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## Review

# REVISIÓN SISTEMÁTICA SOBRE EL EFECTO DEL DEPORTE DE LA VELA EN LA SALUD EN PERSONAS CON DISCAPACIDAD

# A SYSTEMATIC REVIEW OF THE HEALTH EFFECTS OF SAILING ON PERSONS WITH DISABILITIES

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## RESUMEN

La vela puede ser practicada por propósito educativo, recreativo y terapéutico. Anteriores estudios han demostrado que las personas con discapacidad han mejorado su calidad de vida, la autoestima y las condiciones de salud, después de la práctica de la vela. Esta revisión sistemática suministra una panorámica sobre los efectos de la vela en la salud de las personas con discapacidad. Realizamos una revisión sistemática de la literatura científica utilizando 9 bases de datos electrónicas para la búsqueda de todos los estudios publicados en lengua inglesa del año 1997 al 2016. Una búsqueda secundaria ha sido efectuada a través de fuentes adicionales. Han sido identificados 772 artículos científicos, pero solo 6 estudios cumplieron el criterio de inclusión. Los participantes del estudio fueron adultos con graves daños mentales, lesiones de la médula espinal, daño de estrés posttraumático crónico relacionado al combate, sujetos que pertenecen a la comunidad de rehabilitación por consumo de alcohol y drogas, y niños y adolescentes con discapacidad neurológica. En el complejo, estos estudios han demostrado que los participantes han mejorado la calidad de vida, el estado de salud, la confianza en sí mismos, la habilidad social y el humor. No se han mostrado efectos adversos. Esta revisión sistemática muestra los efectos beneficiosos de la vela en personas con discapacidad. Estos resultados no pueden ser generalizados a más tipos de discapacidad a causa del número reducido de sujetos y de la gran heterogeneidad de los estudios incluidos.

**Palabras clave:** rehabilitación, minusvalía, discapacidad.

## ABSTRACT

Sailing can be practiced for educational, recreational and therapeutic purposes. Previous studies have shown that persons with disabilities improved their quality of life, self-esteem and health conditions, following the practice of sailing. This systematic review aims to provide an overview of the health effects of sailing in persons with disabilities. We conducted a systematic review of the literature using 9 electronic databases searching all English-language studies published from 1997 to 2016. A secondary search was carried out on additional sources. A total of 772 scientific articles were identified, but only 6 studies met the inclusion criteria. The study participants were adults with severe mental disorders, spinal cord injuries, chronic combat-related posttraumatic stress disorder, subjects belonging to drug and alcohol rehabilitation communities, and children and adolescents with neurological disabilities. Overall, these studies showed that participants improved their quality of life, health status, self-confidence, social skills and mood. No adverse effects were reported. This systematic review shows the beneficial effects of sailing in persons with disabilities. These results cannot be generalized to more disability type because of the small number and large heterogeneity of the included studies.

**Keywords:** rehabilitation, handicap, impairment.



## INTRODUCTION

Sport positively influences health and quality of life of subjects with different disabilities (Shapiro & Martin, 2014), reducing the risk of chronic diseases and secondary conditions (Durstine et al., 2000). It can improve the performance of daily life activities and enable subjects' integration and social inclusion reducing discrimination and marginalization (Parnes & Hashemi, 2007). The benefits of sport on the physical, mental and social sphere are particularly visible when the activity takes place in natural environments (Frumkin, 2001; Beringer, 2004). Water environments such as rivers, lakes and the sea are able to induce feelings of well-being and relaxation (Völker & Kistemann, 2011). These environments are also used in rehabilitation because their physical characteristics allow an improvement of the conditional and coordinative ability (Lopes, 2015).

The practice of sailing takes place in aquatic environments and requires a high level of physical, technical and mental abilities (Spurway et al., 2007), because of the constant need to modulate skills and strategies according to the surrounding (and often rapidly changing) environment (Sjøgaard et al., 2015). Sailing can improve self-esteem, perceived self-efficacy, physical abilities and aspects related to the subject's social sphere (Schijf et al., 2017). Its practice is also used for educational purposes (Harris et al., 1993), to foster teamwork and cohesion (Mazany et al., 1995) and interpersonal trust (Fraser et al., 2016).

Sailing is adopted in rehabilitation settings for therapeutic purposes (MacLachlan, 2017), resulting in positive effects on health in persons with disabilities (Du Moulin et al., 2013). Some health promotion interventions integrate the practice of sailing with other recreational activities, showing an improvement in the health and quality of life of persons with disabilities (Block et al., 2010) but little is known on the health effects of sailing in this context.

This study aims to systematically review the published scientific literature in order to elucidate the effects of sailing on physical, mental, social health and quality of life of persons with disabilities.

## METHODS

### Inclusion criteria

The population examined is represented by persons who have disabilities. Gender and age do not represent discriminating factors.

For disability we mean the result of a complex relationship between the health condition of an individual and the personal and environmental factors that represent the circumstances in which he/she lives (WHO, 2011). For these reasons, disability can also be understood as a limitation of the subject in carrying out tasks, activities and roles at levels provided by the physical and social contexts (Masala & Petretto, 2008).

The observed intervention is the practice of sailing. Studies that include virtual sailing experiences are also considered, as long as they include water experiences. The observed outcome is related to the quality of life, as well as the physical, psychological and social health of the subject.

### Exclusion criteria

Scientific articles that do not contain outcomes related to physical, psychological and social health but performance related outcomes (e.g. competitive sports) were excluded. All studies focusing on injuries and teaching methods were also excluded.

### Searching

In order to carry out this systematic review of the literature, we followed the PRISMA checklist (Preferred Reporting Items for Systematic Review and Meta-Analysis) (Moher et al., 2009).

The keywords used for the main search of the articles were: sailing, rehabilitation, impairment, disability, handicap and invalidity. Some variations of these keywords were identified through the Medical Subject Headings.

The databases consulted were PubMed, Cochrane Library, National electronic Library for Health (NeLH), Physiotherapy Evidence Database (PEDro), Science Direct, Scopus, Web of Science, EPPI-Centre-Bibliomap and National Institute for Health Research (NIHR). A secondary research was carried out on additional sources through a manual search of the articles that were included in the bibliography of selected articles and a search for similar articles.



We included in this systematic review all studies published in English from January 1997 to December 2016, that contain the keywords in the title or in the abstract. The type of study was not an eligibility or exclusion criterion.

### Methodological quality assessment

The methodological quality of included studies was assessed using the Downs and Black Quality Index (Downs & Black, 1998), which consists of 27 questions grouped into five sections: reporting, external validity, internal validity-bias, internal validity-confounding and statistical power. The aggregate maximum possible score is 32: the higher the value, the greater the methodological quality of the study.

### RESULTS

A total of 772 scientific articles were identified through the research strategy, but only 7 of them respected the inclusion criteria (Figure 1). The scientific articles were found in PubMed, Cochrane Library, Science Direct, Web of Science and Scopus, but no results were found in the remaining 4 databases (Table 1). The search strategies that included the term invalidity did not produce any result.

As shown in Figure 1, fifteen articles were excluded after reading the full text. Ten of these articles were excluded because they were not about sailing, four articles were excluded because they only reported brief hints to the practice of sailing, which was not the main intervention, and one study was excluded because of the investigated outcomes.

The articles included in this review describe 6 different studies, all published since 2013 (Table 2). The participants were adults with spinal cord injuries (Recio et al., 2013; Rojhani et al., 2016), adults with severe mental disorders (Carta et al., 2014a; Carta et al., 2014b), subjects belonging to rehabilitation communities for alcohol and drug addictions (White et al., 2016), persons with post-traumatic stress disorder related to combat (Gelkopf et al., 2013) and adolescents and children with neurological disabilities (Aprile et al., 2016).

Sailing was the main rehabilitative or therapeutic intervention common to all studies, with different types of intervention. In two studies (Recio et al., 2013; Aprile et al., 2016) sailing was also practiced on virtual simulators. Other studies associated sailing with other traditional rehabilitation programs and pharmacological treatments (Carta et al., 2014a;

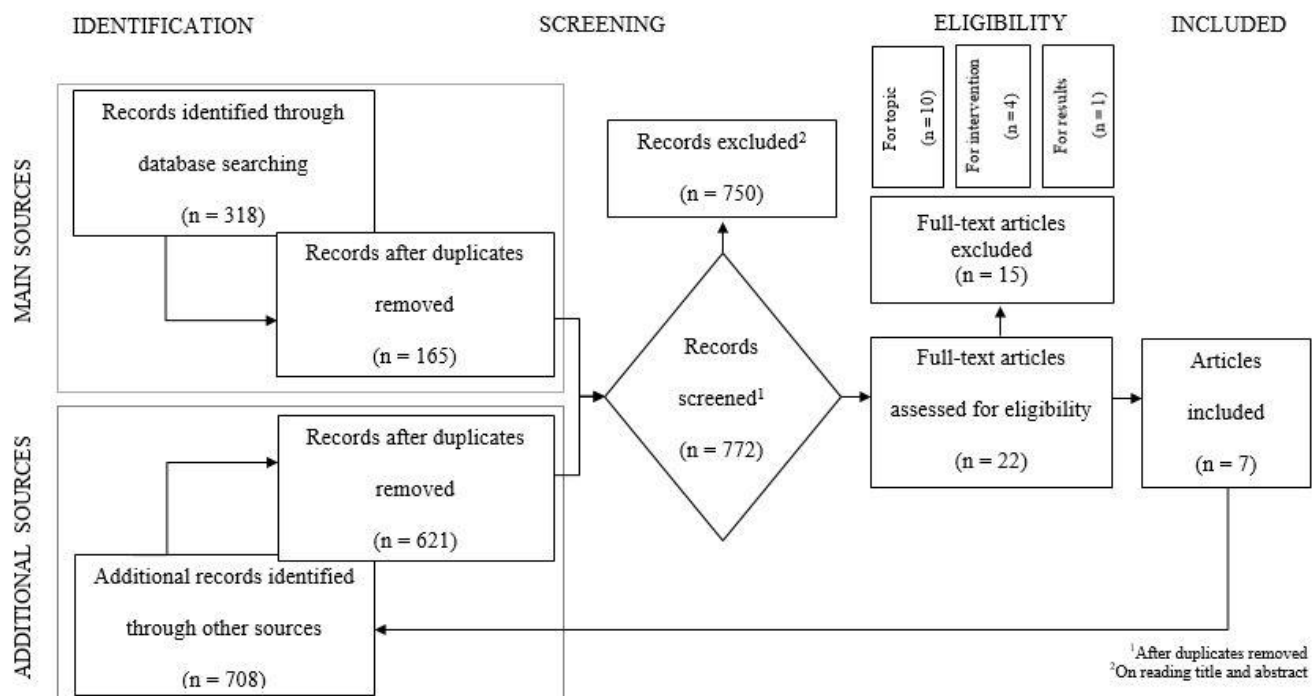


Figure 1. Flow Diagram (from PRISMA 2009 Flow Diagram, modified) describing the selection process of the studies

**Table 1.** Number of articles found for each search strategy

<b>Bibliographic database</b>									
<b>Research strategies:</b>	PubMed	Cochrane Library	Science Direct	Web of Science	Scopus	NeLH	EPPI-Bibliomap	PEDro	NIHR
Sail* AND rehabilitation	21	7	8	14	31	-	-	-	-
Sail* AND impair*	25	8	12	24	44	-	-	-	-
Sail* AND disab*	22	2	11	24	51	-	-	-	-
Sail* AND handicap*	1	-	7	3	3	-	-	-	-
Sail* AND invalidity	-	-	-	-	-	-	-	-	-
Total	69	17	38	65	129	-	-	-	-
Internal copy	10	3	5	9	15	-	-	-	-
<b>Total</b> (– № Internal copy)	59	14	33	56	114	-	-	-	-

Sail\* (sailor, sailing, sail), Rehabilitation, Disab\* (disability, disabled, disabilities, disabled, disablement), Impair\* (impaired, Impairment), Invalidity, Handicap\* (handicapped).

Carta et al., 2014b), proprioceptive platforms for the improvement of balance (Aprile et al., 2016) and other outdoor activities such as sleeping outdoors, camping, swimming, rowing, walking and social activities (Gelkopf et al., 2013). Carta et al. (2014a; 2014b) during the sailing trip included the use of a hydrophone to detect the movement and sound of cetacean flocks.

The outcomes primarily investigated were quality of life (Recio et al., 2013; Rojhani et al., 2016; Carta et al., 2014b; Gelkopf et al., 2013; Aprile et al., 2016), clinical conditions and general functioning (Carta et al., 2014a; Gelkopf et al., 2013), balance (Aprile et al., 2016), perceived control over illness, hope (Gelkopf et al., 2013), satisfaction with life, psychological distress, coping strategies, generalized self-efficacy, self-esteem and optimism (White et al., 2016). The outcomes were evaluated mostly through specific and validated questionnaires. In addition, Aprile et al. (2016) used a proprioceptive platform and Recio et al. (2013) used some physical and neurological indicators as an evaluation tool. Instead, White et al. (2016) carried out assessments through pre and post-trip interviews.

Regarding the effects of sailing, some authors have shown an improvement in quality of life (Recio et al.,

2013; Carta et al., 2014a; Carta et al., 2014b; Gelkopf et al., 2013; Aprile et al., 2016), better clinical status (Carta et al., 2014a; Carta et al., 2014b; Aprile et al., 2016) and general psycho-physical functions of the participants. However, these benefits vanished quickly after the end of the intervention in subjects with severe mental disorders (Carta et al., 2014a; Carta et al., 2014b). Improvements also concerned other aspects such as self-confidence (Recio et al., 2013; White et al., 2016), self-esteem (Rojhani et al., 2016; Carta et al., 2014a; Carta et al., 2014b; Aprile et al., 2016), social skills (White et al., 2016) and the sense of mastery in sailing (Recio et al., 2013). Some participants reported that sailing helped them gaining a positive attitude in recovery and improve their daily lives (Recio et al., 2013; White et al., 2016). Rojhani et al. (2016) also showed improved mood and sense of belonging to the community, whereas Gelkopf et al. (2013) reported improvements in the participants' daily functions, hope and disease control. No adverse effects of sailing were reported.

The average Downs and Black Quality Index value was 17.6 (range 14-22).

**Table 2.** Characteristics of the studies included

Reference	Setting	Sample	Intervention	Results	Limits
Aprile et al. (2016)	Rome (Lazio, Italy)	17 Subjects (aged 9-20 years) with neurologic disability, particularly with a coordination and balance deficit	The program consisted of 3 phases: - Virtual Technological Sailing phase: Training on virtual reality and proprioceptive platforms for 2 sessions a week for 3 months. - Theory-practice phase: theoretical lessons and practical exercises on a sailing simulator for 2 sessions a week for 1 month. - Sporting phase: Real sailing course for 2 sessions a week for 2 months	Virtual-Technological Sailing improved the balance of patients. Virtual-Technological Sailing associated with the Real Sailing course improved the quality of life (physical/ mental/ emotional/ psychological aspects) of patients	Small sample size and heterogeneity of patients' conditions
Carta et al. (2014a; 2014b)	Cagliari (Sardinia, Italy)	40 patients (aged 23-58 years) with severe mental disorders such as: schizophrenia, affective psychoses or severe personality disorders	In a cross-over trial, patients followed sailing programs every 2 weeks for 6 months in the open sea. Sailing rehabilitation was associated with pharmacological treatment in the first year, and with traditional rehabilitation programs in the second year	Sailing rehabilitation protocol was useful to improve patients' clinical status, general health, global functioning, quality of life and self-esteem. Improvements in clinical status and general functioning were time-limited. Social relations did not improve	Small sample size; the assessors were not blinded to the treatment status of the participants
Gelkopf et al. (2013)	Israel	42 subjects (aged 24-59 years) with chronic combat-related post-traumatic stress disorder	Nature Adventure Rehabilitation (NAR) was carried out for 12 months. The program was supervised by a rehabilitation psychologist and also included outdoor sleeping, camping, swimming, rowing, walking and social activities	Compared to the control group, sailing NAR determined some improvement in post-traumatic stress symptomatology, depression, social and emotional quality of life and large improvements in daily functioning, hope and control over illness	Lack of theoretical understanding of the active therapeutic ingredients; small sample size and selection bias
Recio et al. (2013)	Baltimore (Maryland, U.S.A.)	3 adults (aged 50-54 years) with chronic spinal cord injury	12-week pilot therapeutic sailing program using the VSail-Access sailing simulation system (1 session/week) followed by on-water experience	The subjects improved their quality of life, self-confidence, sense of mastery for sailing and had a sense of optimism about the future	Very small number of participants
Rojhani et al. (2016)	Baltimore (Maryland, U.S.A.)	1 subject (aged 27 years) with complete tetraplegia	The participant completed an adapted sailing introductory course with instruction on the sip and puff sail and tiller control mechanism, followed by two experiences on water	The participant noticed an improvement in mood, self-esteem, sense of belonging to the community, and the desire to return to adaptive sailing. He was able to demonstrate improved function about the activity	Not reported





White et al. (2016)	England, Wales and southern Scotland (United Kingdom)	11 subjects (aged 26-64 years) belonging to drug and alcohol rehabilitation communities	Participation in a five-day sail training voyage	Subjects reported improvement of social skills. Greater confidence in the resurgence of their recovery path from alcohol and drugs and their daily lives was also reported by some participants	Small sample size and self-selection of participants in the training experience
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## DISCUSSION

This systematic review of the English-language scientific literature showed that the evidence of the health effects of sailing on disabled individuals is limited, with only 6 studies present in the main biomedical bibliographic databases. These studies showed improvements in participants' health and functional status, self-confidence, social skills and quality of life. However, there were major differences in the type of intervention as well as a large heterogeneity in the population investigated, with study participants suffering from different health conditions and diverse disabilities. Most studies used self-reported data, whose validity is questioned in some settings (Atkinson et al., 1997).

All studies were published from 2013 onwards, which indicates a recent and growing interest in this topic in the scientific community. A review of the literature on sailing and sports medicine published in 2006 described the importance of implementing safety measures in order to prevent injuries among persons with disabilities who sail, but did not consider the health effects of sailing in this population (Allen & De Jong, 2006). A further study assessed different modalities to help blind sailor locate the position of a boat on an auditory and tactile map (Simonnet et al., 2010). We identified two other studies, which were excluded from this review because they were published in languages other than English (Dabov & Berc, 2013; Hegemann, 1991). Both studies confirm that the practice of sailing may have a positive impact on physical and psychological health, promoting better integration (Dabov & Berc, 2013) and better social adaptation (Dabov & Berc, 2013; Hegemann, 1991) in people with physical disabilities (Dabov & Berc, 2013) and behavioral disorders (Hegemann, 1991).

On water activities can also improve social relations and provide a feeling of equality to able-bodied subjects (Pearn & Franklin, 2013). These benefits

were also reported in a recent (non systematic) review on the topic (MacLachlan, 2017).

This systematic review is subject to some limitations. Firstly, the large heterogeneity of disabilities and interventions examined did not allow us to make a summary estimate of the health effect of sailing. Nonetheless, we were able to give an overview of the effects of sailing in different populations with disability. Secondly, since we searched studies published in English, some publications may have been missed. However, the inclusion of studies published in English is a sort of guarantee of the validity of their findings, because English-language journals have a greater visibility, and consequently more rigorous peer-review processes, than journals published in other languages.

## CONCLUSIONS

In association with other therapies, sailing can contribute to the improvement and maintenance of the functional abilities of persons with disabilities. It can induce a psychological and physical improvement of the subjects, having a positive impact on their autonomy and quality of life. However, these results cannot be generalized because of the small number of studies available in the English-language scientific literature. The heterogeneity of interventions and participants examined represent a further limitation in the generalization of these results.

It is necessary to deepen the study of the health effects of sailing in the rehabilitation field, investigating outcomes related to the psycho-physical, social and quality of life sphere of persons with different disabilities. Practitioners in the field of disability may benefit from the publication of evidence-based guidelines and intervention protocols.



## DECLARATION OF INTEREST

The authors report no conflict of interest.

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