European Journal of Physical and Rehabilitation Medicine
EDIZIONI MINERVA MEDICA

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European Journal of Physical and Rehabilitation Medicine 2017 Feb 17
DOI: 10.23736/S1973-9087.17.04570-1

Article type: Systematic reviews and meta-analyses

Efficacy of aquatic therapy for multiple sclerosis: a systematic review

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Abstract

BACKGROUND: Multiple sclerosis (MS) is a chronic, inflammatory, progressive, disabling autoimmune disease affecting the central nervous system. Symptoms and signs of MS vary widely and patients may lose their ability to walk. To date the benefits of aquatic therapy often used for rehabilitation in MS patients have not been reviewed.

OBJECTIVE: To systematically review the current state of aquatic treatment for persons with MS (hydrotherapy, aquatic therapy, aquatic exercises, spa therapy) and to evaluate the scientific evidence supporting the benefits of this therapeutic option.

METHODS: The databases PubMed, Scopus, WoS and PEDro were searched to identify relevant reports published from January 1, 2011 to April 30, 2016.

RESULTS: Of 306 articles identified, only 10 fulfilled the inclusion criteria: 5 randomized controlled, 2 simple randomized quasi-experimental, 1 semi-experimental, 1 blind controlled pilot and 1 pilot.

CONCLUSION: Evidence that aquatic treatment improves quality of life in affected patients was very good in two studies, good in four, fair in two and weak in two.

Keywords: Multiple sclerosis, hydrotherapy, Physical Exercise, Exercise therapy.

Introduction

Multiple sclerosis (MS) is the neurological disorder most frequently appearing in young adults and the second cause of disability in this population, provoking severe mobility and social limitations in affected individuals[1]. It is a chronic, inflammatory autoimmune disease in which the myelin sheath (white matter) of the brain and spinal cord neurons is gradually destroyed. This leads to the appearance of sclerotic plaques (connective tissue) which impair the normal functioning of affected nerve fibres, delaying or preventing nerve impulses. The disease is characterized by the triad of inflammation, demyelination and gliosis (scar tissue), and axonal loss. The disease course includes periods of relapse-remission between episodes of more severe symptoms or may be continuously progressive. Lesions usually appear at different times and at different locations of the central nervous system.

Symptoms and signs of MS vary widely and include cognitive decline, muscle weakness, spasticity and fatigue. The loss of physical and mental fitness due to MS or comorbidities, or both, may play an essential role in the development or persistence of fatigue. Accordingly, improving physical and mental health through exercise therapy may be a beneficial intervention against fatigue in individuals with MS[2]. In effect, this type of therapy has been successfully used in chronic fatigue syndrome[3] and cognitive impairment[4].

The symptoms of MS, especially acute or chronic pain, can affect quality of life. This pain can be managed using both pharmacological and non-pharmacological treatments[5,6].

Sources of pain in MS are difficult to differentiate though certain types of pain have common syndromes such as trigeminal neuralgia which appears in 5% of cases and spasticity in 50 %.

Four forms of MS have been described[7,8]

Relapsing remitting MS (RRMS), which comprises 85% of cases. This form shows periods of symptom attacks and periods intercrisis of complete remission.

Secondary progressive MS (SPMS) follows an initial relapsing remitting course and is characterized by disability progression. The risk of developing SPMS is close to 2% per year and 50% will develop SPMS within 10 years.

Primary progressive MS (PPMS) involves a worsening progression of disability. Patients do not experience symptom attacks rather there is constant functional decline from the time of disease onset. Around 10-15% of cases are this form of MS. Progressive relapsing MS (PRMS) is characterised by periods when symptoms worsen gradually and periods of relapse or symptom attacks. This form is the least frequent, affecting some 5% of patients with MS.

Currently, estimates of patients with MS worldwide are 2.5 million: 600,000 in Europe and 47,000 in Spain, 50% more than 20 years ago mainly attributed to its improved diagnosis. MS affects 4-8 of every 10,000 persons between the ages of 20 and 40 years. The age of presentation is 30 years affecting two times more women than men[6,9,10].

As indicated by the "White Book on Physical and Rehabilitation Medicine in Europe"[11] among its various interventions are the physical treatments, such as those that use water: hydrotherapy (tap water)[12], balneotherapy (natural mineral water)[13] and thalassotherapy (sea or lake salt water)[14,15].

Although aquatic treatments have been widely used for the rehabilitation of patients with MS[16-22], the possible detrimental effects of heat in these patients have been long known. In 1890, Professor Wilhelm Uhthoff reported that an increased body temperature due to physical exertion could lead to transient vision loss in patients with MS due to retrobulbar optic neuritis. This effect was later coined the Uhthoff's sign and up until 1983, the hot bath test was accepted as diagnostic for MS. Besides an increased body temperature, it has since been established that the Uhthoff phenomenon and neurological decline of MS can be triggered by factors such as fever, hot meals, hot weather, menstruation, smoking and stress. For more than 100 years, the Uhthoff phenomenon defined the rehabilitation strategies used for MS. Heat therapy and physical exercise were restricted for fear of provoking a disease flare and aquatic exercises were limited to a water temperature of 30°C[12,23].

However, attitudes have since changed in response to results obtained in randomized controlled trials of progressive exercise programmes. These consist mainly of resistance training and suggest an overall improvement in disability and mobility with aerobic training. Successful results have also been obtained with rehabilitation programmes including treatment in swimming pools at temperatures around 30ºC or higher. Each rehabilitation programme needs to be designed for the specific needs of each patient[24,25].

Rehabilitation and healthy life habits have proven beneficial to maintain the quality of life of patients with MS[26,27].

Hydrotherapy has become an essential component of the rehabilitation of MS patients. Cold baths along with personal cooling devices promote local and systemic hypothermia in the MS patient. In addition, movement in water focussing on trunk mobility, postural stability exercises and body position changes have offered benefits for rehabilitating gait in these patients[28,29].

The special physical properties of water (viscosity, surface tension, density, specific heat and heat conductivity) are the basis of the hydrostatic, hydrodynamic and heat effects of hydrotherapy which have beneficial impacts in patients with MS[30].

In MS patients, aquatic exercise is generally well tolerated and serves to improve fatigue, pain, gait speed, motor actions and cardiorespiratory fitness[31].

This study assesses the scientific evidence available for functional improvements in patients with MS detected in observational studies in response to aquatic treatments compared to other therapies.

Materials and methods

For this systematic review, we identified all articles published in scientific journals from January 1, 2011 to April 30, 2016 assessing the efficacy interventions (hydrotherapy, aquatic therapy, aquatic exercises, spa therapy, balneotherapy, thalassotherapy) in patients with MS, following the indications cited in Preferred Reporting IteEM for Systematic Reviews and Meta Analyses for Protocols 2015 (PRISMA 2015)[32].

Search strategy

The aquatic treatments considered were: hydrotherapy (HT) (using tap water), balneotherapy (BT) (using natural mineral water), and thalassotherapy (TT) (using sea or salt lake water) administered via any topical individually or collectively including aquatic exercise in water.

The databases searched were PubMed, Scopus, WOS, PEDro using the keywords MS in addition to HT, BT, TT, aquatic therapy (AT) or aquatic (A). Inclusion criteria were full-text articles published in journals included in Journal Citation Reports in any language describing human studies. Case studies, letters to the editor and meeting presentations or other contributions were excluded.

Using MS/HT we found 65 articles, of which 28 were published in the study period; using MS/AT we found 80, of which 45 were published in the study period; using MS/A, we found 108 articles, of which 58 were published in the study period; using the terms MS/BT, we identified 51 articles of which only 9 were published over the period established and using MS/TT we found 2 published in years preceding the study period.

Article selection:

The first and second reviewers (IC and EV) read the titles and when possible the abstracts of all the studies found using the search strategy. Articles were considered of interest when in the title and abstract appeared the concepts of MS and any of the other search criteria HT, AT, A, BT or TT. All irrelevant articles were excluded. Complete texts of the studies were independently examined by two reviewers (FM) (FA), who gave detailed reasons for excluding or including a study following established criteria. When there was disagreement, the opinion of the other authors (OA and AA) was sought.

Quality assessment

To assess the quality of the randomized and non-randomized studies included in this review, we selected the Downs and Black scale which has shown the good reliability and internal consistency of most of its five subscales. The final question was modified in that the score of 5 points was changed to 0 or 1 point, where 1 indicates that power or sample size was calculated and 0 means that this was not done and it was not determined whether the number of subjects was appropriate for the objectives established[33,34].

This modified version of the Downs and Black scale has been validated by other authors. The total score is 28. Scores for methodological quality are expressed in percentages as follows: under 50% indicates weak; 50% - 69% fair; 70% - 79% good and 80% - 100% very good[35].

Results

Using the search strategy, 306 articles were identified, 140 published in the last 5 years of which 109 were duplicate publications. After eliminating these duplicate articles, 31 remained of which 21 were excluded: 1 letter to the Editor, 9 meeting proceedings, 1 review article, 7 articles published in journals excluded in Journal Citation Reports and

3 articles not considering the topic of interest. This left only 10 articles that fulfilled the inclusion criteria (Figure 1).

The participants of the ten studies reviewed were 400 patients with MS, 61 men and 349 women, aged 19 to 69 years. Four of the studies did not provide the age range, only mean participant age. The characteristics of the participants of the different studies are provided in Table I.

Table II shows the main symptoms and signs that were treated using this therapies were, fatigue, balance impairment, functional mobility alteration, muscle weakness, walking disorder, physical deconditioning, depression, as well as quality of life.

In 4 of these trials, aquatic treatment were supervised by physiotherapist (PT) and in 2 other by aquatic instructor.

Study designs were five randomized controlled, two simple randomized quasi-experimental, one semi-experimental, one blind controlled pilot and one pilot. Information on study design, intervention type, water or pool temperature, treatment time and conclusions may be found in Table III. Treatments and exercise programmes varied widely:

> *Aquatic exercise***.** In the study by Kooshiar et al.[36] (2015), the aquatic exercise programme consisted of warm-up, stretches, resistance, coordination, strengthening and relaxation. Kargarfard et al.[43] (2012) assessed the benefits of warm-up, joint mobility, muscular F-E, balance, postural, functional activity, intermittent gait and relaxation exercises. Salem et al.[45] (2011) tested activities focussing on joint mobility, muscle strengthening, balance, posture and functionality as well as those designed to treat functional limitations during ambulation. Aquatic exercise programmes in the studies were conducted at different temperatures 28-29.5º C, 28-30 and 31º C; two lasted 8 weeks and one 5

weeks, and in two studies sessions were conducted 3 days per week and in one study 2 days per week. Results indicated improved quality of life and fatigue.

Aquatic cycling. Bansi et al.[37,38] (2013a,b) examined the effects of cycling sessions starting with a warm-up consisting of pedalling without resistance and then incremental resistance testing until the appearance of a limiting symptom and relaxation involving pedalling without resistance. Water temperature was 28ºC and daily sessions were conducted for 3 weeks. Results indicated improved cardiorespiratory fitness, reduced fatigue, improved quality of life and increased levels of brain derived neurotrophic factor with anti-inflammatory effects.

Aquatic training and pilates. The programmes designed by Marandi et al.[40] (2013) consisted of ambulation, stretches, strength and resistance exercises, relaxation and balance and pilates (stretches, strength and nerve-muscle coordination exercises, relaxation). Programmes were completed by two different groups of participants for 12 weeks as three 1 h-sessions per week. Water temperature was not specified. Results indicated improved muscular strength in response to both programmes.

Aquatic aerobic exercise. In the two studies by Hejazi et al.[41,42] (2012a,b), subjects walked in water at 28ºC. Programme duration was 8 weeks and sessions of 55-75 min were conducted 3 days per week. Results indicated improved muscular strength and walking endurance, reduced depression and greater well-being.

Ai Chi. Created by Jun Konno in 1993, this form of exercise involves a series of continuous wide, slow movements performed without effort, Combined with deep breathing[46]. The programme used by Bayraktar et al.[39] (2013) focussed on balance, strength, relaxation, flexibility and respiratory exercises while the participants of the study by Castro et al.[44] (2011) undertook deep slow breathing exercises, wide arm, leg and core movements to work on balance, strength, relaxation and flexibility, and postural exercises. Water temperatures were 28 and 35.5 ºC. One programme lasted 8 weeks and consisted of 60 min-sessions 2 days per week, and the other was 20 weeks though session duration was not specified. Both programmes led to improvements in fatigue, balance, functional mobility and strength, pain, disability and depression.

The modified Downs and Black scale classified two of the studies, which were randomized and controlled, as very good; four as good, two of which were randomized controlled; one was blind-controlled pilot and the other simple randomized quasi-experimental. Two as fair, one randomized-controlled and the other pilot; and a further two as weak, one semi-experimental and the other simple randomized quasi-experimental. Table IV provides scores for each subscale of the modified Downs and Black scale[34]. The mean score for all the studies included was 17.3 ± 2.1, the range was 9 to 24, and maximum score was 28.

Discussion

The objective of this review was to determine the therapeutic efficacy of aquatic therapy relative to other therapies in patients with MS and to assess the scientific evidence for any impacts produced: participants, interventions, comparators and outcomes (PICO)[32].

The main justification for the aquatic treatments are the special physical properties of water as density, viscosity and surface tension, as well as its thermal properties specific heat, thermal conductivity and latent heat. These properties are the basis of the hydrostatic pressure exerting a massage effect that improves the venous circulation; buoyancy decreases real body weight improving mobility in water, It also releases the joint load and exerts a facilitating or resistance effect according to the direction of the movement effected.

On the other hand the water temperature produces hyperemia that improves nutrition and tissue repair.

The techniques of exercise in water are more frequently used in traumatic and musculoskeletal disorders, but also in some processes with neuro-motor disability[47].

Ai-Chi: It is used for its relaxing and pain relief effect due to changes in the autonomic nervous system. Improves joint mobility and joint stability, decreases the sensation of stiffness and pain, and Increases the range of motion (ROM), muscle power and endurance of the lower extremities[48].

Castro and Bayraktar used this technique with different length of treatment, measuring different parameters, except the fatigue that diminishes already at the eight weeks.

Regarding the other parameters measured: Castro et al says that it reduces pain and disability at twenty weeks. According to Bayraktar et al, increased ROM, functional mobility and muscle strength at eight weeks; this makes us assume that pain and disability should have diminish in the same time.

Aquatic exercise: Aquatic exercise consists of performing exercises performed in water, Usually in a group for therapy and rehabilitation[49].

Marandi et al and Hejazy et al agree that muscle strength increases in those patients who use this technique.

Aquatic cycling: Pedaling is a functional exercise, safe and accessible to patients; soft for the lower extremities. Inside the water facilitates and resists the different pedaling movements. At a temperature between 27 to 29 º C, improves blood circulation and reduces body temperature in the prolonged training, which represents an important effect in patients with MS. It decreases the risk of tendon and muscle injuries. It is used as a treatment in general, rehabilitation of the knee in MS and as aerobic exercise[50].

Aquatic aerobic exercise: Increases breathing and blood circulation, improves recovery speed and overall patient function.

Irrespective of the quality of each study, they all concluded that MS patients receiving some form of aquatic therapy showed improvements in one or more symptoms or functions with beneficial impacts on quality of life.

Hydrotherapy alleviated pain, improved depression and diminished fatigue and disability. Ai Chi improved balance and functional motility, reduced fatigue and improved strength. Aerobic aquatic exercise diminished depression and fatigue, increased strength and muscular resistance, improved cardiorespiratory fitness and offered an improved quality of life. No differences were observed in the benefits of pilates and aquatic training.

In seven of the ten studies, water temperature was 28-29.5 ºC and only in two were temperatures above 30 ºC employed.

The evidence that aquatic training and Pilates improved muscular strength was weak, with no differences between the two forms of exercise. Aerobic aquatic exercise improved well-being and diminished depression. There was fair evidence that aquatic exercise improved quality of life, motor function and gait speed, and diminished the physical and psychosocial domains of fatigue perception.

The evidence that Ai Chi improved balance, functional mobility and strength, fatigue, pain, disability and depression was good. Aerobic aquatic exercise improved muscular strength and walking endurance.

There was very good evidence that aquatic cycling improved cardiorespiratory fitness related to quality of life, and increased levels of brain-derived neurotropic factor with antinflammatory impacts.

There are few papers devoted to the study of applications of aquatic therapy for the treatment of different symptoms of MS patients. We also observe that from the reviewed studies the authors are repeated. On the other hand we must take into account the high cost of the necessary facilities and diffculty the transfer of the patients to it.

A further conclusion of the ten studies was that aquatic therapy can be safely used as supplementary to medical treatment in patients with MS. Further researchers should investigate other aspects as the times treatments, effectiveness and more patients.

Funding

No funding has been received for this study

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Conflicts of interest

The authors declare that they have no conflicts of interest

TITLES OF TABLES

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Table II.- Training modalities, symptoms, supervisors presence.

Table III.- Authors, study design, intervention type, water temperature, intervention time and conclusions of the studies reviewed.

Table IV.- Modified Downs and Black scale scores awarded to the studies reviewed.

FIGURE LEGEND

Figure 1.- Flow diagram showing the study selection procedure.

Table I. Characteristics of the participants of the ten studies reviewed.

Author (year), Country	Experimental group			Control group		
	Nº	Age	♂/♀	Nº	Age	♂/♀
Kooshiar et al. (2015), Irán[36]	18	19-45	0/18	19	19-45	0/19
Bansi et al. (2013a), Switzerland[37]	25	44-55	8/17	28	46-56	10/18
Bansi et al. (2013b), Switzerland[38]	25	44-55	8/17	28	44-56	10/18
Bayraktar et al. (2103), Turkey[39]	11	33-48	0/11	7	27-47	0/7
Marandi et al. (2013), Irán[40]	19/19*	NS**	0/38	19	NS**	0/19
Hejazi et al. (2012a), Irán[41]	20	37,2±9,4	0/20	20	30,4±6,5	0/20
Hejazi et al. (2012b), Irán[42]	20	35,4	0/20	20	30,4	0/20
Kargarfard et al. (2012), Irán[43]	10	33,7±8,6	0/10	11	31,6±7,7	0/11
Castro et al. (2011), Spain[44]	36	46±9,97	10/26	35	50±12,3	13/23
Salem et al. (2011), USA[45]	10	44-69	2/8	0		

*Two experimental groups; **NS: Not specified

Table II. Authors, study design, intervention, water temperature, intervention duration and conclusions of the studies reviewed.

Author (year), Country	Study desing	Intervention type Exp. group	 Control group	*t* ºC	Time	Conclusions
Kooshiar et al. (2015), Irán[36]	Randomized controlled	Aquatic exercise	Normal treatment maintained	28-29.5	8 weeks thrice-weekly 45 min	↑ QoL* ↓ Fatigue severity ↓ PPFP*
Bansi et al. (2013a), Switzerland[37]	Randomized controlled	Aquatic cycling	Ergometer - land	28	3 weeks daily 105 min	↑ Cardiorespiratory fitness ↓ Fatigue ↑ HR-QoL*
Bansi et al. (2013b), Switzerland[38]	Randomized controlled	Aquatic cycling	Ergometer - land	28	3 weeks daily 105 min	↑ BDNF* ↑ Antiinflamtory effects
Bayraktar et al. (2013), Turkey[39]	Blind controlled pilot	Ai-Chi	Home exercise programme	28	8 weeks twice-weekly 60 min	↑ Balance ↑ Functional mobility ↑ Strength, ↓ Fatigue
Marandi et al. (2013), Irán[40]	Semi experimental	Aquatic training Pilates	None	NS**	12 weeks thrice-weekly 60 min	↑ Muscular strength Pilates = Aquatic training
Hejazi et al. (2012a), Irán[41]	Simple randomized quasi experimental	Aerobic aquatic exercise	None	28	8 weeks thrice-weekly 55-75 min	↑ Walking endurance ↑ Muscular strength
Hejazi et al. (2012b), Irán[42]	Simple randomized quasi experimental	Aerobic aquatic exercise	None	28	8 weeks thrice-weekly 55-75 min	↓ Depression ↑ Happiness
Kargarfard et al. (2012), Irán[43]	Randomized controlled	Aquatic exercise	None	28-30	8 weeks thrice-weekly 60 min	↓ Fatigue ↑ QoL*
Castro et al. (2011), Spain[44]	Randomized controlled	Ai-Chi	Relaxation exercises	35.5	20 weeks twice-weekly	↓ Pain ↓ Disability ↓ Depression, ↓ Fatigue
Salem et al. (2011), USA[45]	Pilot	Aquatic exercise		31	5 weeks twice-weekly 60 min	↑ Motor function ↑ Gait speed

*QoL: Quality of life, PPFP: Physical and Psychosocial domains of fatigue perception, HR-QoL: Health related Quality of life, BDNF: Brain derived neurothrophic factor
**NS: Not specified

Table III. Modified Downs and Black scale scores awarded to the studies reviewed.

Author (year), Country	Reporting (0-11)	External validity (0-3)	Bias (0-7)	Confounding (0-6)	Power (0-1)	Total (0-28)	Percentage (%)	Classification
Kooshiar et al. (2015), Irán[36]	7	1	5	4	0	17	60,7	Fair
Bansi et al. (2013a), Switzerland[37]	10	3	5	5	1	24	85,7	Very good
Bansi et al. (2013b), Switzerland[38]	10	3	5	5	1	24	85,7	Very good
Bayraktar et al. (2013), Turkey[39]	10	3	5	3	1	21	75	Good
Marandi et al. (2013), Irán[40]	5	0	4	2	0	11	39,3	Weak
Hejazi et al. (2012a), Irán[41]	6	3	6	4	1	20	75	Good
Hejazi et al. (2012b), Irán[42]	5	0	2	2	0	9	32,1	Weak
Kargarfard et al. (2012), Irán[43]	11	1	4	4	0	20	71,4	Good
Castro et al. (2011), Spain[44]	6	3	6	4	1	20	75	Good
Salem et al. (2011), USA[45]	8	1	5	2	0	16	57,1	Fair

Table II. Training modalities, symptoms, supervisors presence.

Author (year), Country	Training modalities	Symptoms-Signs	Supervisors
Kooshiar et al. (2015), Irán[36]	Aquatic exercise	BQoL* Fatigue	Two PTs***
Bansi et al. (2013b), Switzerland[38]	Aquatic cycling	Cytokine Neurotrophin	Independent PTs***
Bayraktar et al. (2013), Turkey[39]	Ai-Chi	Balance Functional mobility Strength and Fatigue	Expert PT*** & Ai-Chi certified
Marandi et al. (2013), Irán[40]	Aquatic training Pilates	MSGS****	NS**
Hejazi et al. (2012a), Irán[41]	Aerobic aquatic exercise	Walking Physical deconditioning	NS**
Hejazi et al. (2012b), Irán[42]	Aerobic aquatic exercise	Depression Happiness	NS**
Kargarfard et al. (2012), Irán[43]	Aquatic exercise	Fatigue BQoL*	Aquatic instructor
Castro et al. (2011), Spain[44]	Ai-Chi	Pain	PT***
Salem et al. (2011), USA[45]	Aquatic exercise	MSGS****	Aquatic instructor

*QoL: Bad Quality of life, **NS: Not specified. ***PT: Physiottherapist, MSGS****: Multiple sclerosis General Symptoms

Table III. Authors, study design, intervention, water temperature, intervention duration and conclusions of the studies reviewed.

Author (year), Country	Study desing	Intervention type: Exp. group	Intervention type: Control group	*t* ºC	Time	Conclusions
Kooshiar et al. (2015), Irán[36]	Randomized controlled	Aquatic exercise	Normal treatment maintained	28-29.5	8 weeks thrice-weekly 45 min	↑ QoL* ↓ Fatigue severity ↓ PPFP*
Bansi et al. (2013a), Switzerland[37]	Randomized controlled	Aquatic cycling	Ergometer - land	28	3 weeks daily 105 min	↑ Cardiorespiratory fitness ↓ Fatigue ↑ HR-QoL*
Bansi et al. (2013b), Switzerland[38]	Randomized controlled	Aquatic cycling	Ergometer - land	28	3 weeks daily 105 min	↑ BDNF* ↑ Antiinflamtory effects
Bayraktar et al. (2013), Turkey[39]	Blind controlled pilot	Ai-Chi	Home exercise programme	28	8 weeks twice-weekly 60 min	↑ Balance ↑ Functional mobility ↑ Strength, ↓ Fatigue
Marandi et al. (2013), Irán[40]	Semi experimental	Aquatic training Pilates	None	NS**	12 weeks thrice-weekly 60 min	↑ Muscular strength Pilates = Aquatic training
Hejazi et al. (2012a), Irán[41]	Simple randomized quasi experimental	Aerobic aquatic exercise	None	28	8 weeks thrice-weekly 55-75 min	↑ Walking endurance ↑ Muscular strength
Hejazi et al. (2012b), Irán[42]	Simple randomized quasi experimental	Aerobic aquatic exercise	None	28	8 weeks thrice-weekly 55-75 min	↓ Depression ↑ Happiness
Kargarfard et al. (2012), Irán[43]	Randomized controlled	Aquatic exercise	None	28-30	8 weeks thrice-weekly 60 min	↓ Fatigue ↑ QoL*
Castro et al. (2011), Spain[44]	Randomized controlled	Ai-Chi	Relaxation exercises	35.5	20 weeks twice-weekly	↓ Pain ↓ Disability ↓ Depression, ↓ Fatigue
Salem et al. (2011), USA[45]	Pilot	Aquatic exercise		31	5 weeks twice-weekly 60 min	↑ Motor function ↑ Gait speed

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Table IV. Modified Downs and Black scale scores awarded to the studies reviewed.

Author (year), Country	Reporting (0-11)	External validity (0-3)	Bias (0-7)	Confounding (0-6)	Power (0-1)	Total (0-28)	Percentage (%)	Classification
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Salem et al. (2011), USA[45]	8	1	5	2	0	16	57,1	Fair

Figure 1.- Flow diagram showing the study selection procedure.

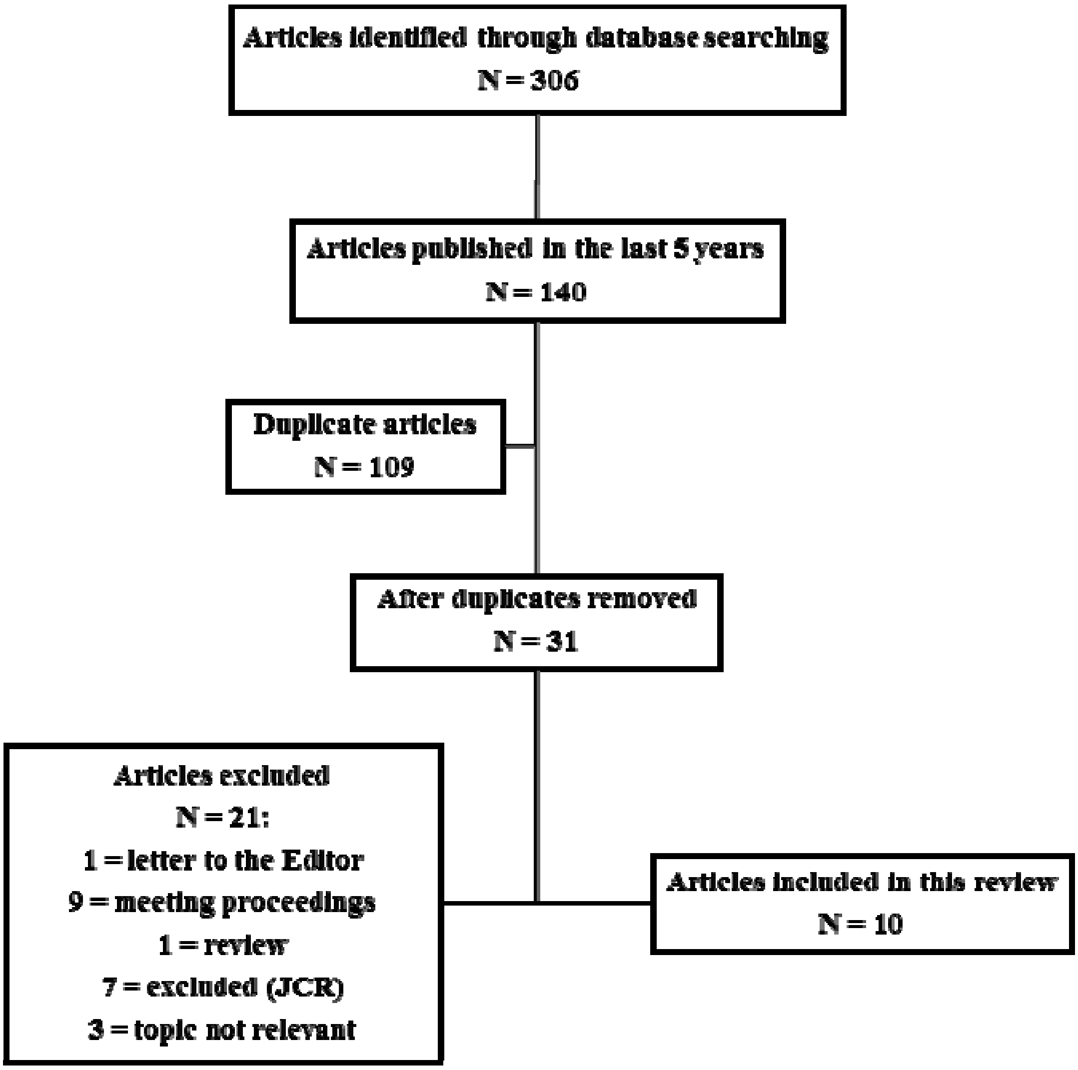

Figure 1. Flow diagram showing the study selection procedure