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ORIGINAL RESEARCH

Physical therapy performance in post-COVID-19 rehabilitation: knowledge and experience of physiotherapists

Atuação fisioterapêutica na reabilitação pós-COVID-19: conhecimento e experiência de fisioterapeutas

Actuación de la fisioterapia en la rehabilitación post-COVID-19: conocimientos y experiencia de los fisioterapeutas

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ABSTRACT | After the acute phase of COVID-19, many patients have persistent symptoms or develop sequelae, which leads them to seek physiotherapy rehabilitation services. Therefore, this study aimed to investigate the knowledge and experience of physiotherapists on the assessment and treatment of post-COVID-19 patients. The cross-sectional observational study was carried out with 73 physiotherapists using an online questionnaire about academic background, areas of expertise, knowledge about COVID-19, and knowledge and experience of assessment and treatment resources in post-COVID-19 rehabilitation, in addition to barriers to the care of these patients in the ambulatory care. Most physiotherapists had heard of post-COVID-19 syndrome, however, only 44% felt sufficiently informed about post-COVID-19 rehabilitation. There was a discrepancy between the degree of importance and experience with the frequency of use of assessment resources, especially the use of specific assessment instruments for skeletal muscle strength, mobility, and respiratory function, in addition to scales and questionnaires to assess disabilities, quality of life, and sleep quality. On the other hand, most reported the importance and had sufficient experience to treat post-COVID-19 patients using cheap and accessible resources. However, less than half use techniques related to respiratory muscle training and/or more sophisticated equipment. Thus, we conclude that most physiotherapists recognize the importance and report sufficient experience to assess and treat post-COVID-19 patients, however, there is a discrepancy between the assessment in the biopsychosocial context of the patient and the treatment process.

Keywords | Post-Acute COVID-19 Syndrome; Physical Therapy; Rehabilitation.

RESUMO | Após a fase aguda da COVID-19, muitos pacientes apresentam persistência de sintomas ou desenvolvem sequelas, o que os leva a procurar serviços de reabilitação fisioterapêutica. Sendo assim, o objetivo deste estudo foi investigar o conhecimento e a experiência

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de fisioterapeutas sobre a avaliação e tratamento de pacientes pós-COVID-19. O estudo observacional transversal foi realizado com 73 profissionais, por meio de um questionário online sobre formação acadêmica, áreas de atuação, conhecimento sobre a COVID-19 e experiência sobre recursos de avaliação e tratamento na reabilitação pós-COVID-19, além de barreiras para o atendimento desses pacientes no ambiente ambulatorial. A maioria dos fisioterapeutas já tinham ouvido falar da síndrome pós-COVID-19, no entanto, apenas 44% se sentiam suficientemente informados sobre a reabilitação pós-COVID-19. Houve uma discrepância entre o grau de importância e experiência e a frequência da utilização dos recursos de avaliação, principalmente o uso de instrumentos específicos de avaliação para força muscular esquelética, mobilidade e função respiratória, além de escalas e questionários para avaliar incapacidades, qualidade de vida e qualidade do sono. Em contrapartida, a maioria relatou a importância deste tratamento, alegando ter grau de experiência suficiente para tratar os pacientes pós-COVID-19 com a utilização de recursos baratos e acessíveis. Dessa forma, menos da metade dos profissionais realiza técnicas vinculadas ao treinamento muscular respiratório e/ou equipamentos mais sofisticados. Concluímos, então, que a maioria dos fisioterapeutas reconhece a importância do tratamento de pacientes pós-COVID-19 e relata uma experiência suficiente para avaliá-los e tratá-los, entretanto, há uma discrepância entre o processo de avaliação no contexto biopsicossocial do paciente e o processo de tratamento.

Descritores | Síndrome Pós-COVID-19 Aguda; Fisioterapia; Reabilitação.

RESUMEN | Terminada la fase aguda de la COVID-19, muchos pacientes presentan síntomas persistentes o desarrollan secuelas, lo que requiere servicios de rehabilitación fisioterapéutica. Ante esto, el objetivo de este estudio fue identificar los conocimientos y la experiencia de los fisioterapeutas respecto a la evaluación y el tratamiento de los pacientes post-COVID-19. Este estudio observacional transversal se llevó a cabo con 73 profesionales, mediante un cuestionario en línea sobre formación académica, áreas de actuación, conocimientos sobre la COVID-19 y experiencia con los recursos de evaluación y tratamiento en la rehabilitación post-COVID-19, además de las barreras para la atención de estos pacientes en el ámbito ambulatorio. Aunque la mayoría de los fisioterapeutas tenían algún conocimiento sobre el síndrome post-COVID-19, solamente el 44% de ellos se sentían suficientemente informados sobre la rehabilitación post-COVID-19. Se observa una discrepancia entre el grado de importancia y experiencia y la frecuencia de uso de los recursos de evaluación, especialmente el uso de herramientas de evaluación específicas para la fuerza muscular esquelética, la movilidad y la función respiratoria, además de escalas y cuestionarios para evaluar la discapacidad, la calidad de vida y la calidad del sueño. Por otro lado, la mayoría informó de la importancia de este tratamiento, afirmando tener experiencia suficiente para tratar a los pacientes post-COVID-19 utilizando recursos baratos y accesibles. Así, menos de la mitad de los profesionales utilizan técnicas vinculadas al entrenamiento de la musculatura respiratoria y/o equipos más sofisticados. Por lo tanto, se concluye que la mayoría de los fisioterapeutas reconocen la importancia de tratar a los pacientes post-COVID-19 y declaran tener experiencia suficiente para evaluarlos y tratarlos; sin embargo, hay una discrepancia entre el proceso de evaluación en el contexto biopsicosocial del paciente y el proceso de tratamiento.

Palabras clave | Síndrome post agudo de COVID-19; Fisioterapia; Rehabilitación.

INTRODUCTION

The impact of COVID-19 has caused numerous consequences for all countries and regions, due to its high level of transmissibility and serious health manifestations. In Brazil, the first confirmed case of the disease occurred on February 26, 2020, but studies show that the virus had already been circulating since the first week of February[1,2].

Clinical manifestations in symptomatic individuals during the acute phase of COVID-19 can vary between mild and severe cases. However, after the acute period of infection, some individuals experience the persistence of symptoms or the development of sequelae, which is classified in the study by Nalbandian et al.[3] as post-COVID-19 syndrome.

Post-COVID-19 syndrome occurs when clinical manifestations persist for more than four weeks after their onset, and is subdivided into: subacute period (4 to 12 weeks) and chronic period (beyond 12 weeks). Symptoms include: fatigue, arthralgia, dyspnea, worsening of quality of life, cough, muscle weakness, chest pain, dysosmia, dysgeusia, psychological disorders—such as depression and anxiety, cognitive disorders, and sleep disorders[3,4].

Thus, in addition to the hospital phase, there is a need for cardiopulmonary and neuromuscular rehabilitation, improving the quality of life of these patients[3-8].

However, as COVID-19 is a relatively new disease, physiotherapists must be aware of international and national recommendations on assessment and treatment methods to meet the demand of patients who may have various sequelae.

Among the international recommendations, in 2020 the European Respiratory Journal published a guide drawn up by experts from the European Respiratory Society (ERS), American Thoracic Society (ATS), and other relevant societies, suggesting provisional recommendations for rehabilitation in the in-hospital and post-hospital phases of COVID-19. Among the post-hospital recommendations is that the patient should undergo an assessment of the need for supplemental oxygen at rest and during exertion after hospital discharge, in addition to tests of physical function, respiratory function, and mental health[9].

In addition, the Brazilian Association of Cardiorespiratory Physical Therapy and Intensive Care Physical Therapy (ASSOBRAFIR) has drawn up recommendations on some assessment methods, with clinical tests and scales/questionnaires that can collect specific information about the patient's limitation, as a strategy to restore physical function and reintegrate the individual according to their particularity[5,10].

These guides aim to demonstrate that, with a targeted assessment for each clinical presentation, the physiotherapist will be able to design a post-COVID-19 rehabilitation program capable of meeting the individual needs and limitations of patients according to the sequelae acquired after the acute period of the disease[5,9,10]. Among some of the recommendations is the prescription of physiotherapeutic exercises found in the literature, which may include light intensity aerobic training with gradual increase and intermittent training for patients with severe fatigue, in addition to muscle strength training, with the aid of neuromuscular electrical stimulation, especially for those who require prolonged periods of disuse or immobilization, and body balance training, breathing exercises, and bronchial hygiene, if necessary, preferably in individual sessions[11-14].

However, even with the recommendations on physiotherapy in the assessment and treatment process in post-COVID-19 patients, many professionals do not modify their clinical practice for this population. This may be related to a lack of knowledge about the existence of guidelines and associations, non-participation in continuing education programs, not being able to access scientific articles and/or understand them, a lack of time and interest in implementing new care strategies, as well as a lack of experience and technical equipment in their work environment[8,15-17].

Thus, studies suggest that, in order to bridge the gap between the patient's needs and the professional's skills in the rehabilitation process, participation in continuing education programs is necessary to ensure the acquisition of scientific knowledge of high methodological quality, either to better understand the disease and its manifestations, or to learn about the diversity of valid and reliable assessment and treatment tools aimed at each clinical situation. As a result, there could be a reduction in risks, such as non-identification of the causal factor, consequences, and/or worsening of physical, functional, social, and emotional conditions, non-identification of the results obtained after treatment, as well as a reduced limitation on communication with other health professionals about the patient, making it possible for the patient to receive multidisciplinary treatment[18-21].

In Brazil, physiotherapists can work in public and private sectors at various levels of health care complexity[22], and post-COVID-19 patients can be in both, depending on their socioeconomic, physical/functional, and emotional status. Thus, when they seek care in these places, they need to be supported by a competent multi-professional team that meets their needs in an individualized and effective way.

In the multidisciplinary team, the role of the physiotherapist in cardiopulmonary and neuromuscular rehabilitation is of paramount importance. For this reason, they must be prepared to evaluate and design targeted exercise programs for each clinical presentation, based on post-COVID-19 evidence-based practice (EBP).

In this context, this study aimed to investigate the knowledge and experience of physiotherapists on the assessment and treatment of post-COVID-19 patients, as well as to analyze the barriers they face in their work environment.

METHODOLOGY

Study design

After reviewing the literature on the subject, we did not identify any instrument validated for Brazilian Portuguese that investigated the knowledge and experiences of physiotherapeutic rehabilitation of post-COVID-19 patients. We therefore constructed a questionnaire

based on the study by Scheiber et al.[18], with adjustments according to ASSOBRAFIR's recommendations, in order to bring them even closer to the reality of Brazilian physical therapists[5].

Once the questionnaire had been drawn up, it underwent content and semantic validation, according to the steps of the Delphi technique[23] to make the tool reliable and accurate before it was released.

Content validation was carried out by six independent expert judges (Physiotherapist Professors, with a minimum master's degree in the field)[24], who were invited via e-mail to revise the content of the questionnaire in three rounds in order to reach a "final" consensus by overcoming/eliminating divergences. In each round, the judges evaluated each item on a five-point Likert scale, according to their degree of agreement with the clarity, relevance, and appearance of each question, as well as spaces in which they entered their comments in full.

After the first round, the questionnaire had to undergo some modifications according to the judges' judgment, and it was sent back for the second round. At the end of the second round, each item showed a Content Validity index ≥0.78 and a total Content Validity index ≥0.90, and the third round was then held, with the final version delivered for approval[25].

Next, with the final version approved, the questionnaire underwent semantic validation (pre-test) with five physiotherapists, three of whom were not specialists in the cardiorespiratory area and two physiotherapists specialized in the cardiorespiratory area, with at least 5 years of experience. The evaluation of the questionnaire identified whether the instrument was understood by professionals with different levels of knowledge and skills to work in post-COVID-19 rehabilitation[26]. This analysis was carried out using scores from 1 to 5, in which all the items were assigned values of 4 or 5 by the physiotherapists, representing agreement with their construction, as well as with the type of scale and the understanding of each item.

Finally, the final questionnaire was completed with 73 questions divided into four sections. The first section presented the Free and Informed Consent Form (ICF) and, after agreeing to take part in the research, the physiotherapist had to answer three questions regarding the registration number with the Regional Council of Physical Therapy and Occupational Therapy (CREFITO), age, and sex. The second section was made up of eight questions regarding academic background and areas of practice in physiotherapy, then the third section was covered by four questions regarding specific prior knowledge about the clinical repercussions of COVID-19 and, finally, the fourth section was covered by questions regarding the degree of knowledge and experience of assessment and treatment resources in post-COVID-19 rehabilitation, in addition to barriers in the care of these patients in the work environment (totaling 58 questions).

The research was carried out online, using the google forms platform linked to the institutional account of the researchers responsible. The questionnaire in Portuguese can be consulted in the supplementary material (S1).

Research participants

The cross-sectional observational online survey was carried out with physiotherapists from December 2022 to April 2023. Participants were randomly recruited and included Brazilian physiotherapists who work in outpatient settings in the private and/or public sectors, regardless of sex, ethnicity, and social class. Those working exclusively in hospital settings and/or with unregulated professional registration with their region's CREFITO were excluded.

Invitations to take part in the survey were sent via digital media, such as WhatsApp, Facebook, and Instagram and, in order to employ a recruitment strategy based on the snowball effect, potential participants were encouraged to forward the survey link to other colleagues. The CREFITO of the 3rd region also supported the research by sharing the access link on its social networks.

Upon accessing the research link, the physical therapists were presented with the ICF and, after reading it, they had to select the option "I agree to take part in the survey" to actually participate in it, or the option "I do not agree to take part in the survey," without having to explain or justify their choice.

The content of the questions in the questionnaire could be viewed before making a decision. A link was also provided so that the participant could download the ICF and keep a copy of the document.

Next, the physiotherapists had to answer the questions in the other sections, regarding their academic background and areas in which they work in physiotherapists therapy, specific prior knowledge about the clinical repercussions of COVID-19, knowledge and experience of assessment and treatment resources in post-COVID-19 rehabilitation, as well as barriers to caring for these patients in the work environment. The estimated time taken to complete the questionnaire varied from 20 to 25 minutes.

Data analysis

Descriptive analysis was used to present the distribution of the results of the data collected, using the mean and standard deviation for quantitative variables, frequencies and percentages for categorical variables. The chi-square test was then applied to analyze the proportion of responses, when necessary. Data were analyzed using SPSS 22.0 software and the significance level was set at $p<0.05$.

RESULTS

A total of 80 physiotherapists were interviewed, seven of whom were excluded because they only worked only in a hospital environment. The final sample consisted of 73 physical therapists, with a mean age of 31.7±7.6 years and a mean work experience of 8.7±7.4 years. The baseline characteristics of the interviewees are shown in Table 1

Table 1. Characteristics of physiotherapists (n=73).

Parameter	Results
Age, in years	31.7 (7.6)
Female	57 (78)
Brazilian regions	
Southeast	64 (88)
South	3 (4)
Central-West	5 (7)
North	1 (1)
Time since graduation, in years	**8.7 (7.4)**
<5 years	**32 (44)**
≥5 years	**41 (56)**
Professional qualification	
Bachelor's degree	17 (23)
Postgraduate *lato sensu*	40 (55)
Postgraduate *stricto sensu*	16 (22)
Clinical specialty*	
Acupuncture	6 (8)
Aquatic Physical therapy	3 (4)
Cardiovascular Physical therapy	9 (12)
Dermato-functional Physical therapy	4 (5)
Sports Physical therapy	4 (5)
Physical therapy in Gerontology	6 (8)
Occupational Physical therapy	3 (4)
Neurofunctional Physical therapy	10 (14)
Physical therapy in Oncology	1 (1)
Respiratory Physical therapy	9 (12)
Traumato-Orthopedic Physical therapy	12 (16)
Physical therapy in Osteopathy	13 (18)
Physical therapy in Chiropractic	6 (8)
Physical therapy in Women's Health	4 (5)
Physical therapy in Intensive Care	16 (22)
Workplace (outpatient setting)*	
Health Center, Basic Health Units (UBS)	16 (22)
Private clinic	37 (51)
Health insurance clinic	10 (14)
Private home care	27 (37)
Home care by insurance plan	11 (15)
Work Regime	
Self-employed	43 (59)
CLT	11 (15)
Both	19 (26)
Qualification in COVID-19	**34 (47)**

Continues

Table 1. Continuation

Parameter	Results
Type of COVID-19 qualification*	
Virtual course	31 (42)
Face-to-face course	6 (8)
Reading articles and materials	25 (34)

Data expressed as frequency (%), except for the variables age and time since graduation, which were expressed as mean (standard deviation). *multiple possible answers.

Knowledge about COVID-19 in the health of individuals

The physical therapists were asked to indicate which body systems may be affected by the COVID-19 virus. All reported that the respiratory system is affected by the disease and more than 50% of the physical therapists indicated that the cardiovascular (n=72), musculoskeletal (n=66), nervous (n=57), and metabolic (n=55) systems are also impaired. In addition, 71 (97%) physical therapists have heard of post-COVID-19 syndrome.

Physical therapy in post-COVID-19 rehabilitation

Of the 73 physical therapists assessed, 55 (75%) believe that the number of post-COVID-19 patients will increase. In addition, 54 (74%) physical therapists care for or have cared for post-COVID-19 patients and, of these, 49 (67%) have provided face-to-face care and five (7%) have provided face-to-face care and telecare.

Knowledge of guidelines and/or associations

Among the 73 physical therapists, only 21 (29%) were aware of any guidelines and/or associations that provided information on recommendations for the rehabilitation of post-COVID-19 patients. However, 39 (53%) had heard of the recommendations for assessment and rehabilitation in post-COVID-19 patients drawn up by ASSOBRAFIR.

There was an association between physical therapists who had heard of ASSOBRAFIR's recommendations and their degree of experience in the respiratory ($p<0.0001$), cardiovascular ($p=0.001$), and neuromotor ($p=0.040$) areas.

Degree of experience in areas of physical therapy

All the physical therapists interviewed reported having some experience in musculoskeletal physical therapy (41% very good, 41% good, and 18% sufficient). The second most cited area was neuromotor, in which 92% reported having experience: very good (32%), good (37%), and sufficient (23%), but 8% reported insufficient experience.

In the area of cardiovascular physical therapy, 76% of physical therapists reported having very good (12%), good (23%), and sufficient (41%) experience. The area with the least degree of experience was respiratory, where 72% of physical therapists reported having very good (16%), good (33%), and sufficient (23%) experience. In both areas, there were reports of no experience (8% in cardiovascular and 8% in respiratory).

Degree of importance and experience in assessing post-COVID-19 patients

Figure 1 shows the degree of importance of assessing post-COVID-19 patients using clinical tests and scales/questionnaires for the participating physical therapists.

At least 81% of the physical therapists indicated that the assessment of fatigue and dyspnea (n=71), functionality and disabilities (n=70), exercise tolerance (n=69), peripheral muscle strength (n=69), quality of life (n=69), spirometry (n=67), body balance (n=67), maximal inspiratory muscle strength (n=66), mobility (n=66), maximal expiratory muscle strength (n=65), and sleep quality (n=59) are important for assessing post-COVID-19 patients (Figure 1A).

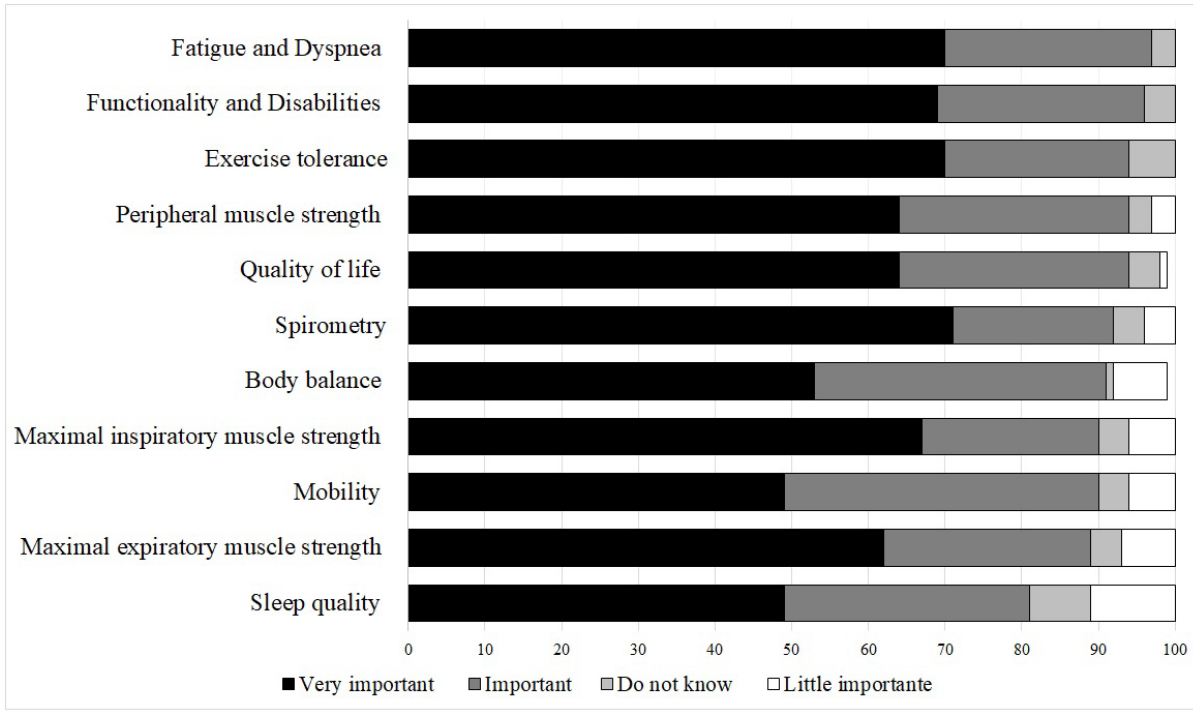
On the other hand, some physical therapists reported having insufficient or no experience in performing spirometry (42%, n=31), assessing sleep quality (33%, n=24), maximal expiratory muscle strength (26%, n=19), maximal inspiratory muscle strength (22%, n=16), fatigue and dyspnea (22%, n=16), and the exercise tolerance test (22%, n=16). For the other tests, at least sufficient experience was reported by more than 84% of the physical therapists (Figure 1B).

Table 2 shows the percentage of physiotherapists who reported using clinical tests and/or scales/questionnaires in their physical therapy evaluation. In total, 757 responses were mentioned by 73 physical therapists. Following the ASSOBRAFIR guidelines[5], we evaluated the responses in five categories for clinical trials and four categories for scales/questionnaires.

The clinical tests used by more than half of the physiotherapists were: pulse oximetry for respiratory assessment, the 1-minute sit-to-stand test, and the 6-minute walk test to assess exercise tolerance; in addition to the Berg balance scale to assess body balance. As for the questionnaires, only the Borg was used by 63% of the physiotherapists, whereas the others were used by less than 30% of the professionals.

Of the 73 physical therapists, 41 (56%) reported the possibility of using technical aids such as equipment and/or questionnaires to assess post-COVID-19 patients, however, 14 (34%) reported having no experience in applying these resources.

A



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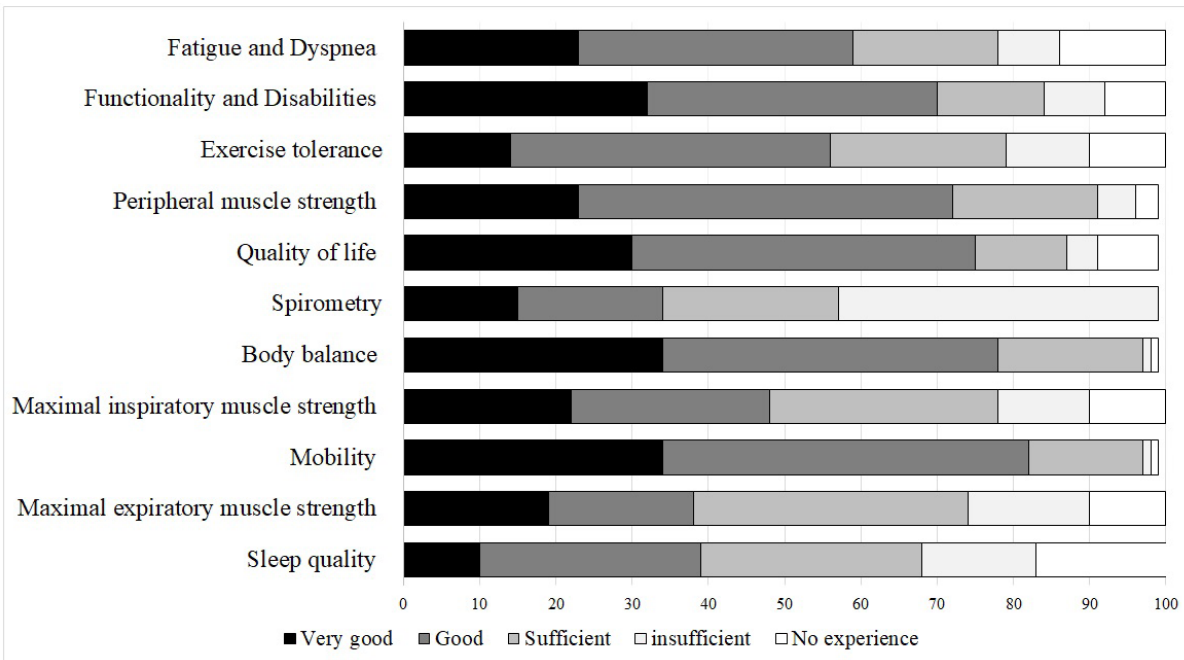

Figure 1. Physiotherapists' perception of the degree of importance of clinical tests and questionnaires in the physiotherapeutic evaluation of post-COVID-19 patients (A) and degree of experience in assessing physical and functional tests and questionnaires (B). Data expressed as percentage.

Table 2. Clinical tests and questionnaires used by physiotherapists in the assessment (n=73). Data expressed as percentage.

Clinical tests (categories)	n	%
Assessment of exercise tolerance		
1-minute sit-to-stand test	46	63
6-minute walk test	40	55
Step test	23	32
Shuttle walking test	4	5
Assessment of respiratory function		
Pulse oximeter	58	79
Spirometry	25	34
Manovacuometry	22	30
Peak expiratory flow	19	26
Vital capacity	14	19
Assessment of skeletal muscle strength		
1RM test	18	25
Medical Research Council (MRC) scale	15	21
Handgrip dynamometry	11	15
Load cell dynamometry	1	1
Isokinetic dynamometer	1	1
Balance assessment		
Berg balance scale	43	59
Tandem or semi-tandem gait	8	11
MiniBest test	5	7
Mobility assessment		
Timed up and go (TUG)	33	45
Gait speed test	23	32
Scales/Questionnaires	**n**	**%**
Assessment of dyspnea and fatigue symptoms		
Borg scale	46	63
mMRC	21	29
BDI and/or TDI	10	14
FACIT	5	7
Disability assessment		
WHODAS 2.0	15	21
IVCF-20	7	10
DASH	5	7
LEFS	2	3
Assessment of quality of life		
SF-36	20	27
Assessment of sleep disorders		
PSQI	9	12
ESS	4	5

mMRC: modified Medical Research Council dyspnea scale. SF-36: short form health survey 36. WHODAS 2.0: World Health Organization disability assessment. BDI and or/TDI. baseline dyspnea index (BDI) and/or transition dyspnea index. PSQI: Pittsburgh sleep quality index. IVCF-20: clinical-functional vulnerability index-20. DASH: disabilities of the arm, shoulder, and hand. FACIT: functional assessment of chronic illness therapy. ESS: Epworth sleepiness scale. LEFS: lower extremity functional scale.

Degree of importance and experience in treating post-COVID-19 patients

Figure 2 shows the degree of importance and experience, respectively, of physiotherapists regarding techniques for treating post-COVID-19 patients.

At least 86% of physiotherapists agree that aerobic training (n=70), peripheral muscle strength (n=69), inspiratory muscle training (n=69), balance and flexibility training (n=67), expiratory muscle training (n=67), lung re-expansion patterns (n=65), and bronchial hygiene (n=63) are important for treating post-COVID-19 patients (Figure 2A).

However, there are physiotherapists who reported having insufficient or even no experience in performing inspiratory (21%, n=15) and expiratory (21%, n=15) muscle training, bronchial hygiene (16%, n=12), and lung re-expansion patterns (14%, n=10). The other resources, such as balance and

flexibility training, peripheral muscle strength, and aerobic training were reported with a sufficient degree of experience in more than 90% of the physiotherapists (Figure 2B).

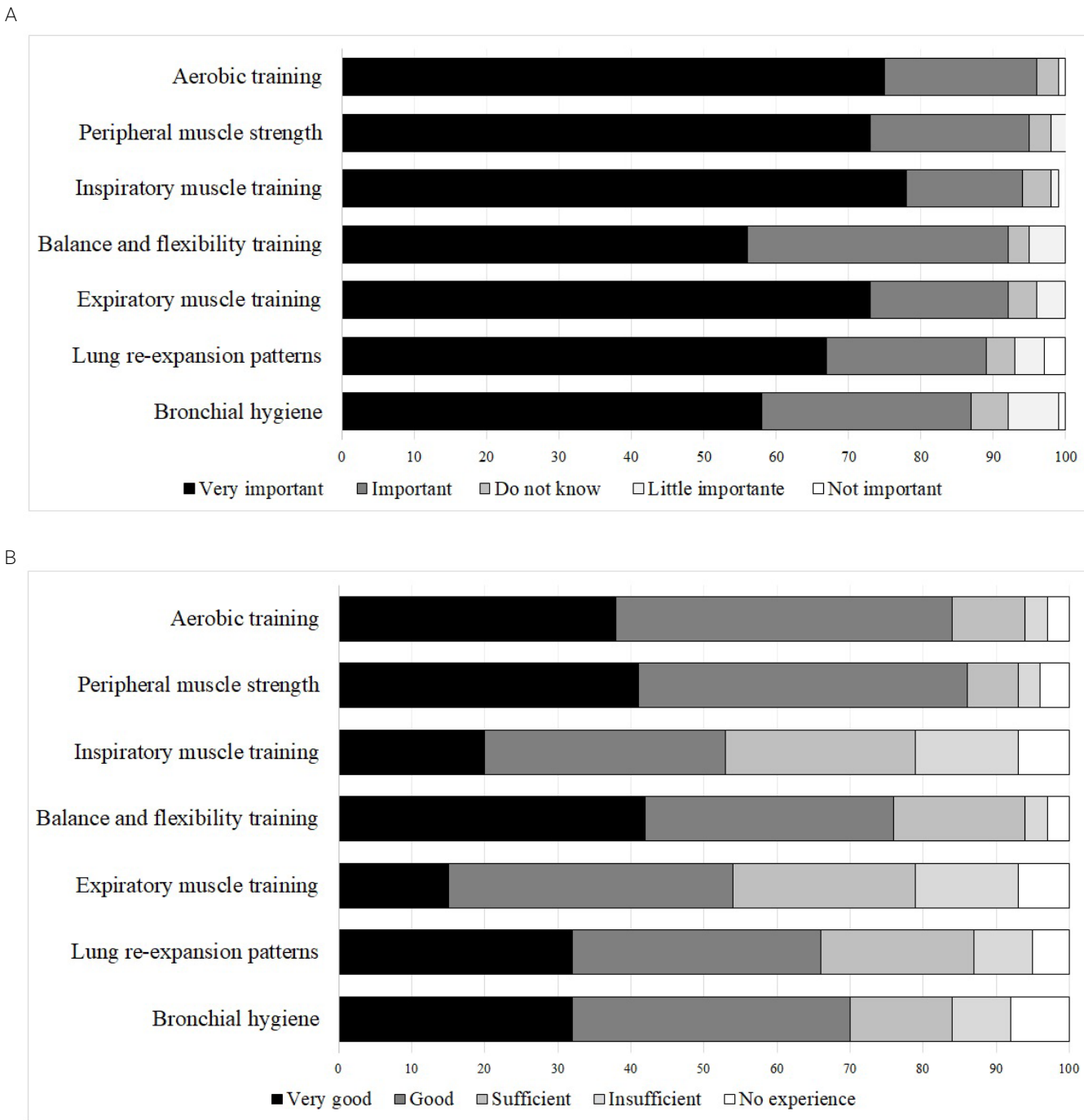

Figure 2. Physiotherapists' perception of the degree of importance (A) and degree of experience (B) of using techniques to treat post-COVID-19 patients. Data expressed as percentage.

Table 3 shows the frequency and percentage of physiotherapists who reported using techniques and equipment to treat post-COVID-19 patients. More than half of the physiotherapists reported using techniques and equipment for aerobic training, muscle strength, balance/flexibility, and respiratory function—such as walking, stationary bike for lower and upper limbs, free weights, resistance bands, functional circuits, stretching, breathing patterns, and bronchial hygiene. Less than half perform respiratory muscle training techniques and/or more sophisticated equipment, such as treadmills, weight training machines, neuromuscular electrical stimulation, and noninvasive mechanical ventilation.

Table 3. Techniques and/or equipment used by physiotherapists in the treatment of post-COVID-19 patients (n=73). Data expressed as percentage.

Aerobic exercise	n	%
Walking outdoors or in the home	49	67
Stationary bike for lower limbs	49	67
Stationary bike for upper limbs	38	52
Treadmill	26	36
Strength exercise		
Free weights (dumbbells)	60	82
Resistance bands	53	73
Weight training machines	19	26
Neuromuscular electrical stimulation	17	23
Breathing exercises		
Breathing patterns	43	59
Airway hygiene techniques	37	51
Non-invasive mechanical ventilation	31	42
Mucus mobilization device	24	33
Inspiratory incentive devices	23	32
Linear respiratory muscle training devices	19	26
Nonlinear respiratory muscle training devices	5	7
Balance/flexibility exercises		
Functional circuits	46	63
Stretching	51	70

Of the 73 physiotherapists, 18 (25%) reported having little experience in using techniques and/or equipment to treat post-COVID-19 patients and 26 (36%) reported not having any equipment assistance available in their current work environment to treat these patients.

When asked about their interest in receiving more information on post-COVID-19 rehabilitation, 60 (82%) physiotherapists reported being interested, but only 28 (38%) of them wanted to attend training on the topic.

According to the degree of agreement of the physiotherapists with the statement *"I feel adequately informed about the assessment and physiotherapeutic rehabilitation of patients with sequelae after a COVID-19 infection,"* 11 (15%) totally agreed, 21 (29%) only agreed, 22 (30%) neither agreed nor disagreed, 15 (21%) disagreed, and five (7%) totally disagreed.

DISCUSSION

To the authors' knowledge, this is the first study to investigate the knowledge and experience of Brazilian physiotherapists on the assessment and treatment of post-COVID-19 patients based on ASSOBRAFIR's recommendations.

Of the physiotherapists interviewed, 44% totally agree or only agree that they feel adequately informed about the assessment and rehabilitation of patients with sequelae after a COVID-19 infection, which was close to the percentage of 47% of physiotherapists who had undergone some type of training via virtual or face-to-face courses and/or reading scientific articles. However, although 82% reported interest in receiving more information on the subject, only 38% of them wanted to attend training on the subject.

Even though half of physiotherapists reported not feeling adequately informed, the vast majority (75%) believe the number of post-COVID-19 patients will increase in the coming years. Studies indicate that the prevalence of symptoms and sequelae after four weeks post-COVID-19 is estimated at around 43% among hospitalized and non-hospitalized patients, suggesting that an as yet unknown percentage of individuals may develop chronic disease conditions[27], which makes the search for rehabilitation programs necessary, even months after the acute period of infection.

At the time of data collection, ASSOBRAFIR had already issued recommendations for post-COVID-19 rehabilitation[5], and various national and international scientific documents on the subject were available to read[9-14]. However, only 29% knew of any guideline and/or association that reported on recommendations for assessment and rehabilitation in post-COVID-19 patients. On the other hand, 53% already knew the recommendations drawn up by ASSOBRAFIR, especially those with good experience in the areas of respiratory, cardiovascular, and neuromotor physiotherapy.

These data show a concern about the lack of knowledge of these guidelines and/or associations, since many physiotherapists end up not using EBP in their routine.

Physical therapy based on EBP carefully, explicitly, and judiciously uses the best evidence to make decisions about its individualized therapeutic plan, considering the professional's experience and respecting the patient's expectations, wishes, and values. However, some obstacles can interfere with the implementation of EBP among professionals—such as lack of time, interest, and/or experience, limited resources, lack of support from the employer, non-participation in a continuing education program, impossibility of access to articles, or even inability to understand the language in which they are written and/or statistical data from studies—reducing the chances of generalizing the results to the patient[19].

The study by Silva et al.[20] identified the behavior, knowledge, skills, resources, opinions, and barriers of physical therapists in the state of São Paulo (SP) regarding EBP. They found that the majority agreed that EBP is important for clinical practice, but they also identified that many have difficulties accessing complete articles in their mother tongue, which may partly explain our results.

Before identifying perceptions of the importance of and experience in assessing and treating post-COVID-19 patients, we evaluated physiotherapists' knowledge of the clinical manifestations after SARS-CoV-2 virus infection and post-COVID-19 syndrome.

According to the World Health Organization (WHO), post-COVID-19 is characterized by a condition that remains with long-term effects on various systems, such as the pulmonary, cardiovascular, and nervous systems, in addition to psychological effects that usually occur three months after the onset of COVID-19 and last for at least two months, not being explained by an alternative diagnosis and affecting the individual's functionality[28]. A study published by Brazilian researchers found that 50% of a sample of 646 people diagnosed with COVID-19 had the long COVID syndrome, with persistent symptoms such as fatigue, cough, and dyspnea, which leads to physical and functional impairment of the patient, affecting their ability to perform activities of daily living, in addition to altering their professional performance and hindering their social interaction[29].

Our results identified that the vast majority of physiotherapists recognize that the respiratory, cardiovascular, musculoskeletal, nervous, and metabolic systems are affected by COVID-19, and have heard of the post-COVID-19 syndrome, which was associated with the result that 75% believe that there will an increase in the number of patients with this disease in the coming years, which will lead them to seek rehabilitation services.

The physiotherapeutic rehabilitation of post-COVID-19 patients should initially be based on a careful assessment using clinical tests and scales/questionnaires capable of collecting information that reflects the limitations and consequences of the functional state after a COVID-19 infection[5,9-12].

Our results showed that most physiotherapists consider it important to assess post-COVID-19 patients; however, some consider their experience insufficient or even non-existent to carry out clinical tests such as spirometry (42%), maximal expiratory muscle strength (26%), maximal inspiratory muscle strength (22%), fatigue and dyspnea (22%), exercise tolerance test (22%), and sleep quality questionnaires (26%). This result is close to the physiotherapists' reports of their insufficient or even non-existent experience in the respiratory (27%) and cardiovascular (23%) areas, which use such assessments more frequently.

In addition, 56% of physiotherapists reported the possibility of using these resources in their work environment; however, 34% admitted a lack of experience in using these resources to assess post-COVID-19 patients, even though they had the possibility of using them. Corroborating these findings, the study by Scheiber et al.[18] observed that, in addition to the lack of resources to enable respiratory rehabilitation, physiotherapists also lacked experience in using devices to assess respiratory capacity and maximal inspiratory and expiratory muscle strength.

On the subject of assessment, we also asked physiotherapists to list all the evaluations used in patients with post-COVID-19 condition. Regarding clinical tests, we found that four were mentioned by more than half of the physiotherapists: pulse oximetry, the 1-minute sit-to-stand test, the 6-minute walk test, and the Berg balance scale. However, although it is well described in the literature that muscle weakness is among the most prevalent symptoms in post-COVID-19 syndrome, less than 20% of participants used tests to assess peripheral muscle strength, which consequently leads to a decrease in exercise tolerance[3,30], and there are several easy-to-handle tests that can be used in clinical practice.[5]

In addition to clinical tests, the patient's quality of life should be assessed, as well as their symptoms of dyspnea, fatigue, functional impairment, and mental disorders,

such as insomnia and anxiety[29], which require the use of scales or questionnaires that are easily accessible and quickly to apply[5].

Our results indicated that scales and questionnaires were less used compared to clinical trials, since more than half of the physiotherapists only used the Borg scale. Questionnaires to assess functional disabilities, quality of life, and sleep disorders were mentioned by less than 30% of respondents.

In the study by Spiegl et al.[21],with 180 physiotherapists from Austria and South Tyrol, it was observed that the vast majority considered the post-COVID-19 patient assessments to be appropriate, however, few carry them out in clinical practice, due to insufficient experience, lack of knowledge, the need for extensive time for assessment, or even the comparison among patients, who report knowing the post-COVID-19 sequelae. The most relevant assessments mentioned by the physiotherapists in the study by Spiegl et al.21 were the 6-minute walk test (45.2%) and respiratory function (45.2%); and the least relevant were strength tests (24.7%), timed up and go (11.0%), Borg scale (9.6%), quality of life assessment (16.4%), assessment of daily living activities (8.2%), and assessment of cognitive function (2.7%), partly corroborating our results.

These findings lead us to reflect that the physiotherapists assessed in our study have a restricted view of the applicability and capacity of these resources to acquire important information about the principle of the patient's biopsychosocial individuality, which negatively impacts the definition of the physiotherapeutic diagnosis, prognosis, and treatment plan, which should be based on the results of a careful physiotherapeutic evaluation[5,9-12].

The respondents of this research also assessed the importance of different treatment techniques for post-COVID-19 patients, in which most believe it is important to have training using aerobic exercises, peripheral muscle strength, respiratory muscle strength, balance and flexibility training, lung re-expansion patterns, and bronchial hygiene.

However, there is a controversy regarding the experience of these techniques, since although all the participants understand that COVID-19 affects the respiratory system and consider its importance for respiratory rehabilitation, they believe they have little (14%) or no experience in applying these techniques (21%).

Regarding the use of resources for the treatment of post-COVID-19 patients, more than half of the physiotherapists reported using resources for aerobic training, muscle strength, balance, flexibility, and respiratory function. However, they used cheaper and more accessible resources, such as walking, stationary bikes for lower and upper limbs, free weights, resistance bands, functional circuits, stretching, breathing patterns, and bronchial hygiene.

In this way, our data demonstrates the need for further clarification and transfer of information contained in the scientific literature on post-COVID-19 rehabilitation, especially in the use of tests based on functional and self-reported performance to assess these patients, in order to build a care plan based on the principle of biopsychosocial individuality and EBP.

As limitations of the study, we can first point out that the sample was obtained by convenience, since it cannot accurately represent the number of physiotherapists in Brazil who work in outpatient settings, so no exact sample calculation can be made. However, according to the Federal Council of Physical Therapy and Occupational Therapy (COFFITO), most physiotherapists are concentrated in the state of São Paulo, which reflects the number of respondents in this study. Secondly, other limitations may be related to the online environment in which the research was carried out, where possible misinterpretations of the items could not be clarified. However, to reduce this limitation, it is worth noting that the questionnaire underwent content and semantic validation. Finally, we emphasize that there is a need for further studies with larger samples, involving physiotherapists from different regions of Brazil.

CONCLUSION

We conclude that most physiotherapists recognize the importance and more than half report at least sufficient experience in assessing and treating post-COVID-19 patients. However, less than half of the participants use assessment resources to assess skeletal muscle strength, mobility, and respiratory function, as well as scales and questionnaires to assess disability, quality of life, and sleep quality. On the other hand, most use cheap and accessible resources to treat aerobic capacity, skeletal muscle strength, balance/flexibility, pulmonary ventilation, and bronchial hygiene, with the exception of techniques to train respiratory muscle strength and/or more sophisticated equipment.

Thus, there is a discrepancy between the assessment process in the patient's biopsychosocial context and the

treatment process, and it is necessary to educate the physiotherapist about the importance of this initial stage of intervention from their undergraduate training, in order to guarantee the development of treatments based on the patient's individuality for daily practice.

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REFERÊNCIAS

1. World Health Organization. WHO COVID-19 dashboard [Internet]. Geneva; 2022 [cited 2022 Mar 4]. Available on: https://covid19.who.int/
2. Menezes M. Estudo aponta que novo coronavírus circulou sem ser detectado na Europa e Américas [Internet]. Fiocruz. 2020 [cited 2022 Apr 8]. Available on: https://portal.fiocruz.br/noticia/estudo-aponta-que-novo-coronavirus-circulou-sem-ser-detectado-na-europa-e-americas
3. Nalbandian A, Sehgal K, Gupta A, Madhavan MV, McGroder C, et al. Post-acute COVID-19 syndrome. Nature Med. 2021;27:601-15. doi:10.1038/s41591-021-01283-z
4. Greenhalgh T, Knight M, A'Court C, Buxton M, Husain L. Management of post-acute covid-19 in primary care. BMJ. 2020;370:m3026. doi: 10.1136/bmj.m3026
5. Nogueira IC, Farias da Fontoura F, Carvalho CRF. Recomendações para avaliação e reabilitação pós-covid-19. São Paulo: Assobrafir; 2021 [cited 2022 Apr 8]. Available on: https://assobrafir.com.br/wp-content/uploads/2021/07/Reab-COVID-19-Assobrafir-Final.pdf
6. Abdullahi A. Safety and Efficacy of Chest Physiotherapy in Patients With COVID-19: A Critical Review. Front Med. 2020;7(454):1-6. doi: 10.3389/fmed.2020.00454
7. Puchner B, Sahanic S, Kirchmair R, Pizzini A, Sonnweber B, et al. Beneficial effects of multi-disciplinary rehabilitation in postacute COVID-19: an observational cohort study. Eurn J Phys Rehabil Med. 2021;57(2):189-98. doi: 10.23736/S1973-9087.21.06549-7
8. Thomas P, Baldwin C, Bissett B, Boden I, Gosselink R, et al. Physiotherapy management for COVID-19 in the acute hospital setting: clinical practice recommendations. J Physiother. 2020;66(2):73-82. doi: 10.1016/j.jphys.2020.03.011
9. Spruit MA, Holland AE, Singh SJ, Tonia T, Wilson KC, et al. COVID-19: Interim Guidance on Rehabilitation in the Hospital and Post-Hospital Phase from a European Respiratory Society and American Thoracic Society-coordinated International Task Force. Eur Resp J. 2020;56(6):2002197. doi: 10.1183/13993003.02197-2020
10. Cacau LDAP, Mesquita R, Furlanetto KC, Borges DLS, Forgiarini Junior LA, et al. Avaliação e intervenção para a reabilitação cardiopulmonar de pacientes recuperados da COVID-19. Assobrafir Ciênc. 2020;11(Supl. 1):183-93.
11. Barker-Davies RM, O'Sullivan O, Senaratne KPP, Baker P, Cranley M, et al. The Stanford Hall consensus statement for post-COVID-19 rehabilitation. Br J Sports Med 2020;54(16):949-59. doi: 10.1136/bjsports-2020-102596
12. Wang TJ, Chau B, Lui M, Lam G-T, Lin N, et al. Physical Medicine and Rehabilitation and Pulmonary Rehabilitation for COVID-19. Am J Phys Med Rehabil. 2020;99(9):769-74. doi: 10.1097/PHM.0000000000001505
13. Zulbaran-Rojas A, Lee M, Bara RO, Flores-Camargo A, Spitz G, et al. Electrical stimulation to regain lower extremity muscle perfusion and endurance in patients with post-acute sequelae of SARS CoV-2: A randomized controlled trial. Physiol Rep. 2023;11(5):e15636. doi: 10.14814/phy2.15636.
14. Sire A, Andrenelli E, Negrini F, Patrini M, Lazzarini SG, et al. Rehabilitation and COVID-19: a rapid living systematic review by Cochrane Rehabilitation Field updated as of December 31st, 2020 and synthesis of the scientific literature of 2020. Eur J Phys Rehabil Med. 2021;57(2):181-8. doi: 10.23736/S1973-9087.21.06870-2
15. van der Wees PJ, Jamtvedt G, Rebbeck T, Bie RA, Dekker J, et al. Multifaceted strategies may increase implementation of physiotherapy clinical guidelines: a systematic review. Aus J Physiother. 2008;54(4):233-41. doi: 10.1016/S0004-9514(08)70002-3
16. Harting J, Rutten GM, Rutten ST, Kremers SP. A Qualitative Application of the Diffusion of Innovations Theory to Examine Determinants of Guideline Adherence Among Physical Therapists. Phys Ther. 2009;89(3):221-32. doi: 10.2522/ptj.20080185
17. Stevens JGA, Beurskens AJMH. Implementation of Measurement Instruments in Physical Therapist Practice: Development of a Tailored Strategy. Phys Ther. 2010;90(6):953-61. doi: 10.2522/ptj.20090105
18. Scheiber B, Spiegl C, Wiederin C, Schifferegger E, Schiefermeier-Mach N. Post-COVID-19 Rehabilitation: Perception and Experience of Austrian Physiotherapists and Physiotherapy Students. Int J Environ Res Public Health. 2021;18(16):8730. doi: 10.3390/ijerph18168730
19. Silva TM, Costa LCM, Garcia AN, Costa LOP. What do physical therapists think about Evidence-Based Practice? A systematic review. Man Ther. 2015;20(3):388-401. doi: 10.1016/j.math.2014.10.009.
20. Silva TM, Costa LCM, Costa LOP. Evidence-Based Practice: a survey regarding behavior, knowledge, skills, resources, opinions and perceived barriers of Brazilian physical therapists from São Paulo state. Braz J Phys Ther. 2015;19(4):294-303. doi: 10.1590/bjpt-rbf.2014.0102
21. Spiegl C, Schiefermeier-Mach N, Schifferegger E, Wiederin C, Scheiber B. Physiotherapeutic evaluation of patients with post COVID-19 condition: current use of measuring instruments

by physiotherapists working in Austria and South Tyrol. Arch Physiother. 2022;12(1):21. doi: 10.1186/s40945-022-00147-0.

22. Costa LR, Costa JLR, Oishi J, Driusso P. Distribuição de fisioterapeutas entre estabelecimentos públicos e privados nos diferentes níveis de complexidade de atenção à saúde. Braz J Phys Ther. 2012;16(5):422-30. doi: 10.1590/S1413-35552012005000051
23. Marques JBV, Freitas D. Método DELPHI: caracterização e potencialidades na pesquisa em Educação. Pro-Posições. 2018;29(2):389-415. doi: 10.1590/1980-6248-2015-0140
24. Lynn MR. Determination and quantification of content validity. Nurs Res. 1986;35(6):382-5.
25. Alexandre NMC, Coluci MZO. Content validity in the development and adaptation processes of measurement instruments. Ciênc Saúde Coletiva. 2011;16(7):3061-8. doi: 10.1590/S1413-81232011000800006
26. Pasquali L. Instrumentação psicológica. Porto Alegre: Artmed; 2010.
27. Scharf RE, Anaya JM. Post-COVID Syndrome in Adults: an Overview. Viruses. 2023;15(3):675. doi: 10.3390/v15030675.
28. World Health Organization. A clinical case definition of post COVID-19 condition by a Delphi consensus. Geneva; 2021 [cited: 2024 Mar 8]. Available on: https://www.who.int/publications/i/item/WHO-2019-nCoV-Post_COVID-19_condition-Clinical_case_definition-2021.1
29. Miranda DAP, Gomes SVC, Filgueiras PS, Corsini CA, Almeida NBF, et al. Long COVID-19 syndrome: a 14-months longitudinal study during the two first epidemic peaks in Southeast Brazil. Trans R Soc Trop Med Hyg. 2022;116(11):1007-14. doi: 10.1093/trstmh/trac030.
30. Soares MN, Eggelbusch M, Naddaf E, Gerrits KHL, Schaaf M, et al. Skeletal muscle alterations in patients with acute Covid-19 and post-acute sequelae of Covid-19. J Cachexia Sarcopenia Muscle. 2022;13(1):11-22. doi: 10.1002/jcsm.12896.