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CLINICAL REVIEW OF PHYSICAL THERAPY INTERVENTION FOR ATAXIA

Grygus I., Romanyshyn M.

NATIONAL UNIVERSITY OF WATER MANAGEMENT AND NATURE RESOURCES USE

Key words: physical therapy, ataxia, rehabilitation intervention, physical therapy specialist.

Słowa kluczowe: fizjoterapia, ataksja, interwencja rehabilitacyjna, specjalista terapii fizycznej.

Abstract. In the article the clinical activity of a physical therapist for patients with ataxia. Analyzed the causes of ataxia, physical examination of patient and rehabilitation interventions in this pathology. Ataxia – (from the Greek α - [means denying] and $\tau\acute{\alpha}\xi\iota\varsigma$ order) means a violation of the coordination of voluntary movement, is a neurological symptom. Ataxia is a non-specific clinical manifestation, which indicates that the dysfunction of the nervous system, namely the ability to co-ordinate voluntary motions (for example, cerebellum).

Codes of the International classification of functions, disability and health (ICF): b750 (Motor reflex functions), b755 (Involuntary movement reaction functions), b760 (Control of voluntary movement functions), b765 (Involuntary movement functions), b770 (Gait pattern functions).

Various means of physical therapy efficiency are confirmed by international surveys of scientific and evidence-based practice, namely: approaches to improve proprioceptive, measures to improve balance, vestibular exercises, approaches to minimized limb ataxia and the use of supportive aids. Separately considered rehabilitative interventions to improve gait in patients with ataxia.

Conclusion. The on top of mentioned elements of the physical therapy intervention to help the physical therapist to reduce signs of ataxia and minimize the limited opportunities, which arises as a result of this dysfunction.

PRZEGLĄD KLINICZNY TERAPIĄ FIZYCZNĄ PRZY ATAKSJI

Grygus I., Romanyshyn M.

NARODOWY UNIWERSYTET GOSPODARKI WODNEJ I WYKORZYSTANIA ZASOBÓW NATURALNYCH

Streszczenie. W artykule klinicznej aktywności terapeuta fizycznego dla pacjentów z ataksji. Analizowano przyczyny ataksji, fizycznego badania pacjenta i rehabilitacji interwencji w tej patologii. Ataksja – (z greckiego α – [oznacza zaprzeczanie] i aby $\tau\acute{\alpha}\xi\tau\varsigma$) zespół objawów określających zaburzenia koordynacji ruchowej ciała. Stanowi jedną z manifestacji wielu chorób centralnego układu nerwowego. Ataksja jest niespecyficznym objawem klinicznym który wskazuje, że zaburzenie układu nerwowego, mianowicie zdolność do koordynowania ruchów dobrowolnych (na przykład, mózdzek).

Kodeksy Międzynarodowej klasyfikacji funkcjonowania, niepełnosprawności i zdrowia (ICF): B750 (funkcje motorowe reflex), B755 (funkcje ruchy mimowolne reakcji), b760 (funkcji control dobrowolnych ruchowych) , b765 (funkcje mimowolna ruchowa), b770 (funkcje wzorzec chodu).

Różne środki sprawności terapii fizycznej są potwierdzone przez międzynarodowych badań naukowych i praktyki opartej na dowodach, a mianowicie: metody poprawy propriocepcji, środki w celu poprawy równowagi,

ćwiczenia, przedsiönkowego podejścia do minimalizacji ataksja kończyn i stosowanie wspomagających środków pomocniczych. Osobno proanalizowano rehabilitacyjne interwencje w celu poprawy chodu u pacjentów z ataksji.

Wnioski. Z powyżej wspomnianych elementów terapią fizyczną pomoże fizycznej terapeuta zmniejszyć objawy ataksja, zminimalizować ograniczone możliwości, które powstaje w wyniku tej czynności.

Statement of the problem. Ataxia – (from the Greek α - [means denying] and τάξις order) means a violation of the coordination of voluntary movement, is a neurological symptom. Ataxia is a non-specific clinical manifestation, which indicates that the dysfunction of the nervous system, namely the ability to coordinate voluntary motions (for example, cerebellum). The term “dystaxia” it is rarely used synonym. Every year on 25 September is the international day of awareness regarding ataxia.

According to the National Foundation of ataxia (National Ataxia Foundation founded in 1957) causes ataxia can be: head injury, stroke, brain tumors, structural violations (the formation of the cerebellum before birth), severe viral infections, the effect of some drugs and toxins (alcohol, anticonvulsants), cardiac arrest and respiratory system [7]. Also, this authoritative organization draws attention to the fact that today there is no medical drugs, which treat the cause of ataxia or of its manifestation. Intervention for ataxia includes attraction specialists of physical therapy, occupational therapy and speech therapists.

The prevalence of ataxia is different in different countries (in the UK as a whole, there are 10000 people), however, the highest prevalence in the environment of French-Canadians and southern Italians. Unfortunately, Ukraine

does not have the statistical reporting forms on this dysfunction. Manifestations of ataxia appear in the age interval from childhood to the age of 60.

Codes of the International classification of functions, disability and health (ICF): b750 (Motor reflex functions), b755 (Involuntary movement reaction functions), b760 (Control of voluntary movement functions), b765 (Involuntary movement functions), b770 (Gait pattern functions).

The aim of the article is to consider the physical therapy intervention for ataxia.

The analysis of last researches and publications. If there ataxia patient (which is manifested in violation of coordination, violations of posture control, balance and moves) physical therapy directed to the improvement of postural control, namely, the postural stability, accuracy of movements of limbs, as well as of the progress.

The vast majority of clinical reviews of scientific-evidence-based practice indicate bad described rehabilitative intervention in ataxia in randomized trials that it is difficult to repeat in a clinical setting.

National rehabilitation encyclopedia [1] indicates that the goals of physical therapy can be briefly described as follows:

1. Improve balance and postural reactions from external stimulus, and gravity changes.
2. Refinement and improvement of postural stabilization as a result of the stabilization of the joint.
3. Development of the functions of upper extremities.
4. To the development of independent and functional moves, improving the quality of life of the patient due to the increase of the independence of the patient while performing daily activities.

The basic principles of physical therapy intervention [2]:

1. Throughout the program intervention exercises should be practiced deliberately as at the first, and at later stages, they must work up to automatism.
2. Exercises should move from the simple to the complicate.

3. Individual exercises should be made first with the open eyes, and then closed.

4. After reaching the proximal stabilization, it is necessary to focus attention on the coordination of movement in the distal segments.

5. Methods of compensation, support tools and special equipment should be used in case of need.

6. The intervention must be supported by appropriate home exercise program.

For physical therapy interventions it is important to identify the program, which will be suitable for the patient and meet its needs, to achieve the desired goal. This can be achieved through the use of relevant measurements and methods of examination and analysis of the obtained results. Measurements and observations is an important not only in terms of the development of the corresponding programs of interventions, but also in the evaluation of the following changes in the condition of the patient during the period of rehabilitation.

The issue of standardization of assessment, measurement and evaluation is one of the most controversial aspects of the neurological rehabilitation. For today we have developed over methods for the examination of the balance, than for coordination.

Let's consider the most used.

Table 1. Methods of Balance Assessment

Assessment Tool	Purpose of Tool
External Perturbation Test - Push and Release test (Jacobs et al. 2006, Valkovic et al. 2008)	Static balance
External Perturbation Test - Pull test (Hunt&Sethi 2006, Munhoz et al. 2004, Horak et al. 2005)	Static balance in different sensory conditions
Clinical Sensory Integration Test (Smania et al. 2008, Chaudry et al. 2004)	Dynamic balance in different sensory conditions
Sensory Integration Test of Computerised Dynamic Posturography (Mirka&Black 1990, Jackson et al. 1995, Cham et al. 2006)	Static and dynamic balance
Static and Dynamic Posturography (Mohan et al. 2008, Federica et al. 2008, Buatois et al. 2006)	Static balance
Single Leg Stance Test (Soyuer et al. 2006, Mann et al. 1996)	Static balance
Functional Reach Test (Martin et al. 2006, Jacobs et al. 2006)	Functional static and dynamic balance
Berg Balance Scale (Yelnik&Bonan 2008, Ryerson et al. 2008, Enberg et al. 2008)	Functional static and dynamic balance
Five Times Sit to Stand Test (Buatois et al. 2008)	Functional dynamic balance and gait
Time Up and Go Test (Zampieri& Di Fabio 2008, Vereeck et al. 2008)	Gait and functional dynamic balance
Dynamic Gait Index (Herman et al. 2008, Chang et al. 2008)	Dynamic balance and gait
Tandem Walking (Ravdin et al. 2008)	Dynamic balance
Four Square Step Test (Blennerhassett&Javalath 2008)	Dynamic balance

Also in as additional assessments may be used scales of daily activity: index Bartel or FIM©.

The program of physical therapy interventions is prepared from the interpretation of the measurement and assessment results. The contents of the treatment program can vary depending on the type and characteristics of ataxia. For instance, while approaches which improve proprioception and incorporate visual aids are used more commonly in patients with sensory ataxia, stabilization training is more important to reduce truncal and extremity ataxia in patients with cerebellar ataxia. The patient with vestibular ataxia should be given habitation exercises in order to reduce vertigo, and also vestibulo-ocular, vestibulo-spinal reflexes should be stimulated to improve balance. In some cases, a problematic condition which requires the use of a number of approaches, such as mixed ataxia, may arise. In such cases, the experience of the physiotherapist and the patient's effort plays an important role in determining the program.

Approaches for improving proprioception. The aim is to increase proprioceptive input by mechanically stimulating the joint surfaces, muscles and tendons, and decreasing postural instability by improving body awareness. There are many approaches that can be used for this purpose. These are: Proprioceptive Neuromuscular Fascilitation (PNF), rhythmic stabilization, slow reversal techniques (Adler et al. 2000, Gardiner 1976), resistive exercises (DeSouza 1990, Arai et al. 2001), use of Johnstone pressure splints (Armutlu et al. 2001), gait exercises on different surfaces (hard, soft, inclined surfaces) with eyes open and closed, plyometric exercises (Risberg et al. 2001), balance board-ball and minitrampoline exercises (Diracoglu et al. 2005).

Recently, vibration has been a frequently used application. Vibration can directly be applied to the muscle and tendon, and also is applied by exposing the whole body to vibration (Schunfried et al. 2007, Hatzitaki et al. 2004, Semenova 1997).

Another method is the suit therapy. The suit is made up of a vest, shorts, knee pads and special shoes attached by using bungee type bands that are used to correctly align the body and provide resistance as movements are performed. Its major goals are to improve proprioception (sensation from joints, fibers, and muscles), and to increase weight-bearing for normalized sensory input regarding posture and movement (Semenova 1997).

Activities for improving balance. Firstly, the proximal muscles and stabilization of the trunk should be improved (Edwards 1996). For this purpose, it is appropriate to use the mat activities of the PNF techniques. Following the neuro-developmental order, the patient should be trained to come to the bridge position from lying on the back, onto the forearms from lying face down, to crawl, and to come onto the knees, half knees and into a sitting position, and to establish static and dynamic stability in these positions. Initially, the patient should be maintained in the required position by approximation and verbal directions, and then static stabilization should be strengthened through external perturbation (pushing and pulling in different directions). Afterwards, the patient should be trained in these

positions for weight transferring and functional extension so as to be prepared for dynamic stabilization. Subsequently, the patient should be trained in positions in which the support surface is narrowed or the center of gravity is changed in order to make the balance activities difficult. (e.g. establishing balance on two or three extremities in the crawling position or shifting the center of gravity upwards by the elevation of the arms in the sitting-on-the-knees position) (Addler et al. 2000).

Vestibular exercises. Since dizziness accompanies balance dysfunction in vestibular problems, repetitive head movements and Cawthorne and Cooksey exercises (Dix 1979) are of great importance. A vestibular exercise program consists of repetitive, progressively more difficult, eye, head and body movements designed to encourage movement and facilitate sensory substitution. Many components of this exercise program are used by physical and occupational therapists today (Ribeiro et al. 2005, Corna et al. 2003, Jauregui-Renaud et al. 2007, Brown et al. 2006).

Approaches to extremity ataxia. Exercises designed for the treatment of extremity ataxia are utilized to provide fixation by establishing balance between the eccentric and concentric contractions within the multi-joint movements of lower extremities and the upper extremities in particular. For this it is necessary to correctly install the stabilization and perform the movement slowly.

Recommend the implementation coordination exercises Frenkel (Freenkel's coordination exercises). Although it is noted that these exercises, as PNF© are effective only in cases of slight ataxia extremities. In the most severe cases are more effective rhythmic stabilization and a combination of isotonic methods.

Use of supportive aids. In cases which restorative physical treatment applications are insufficient, use of supportive devices enables the patient to function more easily within his present functional level. In cases of severe ataxia, suspending weights from the extremities and the use of weighted walkers can be preferred (Gibson-Horn 2008).

Conclusion. The on top of mentioned elements of the physical therapy intervention to help the physical therapist to reduce signs of ataxia and minimize the limited opportunities, which arises as a result of this dysfunction.

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