

MOTOR ACTIVITY IN CHILDREN WITH ADHD: A BRIEF REVIEW

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Abstract

In the treatment of Attention Deficit Hyperactivity Disorder (ADHD), which is among the cases of Special Educational Needs (SEN), scientific literature indicates a potential role of exercise. The effects of physical activity, movement and sport act on the reduction of the main symptoms of ADHD, also improving executive functions. In this contribution, we offer a brief overview of the potential that exercise has in improving the symptoms of ADHD, both in the short term and in the long term. In fact, it has been found that the positive effects observed after acute aerobic exercise are promising, while there are still few and insufficient studies related to long-term physical intervention, although in both cases there are benefits, in general, for the person.

Nel trattamento del Disturbo da Deficit di Attenzione e Iperattività (ADHD), che è tra i casi di Bisogni Educativi Speciali (BES), la letteratura scientifica indica un ruolo potenziale dell'esercizio. Gli effetti dell'attività fisica, del movimento e dello sport agiscono sulla riduzione dei principali sintomi dell'ADHD, migliorando anche le funzioni esecutive. In questo contributo, offriamo una breve panoramica del potenziale che l'esercizio ha nel migliorare i sintomi dell'ADHD, sia a breve che a lungo termine. Si è infatti riscontrato che gli effetti positivi osservati dopo l'esercizio aerobico intenso sono promettenti, mentre sono ancora pochi e insufficienti gli studi relativi all'intervento fisico a lungo termine, sebbene in entrambi i casi ci siano benefici, in generale, per la persona.

Keywords

SEN; Motor Activity; ADHD.

BES; Attività Motoria; ADHD.

Introduction

The SEN, an acronym for Special Educational Needs, are part of those forms of special emergencies that in today's society are becoming increasingly important, also accentuated by the globalization of relations, which, by highlighting the needs of disadvantaged groups, made them necessary for integration and inclusion. There was therefore an urgent need to think of shared solutions, forms of action «whose effectiveness is predictably linked to their correct insertion in a just and shared cultural planning» (Cammisuli, 2016): pedagogy has therefore assumed a fundamental importance in achieving the goal of inclusion. The disadvantaged groups that need inclusive project actions are defined in the school “SEN” or subjects that have special educational needs, because they are disabled, or people whose “diversity” is cultural (such as immigrants) or because they experience situations of discomfort due to family problems, economic problems, etc. The acronym SEN appears for the first time in the Ministerial Directive of 27 December 2012 (“Intervention tools for pupils with special educational needs and territorial organization for school inclusion”) and in the subsequent Ministerial Circular n. 8 of 6 March 2013 (supplemented by MIUR note No. 1551 of 27 June 2013). The SEN category includes all the remaining cases in which «it is the responsibility of the school to identify and plan them» (Cammisuli, 2016, p. 102) therefore, in addition to pupils covered by Law 104/1992 on disability and those covered by Law 170/2010 on Specific Learning Disorders (SLD), all those with deficits relating to the cognitive sphere, language, motor coordination can be represented, attention, etc.

The Law, therefore, invests the school institution of a large responsibility, already at the stage of identification of the SEN, which in some cases can be particularly serious, even for the co-morbidity with other diseases, thus requiring, the assignment of the support teacher, as required by Law 104/92. The SEN cases also include children with ADHD who, because of the lesser severity of the disorder, do not obtain the certification of disability, but have the same right to see their educational success protected. There is therefore a need to extend to all pupils with Special Educational Needs the measures provided for by Law 170 for pupils and students with Specific Learning Disabilities. Pupils with economic, linguistic and cultural handicaps also fall into the category of SEN. The Directive, in this regard, recalls that “each pupil, continuously or for certain periods, can manifest Special Educational Needs: either for physical, biological, physiological or even for psychological, social reasons, with respect to which it is necessary that schools offer adequate and personalized response”. These types of SEN must be identified on the basis of objective elements (e.g. a report by social services operators), that is, well-founded psycho-pedagogical and educational considerations. For the SEN, the same measures are not adopted for cases covered by Law 104 (for example, the assignment of a support teacher), but, as was already the case for the categories covered by Law 170, there is provision for the school to take charge, which implements a different pedagogical approach towards these subjects, based on the creation of personalized study paths. Thus, the right to personalization and individualization of the learning paths enshrined in Law 53/2003 and Legislative Decree 59/2004 is extended to all students in difficulty.

The ADHD syndrome, falls within those cases in which it is necessary to provide a personalized response of the training, as the student presents a special educational need, therefore being counted in the category of the SEN. The acronym ADHD (Attention-Deficit/Hyperactivity Disorder) establishes a “symptomatic” picture represented by behaviors considered dysfunctional, in most cases, based on inattention, impulsivity and motor hyperactivity. From the historical point of view, it takes the place of the already approved “hyperactive child syndrome”, referred first to the “minimal brain damage”, until the end of the 1960s, and then to the “minimal brain disorder” (minimal brain dysfunction, present in DSM III, 1984) finally, transformed into ADHD, not to confuse it with different symptoms or causes due to damage, or brain dysfunction. Despite this, these dysfunctional behaviors, are the subject of controversy for several reasons and to date there is no scientific and approved etiopathogenesis, as well as there is no known drug therapy.

For the reasons described, in the contemporary international scenario, the dominant data of ADHD are different and depend on the statistical procedures of investigation, the analysis of the collected data and especially on the geographical context in which the research was carried out. The different definitions of ADHD also contribute to accentuating the variables of results. Thus, there is considerable variability in the general levels of knowledge and specific misconceptions in the countries under con-

sideration. It has been seen, however, that although knowledge predictors of ADHD varied considerably between countries, some form of vocational training and previous knowledge of ADHD was associated with more information in most countries. In fact, the criticality that emerges from the application of different protocols of history and therapeutic intervention is highlighted in the study “Syndrome of Deficit of Attention with Hyperactivity (ADHD): Critical comparison between two diagnostic protocols” by Salmaso et al., (2012), in which it is highlighted that: in the international scene, the prevalence data of ADHD vary according to the diagnostic criteria used, as there is no common and shared diagnostic algorithm. So, at the expense of ADHD syndrome and its definitions, there is a huge difference between different countries.

In this context, what can provide a valuable help is certainly the comparison between the protocols of the various countries, in order to find a common line in the treatment of cases of subjects suffering from ADHD syndrome. The onset of the disease, which usually occurs around the age of three, presents symptoms not related to specific function deficits, but to problematic behaviors and is manifested both at home and in the school context. The big difficulty lies in the diagnosis also because initially the discrimination to understand if you are in the presence of such a disorder, it is precisely the parents, who in some cases notice problematic behaviors of their children, in others even minimize the scope. Through the study of the respective analysis protocols have emerged points of similarity and difference, but that could be integrated into a single protocol, to be a blueprint for a tool to search for a safe and more standardized diagnostic process for ADHD, but also to give certainty to the behaviors derived from them. In fact, the application of the term “syndrome” for ADHD is questionable for the objective clinical examination, not performed identically and for which the behavior is considered “not adequate” mainly by parents and teachers, the first to report to doctors the difficulties encountered, and also why, the use of adverbs such as, often and easily, accompanied by adjectives such as excessive or too much, being present in the description of the behavior, make the evaluation of the highlighted behaviors subjective. Therefore, the necessary etiology of the objective findings of the signs, so defined (semiotic framework), is urgent. It is therefore clear that Attention Deficit/Hyperactivity Disorder (ADHD) is one of the most common neurological developmental disorders diagnosed in childhood, with symptoms that continue in adolescence and adulthood (American Psychiatric Association- APA 2013), making it fundamental, proper drug treatment to avoid greater consequences.

Exercise in relation to ADHD treatment

Recent studies have shown that exercise can be proposed as an alternative or additional treatment for ADHD and in particular for children, it has proven to be a safe and effective method of managing the symptoms of ADHD, showing beneficial effects, not only on cognition but also on behavior (Gapin, et al. 2011), both in terms of cardiovascular activity, such as running, cycling, dance and exercise on the treadmill, both for a physical activity such as yoga and tai chi (Field, 2012).

Another classification of exercise is based on the duration of the effects, which are considered immediately after physical activity as acute, or chronic, that is, effects that remain even after a long period of rest. It is known that the overall positive effects of sport and movement in general, improve physical fitness, growth, bone mineral density, and also prevent obesity and inflammation (Field, 2012).

The authors Sibley & Etnier (2003) have also observed, both in the acute and chronic phase, the effects of cardio and non-cardio activity, on perceptual skills, intelligence, academic performance, level of development and sound language improvements, as well as mathematical tests on children and adolescents (4-18 years). The benefits of physical exercise are more marked when greater cognitive effort is required, requiring actions of awareness of cooperation, anticipation of the demands of tasks and strategic thinking as in team sports, compared to exercises that do not require cognitive involvement. Such actions, put in place such mechanisms that produce beneficial psychological and cognitive effects, such as an increase in vagal activity, pain relieving and also anti-depressant and activating neurotransmitters such as serotonin and decreasing stress hormones (Field, 2012).

Analyses

In spite of most of the studies on cardio exercises, for the treatment of ADHD, it has found improvements on the cognitive functions of subjects affected by this syndrome, such as the speed of information processing, attention, inhibition and flexibility (Chang, et al., 2012), however, such work did not come to an unambiguous and coherent result. This inconsistency in results may be related to different qualities of methodological study, but it can be said that cardio exercise has beneficial effects on a wide range of cognitive and behavioral functions in children with ADHD.

As anticipated in the introduction, the mechanisms of cognitive processing and the phases of thought that are necessary for the purpose of performing the movement, in the prolonged exercise in time, probably involve an empowerment, neural growth and development that may have long-term implications (Bolduc, et al., 2013), recording an increase in catecholamines and specific proteins/enzymes that are typically reduced in ADHD such as, dopamine, tyrosine hydroxylase and neurotrophic factor derived from the brain, (Chang, et al., 2012). In fact, according to the latter, this can be explained by an improvement induced by cardio exercise in favor of attention and positive influences on the dorsal lateral prefrontal cortex (DL-PFC). Interestingly, such improvements in memory are found, even in healthy adults, after acute cardio exercise. Physical exercise, therefore, acts as a stimulant, with an increase in neurobiological effects (increased availability of monoaminergic catecholamines in the brain (Fritz and O'Connor 2016), resulting in better functioning in overlapping areas of cognition. In conclusion, the advantages of exercise, in the treatment of ADHD, are really many: exercise is combined with all therapeutic protocols, including drug treatment, it is inexpensive, non-invasive and easy to implement, has additional health benefits (for example, potential prevention of chronic diseases and obesity) and can improve psychological well-being (Warburton et al. 2006), even with only 30 minutes of daily exercise.

ADHD and physical activity carried out for research purposes

<i>Type of Exercise</i>	<i>Custom Duration</i>	<i>Authors</i>
Exercise group: aerobic, muscular and motor skills exercises	40 minutes in first 4 weeks and 50 minutes in last six weeks; 3 days a week	Ahmed & Mohamed, (2011)
Gymnastic playground activities (i.e. sliding, climbing, swinging)	1 minute; recurring over 5 days)	Azrin, et al. (2006)
Moderate intensity water aerobic exercise and perceptual motor water exercise and cool down afterwards	90 minutes; 2 days a week	Chang, et al., (2014)
Aerobics exercises such as running and jumping rop	90 minutes; several days a week	Choi, et al., (2014)
Walking, alternatingly in a park and 2 urban settings respectively a downtown and a residential area	20 minutes per walk	Faber Taylor, A., &Kuo, F. E. (2009)
On a chair that was ascended on a vibrating platform	15 minutes; 3 times a day on 10 consecutive day	Fuermaier, et al., (2014b)
Exercise condition: Cycling at 65 % VO ₂ peak	20 minutes	Fritz & O'Connor, (2016)
Moderate to vigorous physical exercise (e.g., biking, skateboarding)	30-60 minutes daily	Gapin & Etnier, (2010)
Physical exercise: Tai Chi, training of postures	30 minutes; 2 days a week	Hernandez-Reif, et al., (2001)
Combination of running, goal-directed throwing, rope jumping and rest	90 minutes; 2 days a week	Kang, et al., (2011)

Combined intervention of sports and behavioral techniques. The exercise Intervention was comprised of vigorous physical exercise in individual sport such as relay races	30 minutes, weekly	Lufi & Parish-Plass, (2011)
Exercise group: sessions of yoga exercise	6- 20 minutes; once a week for 6 weeks	Maddigan, et al., (2003)
Various high-intensity exercise sessions (e.g., forms of running and jumping	60 minutes; 5 days a week	McKune, et al., (2003)
Simulated developmental horse riding program in combination with moderate-vigorous fitness training	90 minutes, weekly	Pan, et al., (2014)
Moderate-vigorous physical exercise such as moving around, hopping, running	30 minutes daily; 8 weeks	Smith, et al., (2013)
Treadmill exercise	5-25 minutes	Tantillo, et al., (2002)
Exercise group: aerobic, muscular and motor skills exercises, cool down afterwards	45 minutes; 3 days a week	Verret, et al., (2012)
Cycle ergometer (varying intensity levels	20–30 minutes	Wigal, et al., (2003)
Specific, moderate vigorous physical exercises; focus on ball handling, manual dexterity and balance	60 minutes weekly	Ziereis & Jansen, (2015)

Conclusions

As the analyzed studies differ greatly in many aspects, namely by study design, type of cognitive tests used, measurement results, types and duration of operation and sample size, it was difficult to directly compare them. They also examined samples of children and adolescents between the ages of 5 and 18, not considering the fact that, the symptomatology of ADHD and cognitive functions change with age and individual development. While the approach to studying the effects of exercise on ADHD is correct, a more effective and standardized methodology must be found to support the results. It is therefore important, on the one hand, to identify the most effective type of exercise for the treatment of ADHD symptoms in clinical practice, on the other hand to evaluate the different effectiveness of cardio exercise compared to non-cardio, as well as the duration of acute effects against chronic. Second, future studies should include groups and establish control conditions that exercise to assess the true effect of training, to be checked with tests and re-tests. In addition, tests must be carried out on a greater number of subjects with different cognitive, behavioral/socio-emotional and physical styles. Finally, future studies should consider the importance of the interaction of exercise with drug treatment to examine possible complementary and/or different effects. Thanks to the promising results and the beneficial relationship with the implementation of exercise (e.g. inexpensive, easy to apply, health benefits) future research should focus on organizing a protocol that clearly and unambiguously defines the type of physical exercise (running, yoga, etc.) the intensity, frequency, duration and the reference sample. Only through the standardization of physical exercise and the application of a reliable protocol with pharmacological integration, will it be possible to guarantee a positive result in the treatment of ADHD symptoms.

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