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SYSTEMATIC REVIEW

Aquatic physical therapy in individuals with muscular dystrophy: systematic scoping review

Fisioterapia aquática em indivíduos com distrofia muscular: uma revisão sistemática do tipo escopo

Fisioterapia acuática en individuos con distrofia muscular: una revisión sistemática de alcance

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ABSTRACT | The aim of this study is to map the use of aquatic physical therapy in individuals with muscular dystrophy, to characterize aquatic physical therapy intervention and identify measured components (variables and measurement instruments used) by the studies. A systematic scoping review included experimental, descriptive and observational studies (in English, Portuguese and Spanish languages). The searches were carried out on MEDLINE (PubMed), CINAHL, Embase, PEDro, Lilacs, ERIC, Scopus, Web of Science, Google Scholar. The extracted data were characterized into three categories: (1) characterization of the records, (2) information referring to aquatic physical therapy, and (3) measured components. There were 556 studies records and 20 records were selected. The studies samples included mostly individuals with Duchenne muscular dystrophy, aged between 5 and 22 years old. Aquatic physical therapy sessions lasted about 45 minutes, and one or two sessions per week were carried out for 21 weeks. That corroborates studies conducted in different populations. Most of the studies investigated pulmonary system and postural control/ functional ability, and a few studies evaluated cardiac system. Egen Klassifikation and North Star Ambulatory Assessment are recommended, and also to perform 6-minute walk test.

Keywords | Muscular Dystrophies; Muscular Dystrophy, Duchenne; Hydrotherapy; Physical Therapy Modalities.

RESUMO | O objetivo deste estudo foi mapear o uso da fisioterapia aquática em indivíduos com distrofias musculares, de forma a caracterizar as intervenções no meio aquático e identificar componentes mensurados (variáveis estudadas e instrumentos utilizados nos estudos). A revisão sistemática do tipo de escopo incluiu estudos experimentais, descritivos e observacionais (em inglês, português e espanhol). As buscas foram realizadas nas plataformas Medline (PubMed), CINAHL, Embase, PEDro, LILACS, ERIC, Scopus, Web of Science e Google Scholar. Os dados extraídos foram alocados em três categorias: (1) caracterização dos registros, (2) informações referentes a fisioterapia aquática e (3) componentes mensurados. Foram encontrados 556 registros e, destes, selecionados 20. As amostras dos estudos selecionados incluíram, na maioria, indivíduos com distrofia muscular de Duchenne, com idade entre 5 e 22 anos, que fizeram fisioterapia aquática com duração média de 45 minutos uma ou duas vezes por semana, por 21 semanas. Essas características corroboram estudos feitos em diferentes populações. A maioria dos estudos investigou alterações pulmonares e controle postural/desempenho funcional, poucos avaliaram os efeitos no sistema cardíaco. Recomenda-se usar a Egen Klassifikation, a North Star Ambulatory Assessment e fazer o teste de caminhada de seis minutos.

Descritores | Distrofias Musculares; Distrofia Muscular de Duchenne; Hidroterapia; Modalidades de Fisioterapia.

RESUMEN | El presente estudio tuvo el objetivo de mapear la práctica de fisioterapia acuática por individuos con distrofias musculares, para caracterizar las intervenciones en el medio acuático e identificar los componentes medidos (variables estudiadas e instrumentos utilizados

Study developed to conclude the Specialization course in Physical Therapy Intervention in Neuromuscular Diseases at Universidade Federal de São Paulo (Unifesp), São Paulo (SP), Brazil. It was presented at the 1st Brazilian Congress of Neurological Rehabilitation and Research (Cobren) and IV Brazilian Symposium on Investigation of Neuromuscular Diseases of Unifesp, 2018.

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en los estudios). La revisión sistemática de alcance incluyó estudios experimentales, descriptivos y observacionales (en inglés, portugués y español). Se llevaron a cabo las búsquedas en Medline (PubMed), CINAHL, Embase, PEDro, LILACS, ERIC, Scopus, Web of Science y Google Scholar. Los datos obtenidos se asignaron en tres categorías: (1) caracterización de registros; (2) informaciones sobre fisioterapia acuática; y (3) componentes medidos. Se encontraron 556 registros, de los cuales se seleccionaron 20. Las muestras de los estudios seleccionados incluyeron mayoritariamente a individuos con distrofia muscular de Duchenne, con edades entre 5 y 22 años, y que se habían sometido a sesiones de fisioterapia acuática con un promedio de duración de 45 minutos, una o dos veces por semana, durante 21 semanas. Estas características confirman estudios realizados con diferentes poblaciones. La mayoría de los estudios han investigado las alteraciones pulmonares y el control postural/rendimiento funcional, pero pocos han evaluado los efectos sobre el sistema cardíaco. Se recomienda emplear la Egen Klassifikation, la North Star Ambulatory Assessment y aplicar la prueba de caminata de seis minutos.

Palabras clave | Distrofias Musculares; Distrofia Muscular de Duchenne; Hidroterapia; Modalidades de Fisioterapia.

INTRODUCTION

Muscular dystrophies (MD) are a heterogeneous group of clinical, genetic and biochemical disorders that share muscular clinical and dystrophic characteristics[1]. The most prevalent is Duchenne muscular dystrophy (DMD), which affects one in every 3,500 boys born alive. As the disease progresses, postural changes, joint contractures and loss of functional capacity appear, compromising the individual's cardiac and respiratory systems and mobility[2-4].

Currently, the literature demonstrates that corticosteroid treatments, respiratory, cardiac, and orthopedic management and rehabilitation programs have improved DMD patients' functionality, quality of life, health and longevity, enabling a life expectancy of up to four decades[2].

Physical therapy is responsible for a number of factors, among them: to maintain functionality, muscle strength and respiratory capacity; to avoid contractures and deformities; guidance on the use of orthoses, and pain management[3,5,6]. For these purposes, it has several resources, including aquatic physical therapy[7], which is frequently recommended by manuals and treatment guidelines on muscular dystrophies[3,5,8-10].

As a result of all the changes that occur with an immersed body, care for patients with DM in aquatic environments is essential to obtain an adequate and safe treatment[11-13]. However, the parameters for proper management, such as water temperature; therapy frequency; session duration, and method to monitor and measure the cardiac and pulmonary systems and fatigue are not yet clearly established[6,14]. Since there is no consensus on the most appropriate parameters for the intervention of aquatic physical therapy in DM, it is necessary to map the literature on the issue. The systematic scoping review aims to examine and categorize the existing literature on a study phenomenon, from which there is verification of gaps in the research literature and/or the possibility of future reviews, using systematic review with meta-analysis to assess effectiveness[15]. Therefore, the objective of this study is to map the use of aquatic physical therapy in individuals with DM in order to characterize interventions in the aquatic environment and identify the components measured by the studies through a systematic scoping review.

METHODOLOGY

Initially, a search was performed on the JBI Database of Systematic Reviews and Implementation Reports, Cochrane Database of Systematic Reviews, and CINAHL, PubMed and PROSPERO databases for some type of review on aquatic physical therapy with individuals with DM. No studies have been identified.

This scoping review was based on the Joanna Briggs Institute Reviewer's Manual[16], which recommends the formulation of the research question, defined by "How has aquatic physical therapy been used in individuals with MD?" The inclusion criteria were established according to the acronym PCC for scoping review: participants (individuals with MD,

of all ages and both genders, submitted to aquatic physical therapy); concepts (muscular dystrophy[1]; aquatic physical therapy[7]), and context (all therapies performed in aquatic environment). Experimental, observational and descriptive studies were included, with no date limitation, in English, Spanish and Portuguese languages due to the researchers' proficiency. Studies with mixed populations and other diagnoses were excluded, since MD have specific progression characteristics[2,3], impacting clinical practice.

In sequence, pieces of research were sought on MEDLINE (PubMed) and CINAHL databases with the defined descriptors (MeSH terms) and keywords, interposed by "AND" and "OR" Boolean operators. Then, there was review of the words present in the title, abstract and descriptors regarding the records found in the previous step, and a need for term adjustment was verified. Subsequently, the search was carried out on the other selected databases and search sites (Chart 1). The selection of records was made between November and December 2017 and the review in September 2019.

The records were revised again using the words present in the title, abstract and descriptors, aiming at excluding those that did not fit the predetermined criteria. The articles selected were read in full; the existence of other relevant records was verified by investigating the references of the articles selected.

The extracted data were classified according to three categories: (1) characterization of the records (author, year of publication, country of origin, objectives of the study, type of study, type of MD, characteristics of the population, sample size); (2) information regarding the procedures adopted in aquatic physical therapy (purpose of therapy, type of activities, session frequency and duration, program duration, water temperature, immersion level and associated therapies), and (3) measured components (variables studied and measurement instruments used in the studies, such as scales, tests, equipment).

Chart 1. Search Strategy

Information sources	Descriptors (MeSH terms)	Keywords
MEDLINE (PubMed) CINAHL Embase PEDro Lilacs ERIC Scopus Web of Science Google Scholar	muscular dystrophies muscular dystrophy, Duchenne muscular dystrophies, limb-girdle muscular dystrophy, Emery-Dreifuss muscular dystrophy, facioscapulohumeral muscular dystrophy, oculopharyngeal myotonic dystrophy sarcoglycanopathies	
	hydrotherapy whirlpool baths	aquatic exercises aquatic physical therapy swimming aquatic therapy water exercises Halliwick therapy balneology thalassotherapy

RESULTS

Figure 1 presents the diagram of information about the different phases of the systematic scoping review. Twenty records were selected, published between 1998 and 2018, with a predominance of Brazilian studies[13,17-28], followed by North American[29-31], Portuguese[32,33], one British[6], and one from northern Cyprus[34]. The types of studies found were as follows: one case series[31], one retrospective experimental[17], one randomized controlled clinical trial[6], three quasi-experimental[26,32,33], five cross-sectional[13,17,19,20,24] and eight case studies[21,23,25,27-30,34].

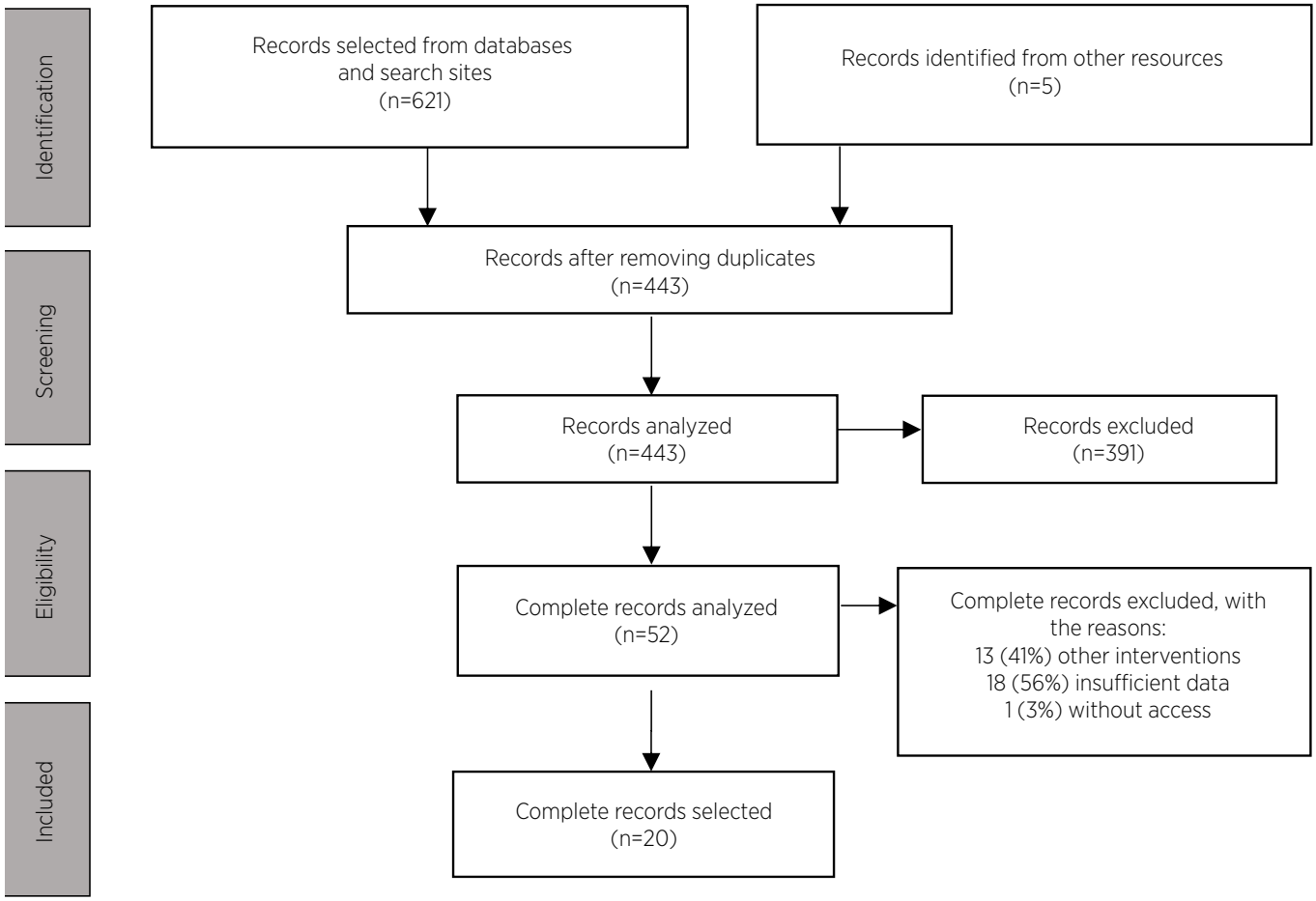

Figure 1. Diagram of information about the different phases of the systematic scoping review

Most of the study participants had DMD, aged between 5 and 22 years old; in two studies, participants had limb-girdle muscular dystrophy[23,29] and one study presented congenital dystrophy[28]. Eight studies reported that individuals performed associated therapies, such as motor physical therapy[6,13,22,27-29,31], respiratory physical therapy[22,27], occupational therapy[22,28], home exercises[30] and adapted sports[31] (Table 1).

There was a predominance of studies that investigated the effects of immersion on the pulmonary system[13,17,24,26,27,29-31] and studies related to the postural control system and functional performance[18,21,22,28-30,32,33]. According to the definition by Shumway-Cook and Woollacott[35], musculoskeletal systems, internal representations, adaptive mechanisms, anticipatory mechanisms, sensory strategies, individual sensory systems and neuromuscular synergies contribute to postural control, terminology that was considered most suitable for this study. All studies that investigated postural control systems were grouped with investigations into functional performance, integrating the component postural control/functional performance.

Objectives also found were effects of immersion on energy expenditure[19,20,28], psychological aspects (self-perception, stress, pleasure and joy)[25,33,34], quality of life[30,31,34] and body mass index[33]. Some authors have investigated adaptation to aquatic environment[23] and the feasibility of carrying out an aquatic physical therapy program[6,29].

The measured components were grouped according to the investigation systems, as the same study evaluated one or more components. There was a predominance of investigation into the pulmonary system, postural control/functional performance and cardiac system. The cardiac system, in turn, was investigated only by the variable heart rate (HR)[13,17,19,20,24,29].

Regarding postural control, studies have presented variables such as measuring range of motion[29] with goniometer, muscle strength with dynamometer[30], and muscle activation with electromyography equipment[28]. Functional performance was analyzed mainly by Egen

Klassification (EK)[18,22,32,33] and the six-minute walk test (6MWT)[6,19,20,30]. The tests used to evaluate functional performance were gait assessment using a Likert scale[22], functional range test[22], timed function test[30], and zigzag agility test[18]. Only one study used Vignos scale for disease staging[22] (Chart 2).

A relevant variable for studies on aquatic physical therapy is the level of adaptation of individuals to water environment, addressed by four studies in different ways: previous experience in aquatic environment[25,29]; assessment of adaptation using Likert scale[22], and assessment of aquatic skills by means of an instrument developed by the author himself[23].

Aquatic physical therapy was characterized (Table 1) by sessions ranging from 30 to 60 minutes, with a predominance of 45-minute sessions and an average of once or twice a week (only one study performed three sessions a week[21]). The programs lasted 21 (±24) weeks (minimum 6 weeks, and maximum 89 weeks), on average, and only one study showed a two-year follow-up[22]. The average water temperature was 32.7 °C (±1.6) and immersion was at the seventh cervical vertebra level[13,24], xiphoid process[18-20], and varied levels[29,31]. The types of activities developed were strengthening[6,21,28,31], passive and active stretching[6,21,26,29,31,34], breathing exercises[17,18,21,27,31,34], exercises for trunk control[6,18,21,28,31], gait[6,17,29], body balance exercises[6,29], jumping[29], running[29], swimming[29,34], diving[27], transfer training[28], wheelchair handling[18], besides specific exercises (not described) of the Halliwick concept, Bad Ragaz Method and hydrokinesiotherapy[25], adaptation activities to the aquatic environment[23,34].

Table 1. Characterization of the records and aquatic physical therapy

Reference	Country	Type of study	Objectives of the records	Sampling						Objectives of the therapy	Session frequency and duration	Program duration	Water temperature (°C)	Associated therapies
				Experimental			Control							
				n	Age	Diagnosis	n	Age	Diagnosis					
Adams et al.[31]	USA	Case series	Lung function and quality of life	3	5-13	DMD	-			Strengthening, ROM and respiratory function	Once a week, 60 min.	8 weeks	32.7	Physical therapy, adapted sport
Almeida et al.[13]	Brazil.	Cross-sectional	Respiratory parameters of immersion at C7 level	15	12	DMD	-			-	-	-	33.5	Physical therapy, swimming or yoga
Atamturk and Atamturk[34]	Northern Cyprus	Case study	To investigate the impact on physical and psychological health	1		DMD	-			Adaptation to aquatic environment	Twice a week, 45 min.	8 weeks	-	-
Caromano et al.[17]	Brazil.	Cross-sectional	Physiological effects of immersion	20	8-15	DMD	-			-	40 min.	-	30-32	-
DiBiasio et al.[29]	USA	Case study	Effects and feasibility of an individualized program	1(F)	12	LGMD	-			Weight loss, flexibility, strengthening and physical endurance	Twice a week, 45 min.	32 weeks	28-30	Physical Therapy
Fachardo et al.[21]	Brazil	Case study	Disease delay	1	9	DMD	-			-	Three times a week, 40 min.	Two 7-week periods	30-32	-
Ferreira et al.[22]	Brazil.	Retrospective experimental	To compare motor function on the ground and in immersion	23	15.1±4.2	DMD	-			Adaptation to the environment, functionality, swimming, balance, walking, relaxation	Once a week, 40 min.	2 years	34	Motor physical therapy, respiratory physical therapy, occupational therapy
Hind et al.[6]	United Kingdom	Randomized controlled clinical trial	Large-scale research feasibility	8	8.0±0.9	DMD	4	9.8±2.5	DMD	-	EG: FA (twice a week., 30 min.) + F (four times a week.) CG: F(/six times a week)	26 weeks	34-36	Physical Therapy

(continues)

Table 1. Continuation

Reference	Country	Type of study	Objectives of the records	Sampling						Objectives of the therapy	Session frequency and duration	Program duration	Water temperature (°C)	Associated therapies
				Experimental			Control							
				n	Age	Diagnosis	n	Age	Diagnosis					
Honório et al.[32]	Portugal	Quasi-experimental	Functional mobility, body mass index and percentage of fat mass	1		DMD	6	9-11	DMD	Functional mobility	Once-twice a week, 45 min.	-	-	-
Honório et al.[33]	Portugal	Quasi-experimental	Functional mobility, pleasure, joy	1		DMD	3	9-11	DMD	Functional mobility	Once-twice a week, 45 min.	89 weeks	-	-
Israel[23]	Brazil.	Case study	Water adaptation and independence program	2(F)	32,33	LGMD	-			Water skills	Once a week, 30 min.	15 weeks	33-34	-
Nelson et al.[30]	USA	Case study	Quality of life, motor and pulmonary function	1	NR	DMD	-			-	Once a week	6 weeks	-	Home exercises
Nicolini et al.[24]	Brazil.	Cross-sectional	Ventilatory parameters	8	15-22	DMD	13	15-22	Healthy	-	-	-	33	-
Nunes et al.[25]	Brazil.	Case study	Child stress	1	10	DMD	-			Adaptation to the environment, trunk control, strength maintenance and prevention of deformities	Twice a week, 45 min.	5 weeks	33-34	-
Ramos et al.[26]	Brazil.	Quasi-experimental	Respiratory muscle strength and cough peak in a patient with non-invasive ventilation and aquatic physical therapy	3	13-19	DMD	3	13-190	DMD	-	Twice a week	10 weeks	-	-
Sales et al.[27]	Brazil.	Case study	Respiratory parameters	1	6	DMD	-			Maintenance and stimulation of respiratory function	Once a week, 30 min.	6 months	34	Stretching, respiratory physical therapy
Santos et al.[28]	Brazil.	Case study	Speed and energy expenditure rate when moving on a flat surface, and functional range	1 (F)	6	Congenital Dystrophy	-			To improve movement speed on flat surfaces	Twice a week, 35 min.	12 weeks	33	Physical therapy, occupational therapy

(continues)

Table 1. Continuation

Reference	Country	Type of study	Objectives of the records	Sampling						Objectives of the therapy	Session frequency and duration	Program duration	Water temperature (°C)	Associated therapies
				Experimental			Control							
				n	Age	Diagnosis	n	Age	Diagnosis					
Silva et al.[18]	Brazil.	Case study	Effects on agility	1	12	DMD	-			Wheelchair agility	60 min.	10 sessions	32	-
Silva et al. [19]	Brazil.	Cross-sectional	Energy expenditure when walking in immersion and on the ground	8	10.4±0.5	DMD	-			-	-	-	32	-
Silva et al. [20]	Brazil.	Cross-sectional	To compare energy expenditure between healthy children and those with DMD	8	10.4±0.5	DMD	20	10.7±0.4	Healthy	-	-	-	32	-

F: female; EG: experimental group; CG: control group; LGMD: limb-girdle muscular dystrophy.

Chart 2. Measured components

Reference	Pulmonary function															Postural control/functional performance													
	Thoracic cirtometry	Cough peak flow	Inspiratory capacity	O2 saturation	Minute volume	Respiratory frequency	Tidal volume	Forced vital capacity	MIP	MEP	FEV1	FEF25%–75%	MFEF	Lung function	Vital capacity	Range of motion	Muscle strength	Evaluation of functional activities in DMD	Balance (Likert scale)	Gait (Likert scale)	Egen Klassification	Vignos	Six-minute walk test	North Star Ambulatory Assessment	Activity limitations questionnaire	Timed function test	Motor function measurement	Functional range	Electroneuromyography	Zigzag test
Adams et al.[31]	x	x	x																											
Almeida et al.[13]		x		x	x	x	x	x	x	x																				
Caromano et al.[17]				x					x	x																				
DiBiasio et al.[29]								x			x	x	x			x	x													
Fachardo et al.[21]																		x												
Ferreira et al.[22]																			x	x	x	x								
Hind et al.[6]								x															x	x	x					
Honório et al.[32]																					x									
Honório et al.[33]																					x									
Nelson et al.[30]														x			x						x			x				
Nicolini et al.[24]		x		x	x	x	x	x	x	x																				
Nunes et al.																														
Ramos et al.[26]		x							x	x																				
Sales et al.[27]	x					x									x															
Santos et al.[28]																											x	x	x	
Silva et al.[18]		x		x	x	x	x	x	x	x											x								x
Silva et al.[19]				x		x																	x							
Silva et al.[20]				x		x																								

MIP: maximal inspiratory pressure; MEP: maximal expiratory pressure; FEV_1: forced expiratory volume in one second; FEF: forced expiratory flow

DISCUSSION

The scoping review allowed identifying that over the past ten years there has been an increasing number of studies evaluating the effects of aquatic physical therapy in patients with DM, mainly with DMD. However, there was a predominance of studies with small samples (up to three individuals) of the descriptive[18,23,28-31,34] and quasi-experimental types[26,32,33]. The only randomized controlled clinical trial[6] detected is a pilot study that verified the feasibility of an aquatic physical therapy program associated with ground physical therapy in six centers in the United Kingdom. Barnett et al.[36] show that quasi-experimental studies and experimental projects with

a small number of individuals are ideal for clinical research, in order to understand the situation of the research in question and make adjustments when necessary[36].

Based on this scoping review, we identified that data from individuals such as age and disease stage are important information for characterizing the sample and predicting functional changes in patients with DMD, as demonstrated by Ferreira et al.[22] using Vignos scale. After all, the literature points to a correlation between age and the patient's clinical condition, with a reduction in function according to age increasing[37].

It was also observed that there is no standardization of the aquatic physical therapy intervention in the experimental studies investigated. Therefore, descriptive studies related to aquatic physical therapy interventions are necessary according to the clinical condition of patients with DM. The intervention classification for patients with DMD by Bushby et al.[2] can be a guide for this description.

Postural control/functional performance was measured by validated[38]or reliable[39] instruments for DMD, such as EK scale[18,22,32,33] to assess functional impairment in daily living activities, and 6MWT[6,19,20,30] to assess gait performance. The North Star Ambulatory Assessment was suggested by Hind et al.[6] as a viable and adequate test for monitoring patients with DMD, corroborating Birnkrant et al.'s DMD management manual[10], which recommends that the instrument should be used from three years of age. Besides, the authors suggest exploratory use of the gross motor function measurement; Hammersmith Functional Motor Scale Expanded; Alberta Infant Motor Scale, and Bayley Scales of Infant and Toddler Development, Third Edition (Bayley-III); for non-outpatient individuals, they suggest using Brooke Upper extremity scale.

As the disease progresses, there is an increased risk for pulmonary and cardiac changes[3]. Therefore, it is necessary to monitor and periodically assess these individuals[2], as well as determining safety measures for these patients. The studies by Silva et al.[19] and Silva et al.[20] used oxygen saturation values as safety measures during 6MWT, both on the ground and in immersion. The test was interrupted if the individual had an oxygen saturation value below 90%. DiBiasio et al.[29] calculated the target HR using Karvonen formula modified for the aquatic environment, using a HR monitor during the sessions to enable exercises performance within a safety interval. We emphasize that there is no consensus regarding safety parameters, for changes both in the respiratory system and in the cardiac system in immersion. However, the parameters established in the three studies[19,20,29] can guarantee greater safety and care for therapies developed in the aquatic environment. Despite these indications, further discussions on the pulmonary parameters already measured and more studies on cardiac parameters are necessary.

Another relevant aspect for studies with individuals with DM is muscle fatigue that occurs due to muscle weakness, which was not investigated quantitatively in any study in this review. In addition, it has been shown that immersion in different temperatures can alter the perception of effort in healthy individuals, measured by Borg scale[40].

As for the characterization of the intervention, regarding the studies[6,22,27-30] that associated ground and water physical therapy, only Hind et al.[6] compared this relationship and performed a six-month follow-up. Eight boys underwent water therapy twice a week and ground therapy (experimental group) four times a week, and four boys underwent only ground therapy (control group). At six months, the authors observed an average change in the North Star Ambulatory Assessment of –5.5 (SD: 7.8) in the control group and –2.8 (SD: 4.1) in the experimental group. Ferreira et al.[22] have evaluated the motor performance of individuals with DMD on ground and in water for two years, and observed maintenance in the performance of aquatic activities and worsening of ground motor function. Probably the aquatic environment promotes the maintenance of active movement and the consequent independence for a longer period.

Previous experience in water is a factor to be considered for studies on this environment, as individuals who are familiar with and feel comfortable in water participate more intensively in the proposed activities compared with those less adapted[41]. Fragala-Pinkham, Haley and O'Neil[42] confirmed that children more adapted to the aquatic environment were able to exercise for a longer time within the target HR.

The findings of this scoping review in relation to session time, session frequency and treatment program duration corroborate the systematic review by Roostaei et al.[41] in individuals with cerebral palsy, which reports greater effectiveness in sessions of 45-60 minutes for two to three times a week, for at least six weeks, and which can last for 16 weeks.

Through this review, a certain standardization of the measured components and procedures adopted in aquatic physical therapy is recognized, but there is still a shortage of studies with high scientific evidence. This situation can probably be exemplified by the experience of Hind et al.[6], which had great sample loss throughout the study,

as many participants either had difficulty accessing the rehabilitation centers or were enrolled in other clinical trials, or due to lack of pools available. Because of this situation, the authors[6] suggested different approaches for future studies, such as increasing the number of aquatic physical therapy sessions offered by health systems; making therapies with children with other neuromuscular conditions; inserting parents in the pool with the guidance of a physical therapist, and that the health system and volunteer centers come together and share the pool rental costs[6]. It is defended that such suggestions can also be accepted by the Unified Health System and by several associations in the Brazilian territory.

Despite discussing a considerable number of studies, the limitations of this study were not having researched gray literature on the basis of theses and dissertations that discuss the object in question and restrictions on searches in Portuguese, English and Spanish languages.

CONCLUSION

It is concluded that the characterization of the sample using Vignos scale or another instrument to stage the disease is essential to identify the effects of aquatic physical therapy on different stages of the disease and verify the future effects of this intervention. In addition, it is recommended that EK and the North Star Ambulatory Assessment should be used, besides 6MWT performance.

Several studies have investigated pulmonary changes and postural control/functional performance in patients with DM, and few studies have evaluated the effects on the cardiac system. Since this systematic scoping review was not intended to discuss the effectiveness of aquatic physical therapy, a new study is suggested in order to discuss the existing data and analyze the treatment effectiveness. Based on the information obtained in this study, 45-minute aquatic physical therapy sessions are recommended twice a week, for an average of 21 weeks and with the water temperature at 32.7°C, on average.

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