forms (digital questionnaire), through social media invitations and personal email invitations, ensuring both anonymity of responses and



automatic delivery to the researcher. To maximize the number of participants, multiple invitations were made on the same media.

### *Measurements*

Participants had access to the questionnaire by clicking on the available link. In order to continue to the content, they had to have previously not answered the questionnaire (e.g., the second completion period or a second time in the same completion period). When participants completed the questionnaire, they clicked submit to send the responses anonymously, which were automatically received by the research team.

### *Specific Questionnaire*

To create the specific questionnaire, an extensive review of the literature on the use of functional assessment tests in post-COVID-19 patients was conducted, as well as a search of all published clinical guidelines from scientific societies and institutions (up to October 2021). An initial 32-items questionnaire was developed by the research team and it was distributed to 20 physiotherapists with clinical (n=12) and private practice (n=8) experience with different study levels [bachelor (n=14), postgraduate degree (n=4) and PhD (n=2)] aiming to identify the clarity and relevance of each question to the aims of the study. In detail, each participant was asked verbally to judge whether each question was relevant to the aim of the study by answering yes or no (Stone et al., 1993). Thus, questions with similar meaning were removed and minor corrections were made for the final version of the questionnaire. The final version was divided into 3 main sections and an initial demographic section. The initial section (8 questions) addressed the demographic characteristics, educational level and work experience of the participants. The 1st section (8 questions) was related to their involvement with post-COVID-19 patients (number of patients per day) and sources of information (ways to find out about newer research data). The 2nd section (8 questions) was related to the most widely used functional tests used by Greek physiotherapists in clinical practice as a means of assessing post-COVID-19 patients. The 3rd section (3 questions) related to their willingness to participate in further training in the application of functional tests. The format of the answers was multiple choice, single choice, short answers. For those responses that

required scoring, the 5-point Likert scale (1-5) or 10-point (0-10) preference scale was used.

Data collection was done automatically by the Google Forms administration software. In the second questionnaire completion period, the software was set to automatically exclude those who went to complete the questionnaire a second time.

## DATA ANALYSIS

All the data received were processed using the Microsoft Excel and SPSS version 22 programs. The responses were categorized and divided based on the subsections of the questionnaire. The results were presented in quantitative and percentage (%).

## RESULTS

### *Participants' characteristics*

Of the total 89 participants, seven did not meet the inclusion criteria and they were excluded from the study. Thus, 82 physiotherapists, 28 males (34.2%) and 54 females (65.8%), made up the sample. The characteristics of the participants are presented in Table 1.

The 80.5% (n=66) of the participants had more than 2 years of professional experience, while half of them (n=41) had more than 10 years. They mainly used scientific articles, recent publications in scientific journals and the internet for their continuous information and updating (Table 2). Participants' sources of information are presented in Table 3.

**Table 1.** Participants' characteristics regarding gender, age, job position, and educational level (n=82).

<b>Characteristics</b>	<b>Number (n)</b>	<b>% percentage</b>
Men/Women	28/54	34.2/65.8
<b>Age (years)</b>		
<30	27	32.9
30-39	19	23.2
40-49	20	24.4
>50	16	19.5
<b>Position at work</b>		
Intensive care unit	19	23.1
Public Hospital	32	39.1
Private physiotherapy clinic	8	9.8
Rehabilitation centre	17	20.7
Home visits / Freelance	4	4.9
Doctoral candidate	2	2.4
<b>Educational level</b>		
Bachelor's degree	46	56.1
Postgraduate degree	32	39
Doctoral degree	4	4.9
<b>Additional education</b>		
Yes/No	61/21	74.4/25.6
Seminars/Conferences per year (number)		
Up to 2	54	65.8
Up to 4	18	22
> 5	10	12.2

Values are presented as number of participants (n) and % percentage.

**Table 2.** Professional experience and sources of information (before and after the COVID-19 pandemic) for all participants (n=82).

<b>Characteristics</b>	<b>Population (n)</b>	<b>percentage %</b>
<b>Professional experience (years)</b>		
<2	16	19.5
2-5	18	22
5-10	7	8.5
>10	41	50
<b>Sources of information (before the pandemic)*</b>		
Scientific articles	54	65.9
Internet	49	59.8
Scientific journals	33	40.3
Books	30	36.5
<b>Sources of information (post-pandemic)*</b>		
Recent publications in scientific journals	57	69.6
Scientific meetings via internet	34	41.4
Books	18	22

Values are presented as number of participants (n) and % percentage.

**Table 3.** Usual informing before and after the COVID-19 pandemic for all participants (n=82).

<b>You used to be informed from...</b>	<b>None</b>	<b>Few</b>	<b>Partially</b>	<b>Mostly</b>	<b>Completely</b>
<b>Before COVID-19</b>					
Scientific articles	9 (10.9%)	14 (17.1%)	24 (29.3%)	21 (25.6%)	14 (17.1%)
Internet	6 (7.3%)	12 (14.6%)	14 (17.1%)	30 (36.6%)	20 (24.4%)
Books	10 (12.2%)	23 (28%)	18 (22%)	23 (28%)	8 (9.8%)
<b>After COVID-19</b>					
Scientific articles	2 (2.4%)	11 (13.4%)	10 (12.2%)	30 (36.6%)	29 (35.4%)
Scientific meetings via internet	9 (10.9%)	15 (18.4%)	23 (28%)	17 (20.7%)	18 (22%)
Books	24 (29.3%)	20 (24.4%)	19 (23.1%)	11 (13.4%)	8 (9.8%)

Values are presented as the number of answers (n) and % percentage of all participants.

#### *Patient involvement and functional assessment of post-Covid-19 patients*

The majority of participants treated 3 to 5 post-COVID-19 patients per day. A high percentage of physiotherapists (84.7%) took complete history before starting the treatment program. The 59.8% (n=49) believed that patients needed more attention compared to other patient categories. Table 4 presents the engagement of the sample with the COVID-19 participants.

**Table 4.** Information on engagement with post-COVID-19 and long-COVID-19 patients (n=82).

<b>Characteristics</b>	<b>Number (n)</b>	<b>Percentage (%)</b>
<b>Working period (months)</b>		
Up to 3	33	40.2
3-5	18	22
>6	31	37.8
<b>Post-COVID-19 patients per day (number)</b>		
<5	57	69.5
5-9	13	15.9
>10	12	14.6
<b>Long-COVID-19 patients per day (number)</b>		
<5	67	81.7
5-9	8	9.8
>10	7	8.5

Values are presented as number of participants (n) and % percentage.

The most well-known functional tests were the 6MWT, the 1-MSTS, and the TUG (Table 5). The 6-minute walk test was most commonly used. A total of 80.5% of participants used the functional tests at baseline assessment, and 70.8% at reassessment. Twelve physiotherapists (14.6%) reported that they did not use functional tests at all in the assessment of their patients. The 73 (89%) of the participants reported that functional testing did not consume time at the expense of treatment while improving the quality of the treatment program [mean (SD) 8.67 (1.54)]. The majority of physiotherapists (91.5%) reported that they would like to be trained to use functional testing correctly in clinical practice.

**Table 5.** Functional assessment tests of patients with post-COVID-19 used by the physiotherapists (n = 82).

<b>Functional Test</b>	<b>Population (n)</b>	<b>% percentage</b>
<b><i>Commonly used functional tests*</i></b>		
1-MSTS	71	86.6
6MWT	70	85.4
TUG	63	76.9
2MST	45	54.9
Barthel Index	39	47.6
SPPB	20	24.4
<b><i>Frequency of use of functional tests*</i></b>		
6MWT	42	51.2
1-MSTS	40	48.8
TUG	33	40.3
Barthel Index	18	22
2MST	17	20.7
SPPB	9	11

Values are presented as number of participants (n) and % percentage? 1-MSTS: 1-minute Sit-to-Stand test; 6MWT: 6-minute Walk Test; TUG: Timed Up and Go test; 2MST: 2-Minute Step Test; SPPB: Short Physical Performance Battery.

## DISCUSSION

This study was the first attempt to investigate the knowledge of functional tests that used by Greek physiotherapists for the evaluation of patients with post-COVID-19 symptoms. According to the responses, among the most well-known and applicable functional tests were the 1-MSTS, the 6MWT, and the TUG. The less applicable functional test by Greek physiotherapists was the SPPB.

According to a mapping review by Simonelli et al. (2021), the most well-known and widely-used assessment tools in post-COVID-19 patients are the Barthel

Index, the 6MWT, the SPPB, and the 1-MSTS. These tools are used either at hospital discharge or as part of a rehabilitation program for assessing COVID-19 patients' functional status. These tests simulate everyday activities, are inexpensive, and do not require specialized equipment to be performed. In the present study, the majority of the participants (69.5% and 81.7%) (Table 4) treated up to 5 post/long COVID-19 patients per day using MWT, 1-MSTS for the assessment of the functional capacity of those patients who proceeded at the special COVID-19 clinics or at private physiotherapy units. In addition, Greek physiotherapists seem to frequently use the TUG (Table 5), an easy and quick assessment test, which combines gait, leaning, and speed and provides information relevant to the limitations of patients after COVID-19 disease, even 3 months after discharge (Kowal et al., 2023).

Almost 80% of the total number of participants reported that they used functional tests as part of the assessment prior to entering a rehabilitation program. Postigo-Martin et al. proposed a model for early detection of post-COVID-19 sequelae to adopt therapeutic strategies by physiotherapists. This management model assesses cardiopulmonary, neurological, and musculoskeletal deficits. Therefore, taking the medical history and general assessment of the physical status (vital signs, symptoms, body composition, physical activity, etc.) are the key components for the subsequent physiotherapeutic assessment (Kortianou et al. 2022).

Sixty-six of those physiotherapists who took part in this study reported that they used functional tests at the initial assessment of a rehabilitation program, and 59 of them also used the test at the reassessment. According to Torres-Castro et al., functional capacity assessment is essential for assessing the effectiveness of a rehabilitation program, it should be performed at the beginning (between 8 and 12 weeks after hospital discharge) and at the end of the program. (Torres-Castro et al., 2023).

Interestingly, the vast majority of the participants express their willingness to further be trained in the implementation and the interpretation of the results of the functional tests they use. The lack of adequate knowledge and skills in performing functional tests has been reported by previous similar studies. In detail, an observational study by Spiegl et al (2022) demonstrated that 41.8% and 33% of the physiotherapists in South Austria reported a lack of experience and knowledge, respectively in the rehabilitation of post-COVID-19 patients. Similarly, in another study among



professional physiotherapists and final-year physiotherapy students, it was reported that only 11.2% of the participants (n=255) felt adequately trained in the rehabilitation of post-COVID-19 patients. The authors pointed out that there is an urgent need for further training of physiotherapists in the components of assessment and treatment of this patient population (Scheiber et al., 2021).

### *Research limitations*

The study has several limitations. Firstly, the study sample was small (n=82) and was not randomly selected, e.g., from lists of physiotherapists in the Panhellenic Association of Physiotherapists, indicating that it was not representative of the Greek physiotherapy community. Furthermore, the completion of the questionnaire by those physiotherapists who used to treat post-COVID-19 patients, possibly attracted only those who already knew and used the functional tests in their everyday clinical practice, while those who were not aware may probably avoided completing the questionnaire. The aforementioned limitations may bias the results and therefore, we cannot generalize the results to the general Greek physiotherapy professionals.

Finally, the questionnaire was created by the research team after reviewing the literature. It was not the product of a methodological procedure usually followed to strengthen the construct validity of a questionnaire (Jenn, 2006). However, the final questionnaire is the product of a study of the relevant literature and it was completed after previously being pilot-distributed to physiotherapists to investigate questions' clarity and validity (Stone et al., 1993)

This attempt was the first to investigate the knowledge and use of functional testing by Greek physiotherapists and, provides a rough picture immediately after the COVID-19 pandemic of how physiotherapists assessed this patient population prior to their inclusion in any therapeutic program.

### CONCLUSIONS

In conclusion, the evaluation of post-COVID-19 patients by Greek physiotherapists included the 1-MSTS, the 6MWT, and the TUG functional tests. The functional tests are mainly used either during the initial assessment or during reassessment. The majority of the participants express willingness to further improve their skills and knowledge on performing and interpreting the results of functional tests.