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Sports Practice and Motor Imagery to improve the quality of life in Patients with Multiple Sclerosis

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Abstract

La sclerosi multipla, chiamata anche sclerosi a placche, è una malattia cronica demielinizzante, che colpisce il sistema nervoso centrale. E' dimostrato, nei soggetti con sclerosi multipla che oltre ai programmi di riabilitazione codificata, si possono affiancare svariate attività sportive, ovviamente adattati alla disabilità del paziente.
Inoltre, accanto all'attività fisica ed allo sport, per migliorare la disabilità e la qualità della vita di questi pazienti si può associare l'immagine motoria.
Nella ricerca sportiva l'uso delle immagini da parte dell'atleta è stata valutato con interesse durante la riabilitazione dopo un incidente o durante e dopo un periodo di allenamento. Studi scientifici hanno riportato effetti positivi delle immagini riguardanti le intenzioni cognitive, motivazionali e di guarigione degli atleti.
Sulla base di tali premesse noi abbiamo valutato gli effetti dell'applicazione dell'immagine motoria a soggetti con sclerosi multipla affetti da disturbi motori, che praticavano o non praticavano sport. I dati riportati in questo studio suggeriscono che c'è un potenziale per l'applicazione dell'immagine motoria nella terapia fisica, specialmente per il miglioramento dell'equilibrio nei soggetti con sclerosi multipla.

Multiple sclerosis, also called multiple sclerosis, is a chronic demyelinating disease that affects the central nervous system. It is shown, in the subjects with multiple sclerosis that in addition to the codified rehabilitation programs, it is possible to combine various sports activities, obviously adapted to the patient's disability.
In addition, alongside physical activity and sport, the motor image can be associated to improve the disability and quality of life of these patients.
In sports research, the use of images by the athlete was evaluated with interest during rehabilitation after an accident or during and after a period of training. Scientific studies have reported positive effects of the images regarding the cognitive, motivational and healing intentions of the athletes.
On the basis of these premises we have evaluated the effects of the application of the motor image to subjects with multiple sclerosis affected by motor disorders, who practiced or did not practice sports. The data reported in this study suggest that there is potential for the application of motor image in physical therapy, especially for the improvement of balance in individuals with multiple sclerosis.

Keywords

Sports Practice; Motor Imagery; Quality Of Life; Multiple Sclerosis

Pratica Sportiva; Motor Imagery; Qualità della Vita; Sclerosi Multipla

Introduction

Multiple sclerosis (MS), also called multiple sclerosis, is a chronic demyelinating disease that affects the central nervous system. The etiology of multiple sclerosis is still unknown. Research has developed in three main directions: genetic studies (1,2), virological studies (3-6) and immunological studies (7-10). None of them gave results that would allow us to fully understand what the cause of the disease might be.

The disease often affects individuals between the ages of 20 and 40, although the onset of childhood and adolescent disease (before age 15) and after age 50 becomes more common. Clinically, the onset of MS is determined by a recurrent, immune-based inflammatory process that causes damage to the myelin, Such demyelination phenomena are disseminated in the white matter of the central nervous system (CNS), encephalous and spinal cord (11).

The symptoms at the onset of the disease are very variable and can occur singly or in association, in an acute, subacute or slowly progressive form. They can co to learn fatigue (12), intestinal disorders (13), pains of variable intensity, dysarthria and dysphagia and in the most severe and chronic forms, urinary disorders (14). The motor disorder, with involvement of one or more limbs, is the most frequent in cases with late onset: it manifests itself by a reduction in muscle strength of various entities.

There has been a long controversy between Physical Activity (PA) and MS in the past with the fear of increasing fatigue and potentially causing relapses. The results of recent studies have shown that physical activity does not worsen MS (15,16). On the contrary, beneficial effects were found (17).

In several European countries the PA is also included in the term "sport". However, we must make a distinction between PA and sport. PA is defined by "any bodily movement produced by skeletal muscles that results in energy expenditure" (18). This includes the activity of daily life, like sport, but also work or leisure. Sport is a PA that also includes competitions and use of rules.

The primary objective of the PA in MS is to avoid the effects of a sedentary lifestyle (19-22). In these patients it is important to promote the PA to fight fatigue and other symptoms and to also improve disability and quality of life (QOL).

The first guidelines for the practice of PA in MS were published in 1999 (23). Two types of exercises were then used alone or in combination: resistance training program and muscle strengthening. In addition to codified rehabilitation programs, sports activities can be added. Several studies have shown that the practice of sports such as yoga (24), Tai Chi (25), pilates (26), acqua Gym (27), (very useful thanks to the decrease in gravity movements are easier and the physical effort more sustainable), riding (28), kickboxing (29), climbing (30) and dancing (31) can be practiced freely as it is possible to practice most sports without bans. They must be adapted to the disability of the patient who must have personalized support provided by professionals.

Besides physical activity and sport, motor image can be associated to improve the disability and quality of life of these patients. This can be defined as "the ability for a subject to mentally represent an action without producing movement"

New rehabilitation approaches have been identified, such as, for example, robotics (32), rehabilitation in virtual reality (33), and motor image (34).

The motor image can be defined as "the ability for a subject to represent mentally an action without producing movement "and as a dynamic state during which a subject mentally simulates a certain action it follows that the use of the motor image can be used fruitfully in rehabilitation. Functional Magnetic resonance imaging, PET and other research tools have shown that movement does not end in muscle contraction or activation of the motor area, but begins much earlier, requiring an organization that from time to time must be elaborated on the base of the prediction of the motor act to be performed. The use of the motor image has its origin in

the psychology of sport and behavioral psychology at the end of the 19th century. It consists, as we have already mentioned, in trying out a known motor act without any visible muscular contraction or motor power (35).

In sports research the use of images by the athlete was evaluated with interest during rehabilitation after an accident (36), or during and after a training period (37). Driediger et al. (36) reported positive effects of the images regarding the cognitive, motivational and healing intentions of the athletes.

Based on these premises, we have evaluated the effects of the application of the motor image to subjects with multiple sclerosis affected by motor disorders, who practiced or did not practice sports.

1. Materials and Methods

Recruitment of patients

Patients of the research project were recruited after medical examination only if they presented a score in the Expanded Disability Status Scale (EDSS) from 0 to 4.5. In addition, patients who fell within the following criteria were admitted to this study:

- not having participated in a rehabilitation program for problems arising from multiple sclerosis;
- between the ages of 18 and a maximum of 40;
- multiple sclerosis in the non-acute phase;
- sufficient linguistic skills to understand the tape.

FURTHERMORE, With these characteristics, six subjects were selected:

- three who had not performed any physical activity intended as a sport;
- three subjects performing sport (kickboxing constant but not competitive).

As reported in table 1 the following evaluation was performed on the patients Unilateral Stance Test (unilateral positioning test - ULST); Tandem Stance Test with eyes open (tandem positioning test with open eyes - TSTEO); Tandem Stance Test with eyes closed (Tandem positioning test with closed eyes - TSTEC); Romberg; Sharpened Romberg (Romberg Sensitized); Bird-dogging (BD); Tandem walk (TW) and Tinetti Balance Assessment Tool (TBAT).

Taping Motor Imagery

To all the patients enrolled (who had slight balance problems), before starting the study, several tests were performed, repeated three times on three consecutive days, calculating the average of the results obtained, as reported in table 2. Subsequently, it was said to the patients who practiced sport to perform their usual sports exercises for a week at least 3 times a week. Patients who did not practice any sport were asked to perform activities such as sitting and standing up, walking, etc. for the same time. At the end of the session of physical activity the patients were given the tape telling them to listen to him twice a day. The tape contained a first part describing relaxation exercises and a second part describing hydrokinetic facilitation exercises. Patients were not allowed to physically practice any of the activities mentioned in the tape. Every ten days patients were evaluated by the parameters in table 2 to establish possible improvements over time.

2. Results

After the first ten days of listening to the tape all six patients on physical examination showed no perceptible change in the range of motion, sensation or strength. Coordination seemed to have improved slightly in quality but quantitative measurements had not changed much. At this stage no measurements related to equilibrium were made.

Only after 60 days the patients asserted that their balance had improved and this sensation was confirmed by a slight improvement in the measurements of the balance results compared

to the initial ones. This improvement was more important for the 3 patients who practiced sport on a regular basis.

Table 3 shows the comparison between the average values obtained by patients at the beginning and at the end of the rehabilitation program.

3. Discussion

The patients at the end of the study said they had a feeling of better control of their motor skills, and the ability to participate in a pro-active therapy program was psychologically important for people suffering from multiple sclerosis.

This disease is devastating and gives patients the feeling of having their bodies completely out of control also, due to the perceived fatigue, it does not allow them to participate in the exercise in the way they would like.

Furthermore, it would seem that adding to the physical activity also the sporting practice side by side with the motor imagery provides many beneficial effects on balance, fatigue, mobility and quality of life.

Many sports psychologists, who use the motor image, spend a lot of time studying the most appropriate and effective application of this technique. It may therefore be useful to apply the principles of sports psychology to physical therapy in individuals with multiple sclerosis.

The methodology of this study could be improved with measurements made by a therapist different from the one who followed the patients and, probably, observing patients during the course of daily motor gestures could improve the formulation of the contents of the tape.

Although with many limitations due to the examination time and the use of a limited number of patients, this study suggests that there is potential for the application of the motor image in physical therapy, especially for the improvement of balance in subjects with multiple sclerosis.

Surely this application, to patients suffering from multiple sclerosis, requires further studies.

Studies performed by adding control groups, as described in the project, are needed to further evaluate the utility of the motor image as primary intervention and/or as additional intervention.

Physical therapy has done little to understand the impact that the motor image has on physical improvement. With patients with high levels of fatigue, which hinder extensive physical practice, motor image can be an alternative method of motor practice.

Table 1: Initial Evaluation of the systems of Physical Therapy

SYSTEM	EVALUATION
PERCEPTION	Vigilant and oriented towards the person, space and time Follows simple and complex commands correctly Mini-Mental State Test 30/30
FLEXIBILITY	ROM within normal limits
MOTOR CONTROL	Evaluation of strength at the Manual Muscle Test 4+ - 5/5 for all major muscle groups Coordination at the limit at all four ends

VISION	Intact vestibulo-ocular reflex Intact fields of vision Normal pursuits and convergence points
SOMATO SENSATION	Evaluation of intact proprioception

Table 2: Assessment of Equilibrium in Initial Physical Therapy

TEST	SUBJECTS NOT PERFORMING SPORT	SUBJECTS PERFORMING SPORT
Unilateral Stance Test (ULST)	Right = 5 sec Left = 5 sec	Right = 7 sec Left = 7 sec
Tandem Stance Test with eyes open (TSTEO)	Sec = > 60	Sec = > 60
Tandem Stance Test with eyes closed (TS-TEC)	Sec = 30	Sec = 40
Romberg	Sec = > 60	Sec = > 60
Sharpened Romberg	Sec = > 60	Sec = > 60
Bird-dogging (BD)	Conducted with the right upper extremity = 45 sec Cunducted with the left upper extremity = 45 sec	Conducted with the right upper extremity = 50 sec Cunducted with the left upper extremity = 50 sec
Tandem Walk (TW)	6 consecutives steps	8 consecutives steps
Tinetti Balance Assesement Tool (TBAT)	12/16	13/16

Table 3: Comparison between the average values obtained by patients at the beginning and at the end of the rehabilitation program

TEST	SUBJECTS NOT PERFORMING SPORT		SUBJECTS PERFORMING SPORT	
	INITIAL MEASURES	FINAL MEASURES	INITIAL MEASURES	FINAL MEASURES
Unilateral Stance Test (ULST)	Right = 5 sec Left = 5 sec	Right = 10 sec Left = 10.5 sec	Right = 7 sec Left = 7 sec	Right = 15 sec Left = 15.5 sec
Tandem Stance Test with eyes open (TSTEO)	Sec = > 60	Sec = > 60	Sec = > 60	Sec = > 60
Tandem Stance Test with eyes closed (TSTEC)	Sec = 30	Sec = 35	Sec = 40	Sec = 58
Romberg	Sec = > 60	Sec = > 60	Sec = > 60	Sec = > 60
Sharpened Romberg	Sec = > 60	Sec = > 60	Sec = > 60	Sec = > 60
Bird-dogging (BD)	Conducted with the right upper extremity = 45 sec Conducted with the left upper extremity= 45 sec	Conducted with the right upper extremity= 50 sec Conducted with the left upper extremity = 50 sec	Conducted with the right upper extremity = 50 sec Conducted with the left upper extremity= 50 sec	Conducted with the right upper extremity= 58 sec Conducted with the left upper extremity = 59sec
Tandem Walk (TW)	6 consecutives steps	9 consecutives steps	8 consecutives steps	13 consecutives steps
Tinetti Balance Assesement Tool (TBAT)	12/16	13/16	13/16	15/16

The time for all tests was calculated with a digital stopwatch

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