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BMI Effects on Childhood Motor Skills

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Abstract
Introduction: The development of Motor Skills (Fine and Gross) during childhood is considered essential and very important considering them as „building blocks" of their motor development. Educating early motor skill competences are mediatory for children helping them to easily perform different daily movements and more complex influencing on providing an active lifestyle. But unfortunately, the motor skills in obese children seem to be limited as a result of having difficulties controlling their posture during different daily movements. Postural control plays an important role almost at every type of movements, especially over those which are directly influenced by this capacity in the biomechanical aspect. **Aim:** The goal of this review paper was to investigate the relationship between BMI and Motor Skills in children. Through this study, we wanted to provide other important scientific reasons about the necessity of obesity prevention since childhood period as mediatory of a better lifestyle. **Methodology:** To successfully realize this review paper we studied and analyzed the contemporary scientific literature provided by various Internet-based research sectors such as „Jab Ref" „Pub Med" „Google Scholar" „Medline" „Sports Discuss" and „Research Gate". **Results:** The results have shown that obese children manifested limited „Gross" Motor Skills, which are identified mostly in those motions that BMI negatively impacted on their execution affecting especially their dexterity. This limited situation regarding gross motor skills at obese children result because of difficulties that they have to manage their heavyweight and to keep balance during performing. Unfortunately, the relationship between *fine motor skills and BMI* continues to be unclear because there are few studies

analyzing this relationship and different testing protocols used by them to identify it. **Conclusion:** At the end of our study, we can say that despite the diverse evidences, BMI may negatively affect especially those Motor Skills (fine & gross) when body weight makes it difficult to maintain balance during motion execution reducing postural control. One of the most important conclusion after all of this review we can strongly emphasize that Physical Activity must be part of everyone daily life for a healthy lifespan. In addition, for obese children, physical activities are mediatory in order to lose weight influencing postural control improvement and better motor skills.

Keywords: obese and overweight children, motor skills development, fine & gross motor skills.

Introduction

To provide a normal motor development for young generation means a lot for them, facilitating the execution of daily life activities and integration in different experiences. Therefore, it is important to motivate more and more our children towards the development of motor competencies focusing on the diversity and accuracy of these abilities. The sedentary lifestyle, as the latest trend of modern life, has negatively affected the normal motor development reducing also the possibility to provide diverse motor abilities among children. Unfortunately, these limited motor competences among young generation are consequences of obesity caused by the lack of physical activities *(Castetbon K and Andreyeva T., 2012)* There are many studies that recently are focused on analyzing the correlation between BMI and Motor skill based on the essential importance of motor skills among children and the increased prevalence of childhood obesity. *(Gortmarker et al., 1993; Lopes et al, 2012; Kumanyika, S, 2001)*

The aim of our study was the identification of scientific data about the impact of BMI on Motor Skill development on children because of the prevalence of obesity detected even at Albanian children. Detecting this correlation will be another negative health issue caused by obesity, which means that the prevention of it is immediately necessary in order to promote the wellbeing among children.

Motor skills are considered essential for better children development because of the positive influence on self-confidence and social relationships. Unfortunately, these motor competences appear limited among children because of inactivity created by the time spent with electronic games keeping them away from many active funny games (outdoor or indoor games). *(Markola et al., 2016)* Gross motor skills, including movements that are productions of big muscles contraction such as walking, running, standing, are the first motor skills that develop among childhood. Furthermore, the sequence of motor skills development continues with fine motor skills such as catching and keeping, keeping and throwing and many other motor abilities that are products of small muscles contraction. Fine motor skills are the ones that give a child the ability to handle or manipulate small objects while Gross Motor Skills are important for more complex tasks where coordinating and maintaining balance during their performance is important. *(Adolph & Berger., 2006)* It is important to emphasize the necessity of developing Gross Motor Skills because of its effects on the physical development of our child. *(Price & Greeen, 2016)*

Unlike the „Gross" Motor Skills which are the first who develop, Fine Motor Skills appears later and more exactly when children are able to use their smaller muscles, such as hand and feet muscles. *(Greutman H., 2017)* Fine Motor Skills are identified as one of the most important motor abilities for a better daily life because they help children to perform different actions like writing, holding small objects, wearing clothes, eating, using scissors, using computer keyboards, manipulate different objects etc. These fine motor competences except coordination ability, as a mandatory requirement, requires even precision which is another very important component that determines the success of such fine movements. *(Amundsen & Weil, 2001)*

However, it is important to note that in order to ensure a smooth development of Fine Motor Skills, the Gross Motor Skills should be developed too as these skills affect one another demonstrate with ease, and above all with precision. *(Gesell & Amatruda, 1947)*

There are many researches about the consequences of obesi-

ty showing the negative impact of it on health, psychosocial and physical aspects limiting also motor abilities reducing quality of daily life activities. Excessive body weight complicates the ability to move easily affecting negatively the balance control ability which is important and essential for the development of motor skills. *(Teasdale et.al, 2013; Daniels S.R, 2006)*

Since the „balance" is the basic requirement for almost all the daily life motions and the difficulties that obese children have to control balance, becomes the cause of the accuracy and dexterity reduction. This is the reason why an increased BMI, by causing problems with the ability to control balance during performing, may negatively affect also the accuracy and dexterity of different motor patterns. *(Browning, R.C, 2012)*

There is a study about the correlation between BMI and Motor Skills realized in 2004 that identified that obese children could perform every action according to the test protocol but their performance resulted slower than their peer group with normal weight. *(Graf C, et al., 2004)*

This result has been shown even in 2009 from the study of *Deforche* who determined that obese children because of their difficulties to perform fast are less likely to be part of such sports or physical activities where jumps are the most frequent actions. *(Deforche et al., 2009)* Unfortunately, avoiding obese children from various physical activities can further contribute to maintaining excess body weight and even further accumulation of body fat. *(Parsons et al., 1999)*

For our study, it is interesting to analyze the study of *Hills and Parker* who studied the influence of BMI on the model of walking over 20 children (10 with normal weight and 10 obese) aged 8.5-10.9 years old. They registered the model of walking for about 10 meters in three ways 1) in a normal, slower way (10% slower than normal walking) and walking fast (30% faster than normal walking). From this study it turned out that obese children were significantly slower where the relative speed of walking was low and they spent more time during a supportive phase and two supporters. It was also noted the difficulty of walking where dexterity and

rhythm of steps were reduced to obese children compared to normal weighted peers. *(Hills & Parker, 1991)* These data resulted even by *McGraw and his colleagues* in the 2000. *(McGraw et al., 2000)*

This negative correlation between BMI and postural control limiting Motor Skills development (Gross and Fine) is detected even by *Teasdale in 2007*, who determined the necessity of reducing body weight on obese children in order to affect their motor abilities by improving both, fine and gross motor skill development. *(Teasdale et al., 2007)*

The delay of motor skills development at obese and overweight children is also detected even from the study concluded during 2017 from two authors *Abdelgawad and Moustafa*. They, after analyzed 75 children age with mean age 15 ± 2.1 months, determined not only the impact of BMI on motor skills development emphasizing that motor developmental appears delayed among overweight and obese children. They also declare the importance of obesity prevention during infancy as necessity to reduce the motor developmental delays in obese and overweight young children. *(Abdelgawad H.A and Moustafa M.M. 2017)*

The same results were detected even by *Berrigan* and his colleagues in 2008 about obesity and its negative influence on motor skill. Part of their study was also the identification of Physical Activity impact on improving reduced motor skills in obese children. They showed great efficacy of losing weight because it was associated with postural control improvement affecting speed and precision of motor skill performance. *(Berrigan et al., 2008)*

This positive effect of losing weight on motor skill improvement is clearly identified even by D'hondt and his colleges in 2011. They detected that the reduction of BMI as result of physical activities was associated by motor coordination and postural control improvements. *(D'hondt et al, 2011)*

There are data indicating that the relationship between BMI and Motor Skill varies from the type of actions selected to the test. Based on these, researches have shown that the relationship was detected more significant especially at those movements that body

weight plays a key role in their performance such as hopping and jumping. *(Castetbon K and Andreyeva T., 2012)*

According to D'hont, because of the lack of studies about fine motor skills and BMI impact, the relationship between BMI and Gross Motor skill is clearer than with fine motor skills.

Despite that, this lack of data showed the absence of these relationships because the selected actions of tests to evaluate fine motor skill development at obese children exclude the impact of BMI on their execution. *(D'hont et al 2008)*

The variety of data that resulted from our review about the relationship between Motor Skills and BMI is the result of various protocol of tests used to assess the Motor Skills, the small number of actions used to analyze „fine and gross" motor skill at obese children and various age groups where studies are based.

Methodology

To successfully realize this review paper we studied and analyzed that contemporary scientific literature that deals more closely with *the effect of overweight or obesity (BMI) on the performance of motor skills in children* and *the importance of physical activity to improve impaired motor skills in children with high body weight (overweight or obese)*. This literature was provided by various Internet-based research sectors such as „Jab Ref" „Pub Med" „Google Scholar" „Medline" „Sports Discuss" and „Research Gate".

Conclusions

After a detailed analysis of refereed researches, we noticed a variety of data related to the correlation between BMI and Motor Skills, where most of the studies are focused more on the examination of BMI impact on Gross Motor Skill than on Fine Motor Skills. At the end of the study, we noticed that most of the studies determine the negative impact of BMI at motor proficiency. Fur-

thermore, excessive body weight seems to have a greater impact on gross motor skills particularly on those gross movements that BMI affects negatively by reducing the dexterity to perform such gross movements as *running, jumping, walking*.

Based on these results we can conclude that the negative impact of BMI on some of the „Gross" motor skills may be the consequence of the biomechanical changes that the obesity causes, making difficult its execution and the ability to perform such movements with agility. In addition, obese children compared to those with normal weight show limited performance of gross motor skill because of less postural control and the difficulties to maintain their balance during a performance which unfortunately is negatively compromised by excessive body weight.

The data about the impact on fine motor skills aren't as clear as the evidence is about gross motor skills and the cause of it is the lack of researches made due to these skills.

In conclusion we noticed that there are two different results of fine motor skills and BMI such as:

- There are studies that have identified and support that BMI can reduce the development of fine motor skill at children. These studies are focused on the examination of those fine movements where the postural control component is essential for their performance and as it is known obese children have difficulties to perform movements where keeping balance is necessary for the execution of fine motor skills.
- But there are also studies that exclude the negative impact of BMI on the development of fine motor skills. These studies determine that obese children can perform fine motor skills as easily as a normal weight child can because during tests are such fine moves where maintaining the equilibrium is not necessary for a good performance.

In conclusion, we emphasize that the variety of data is the consequence of different actions used testing fine and gross motor skills and the different age group where each of the refereed studies is focused.

Despite the diversity noticed in our study, we came to the conclusion that:

- BMI may adversely and negatively affect Motor Skills development, emphasizing that the negative effect of BMI occurs particularly at those movements (*fine or gross*) that overweight hamper the performance of any movements, because of its biomechanical consequences.

It is very important to present that there are many studies proving the necessity of physical activities among obese children emphasizing its impact on losing weight influencing positively motor skills development improving the ability to maintain equilibrium. These studies that prove this positive impact of physical activities on obese children with reduced motor skills, unfortunately, have no practical recommendations of training programs used by them.

Based on the results of our paper, we recommend that:

- Obesity should be one of the most important and immediate health issues for the new generation in order to minimize the reduced mobility that an obese child can manifest in his daily life activities and in different physical activities.
- We should pay more attention to the normal development of Fine and Gross Motor Skills as they are essential for later development of more complex and specialized movements that children need to competently participate in different games, sports or creative activities.
- Further studies are needed to be carried out regarding intervention programs recommendations to improve Motor Skills in Obese children, in order to minimize the reduced mobility of obese children.

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