EVALUATION OF DYNAMIC BALANCE AND STABILITY IN OBESE CHILDREN VERSUS NON OBESE CHILDREN

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Abstract:
Background: Childhood obesity and overweight are being called serious epidemics and global issues that are increasing, according to health organizations. If children are overweight, they may have trouble moving around and this can cause problems with their bones and joints. The goal of this study was to compare how well obese kids and non-obese kids can balance while moving.
Patients and Methods: 30 kids were taken. 15 people who were not overweight (BMI less than 25) were chosen as a control group, while 15 overweight people (BMI greater than 30) were chosen as an experimental group. Their balance was measured using the Biodex Balance System, and scores for overall stability, front-back stability, and side-to-side stability were obtained at level 6 of stability. **Results:** The average scores for OA, AP, and ML were much higher among the experimental group (obese children) compared to the control group (non obese children). The research showed that overweight children have trouble with keeping their balance and staying stable compared to kids who are not overweight.
Conclusion: We found that being very overweight affects how well obese children can keep their balance.
Key words: Obesity, Children, postural equilibrium, balance.

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INTRODUCTION

Obesity is strongly linked to high blood pressure, diabetes, heart disease, knee arthritis, and respiratory problems (1–2).
Walking is a good and popular way to exercise, but it can also be a source of the physical forces that connect with being overweight (3).
Obesity changes the shape of the body by making some parts bigger and affects how the body moves during everyday activities (4).
Obesity puts more stress on your body when you walk, and this stress gets worse as you walk faster. If this is true, then telling people to walk fast to lose weight might actually make them more likely to get injuries in their muscles and bones (5).
Having a high body mass index (BMI) is generally not bad for the body's ability to move, but being obese can increase the chance of falling and getting hurt afterwards (6).
When we have too much weight, it puts extra pressure on our bones, joints, and soft tissues. This can cause problems with how our muscles and bones work together (7).
These problems with balance, walking, strength, senses, and nerves make a person more likely to fall.
Multiple studies have discovered that obese individuals walk slower and take shorter and fewer steps compared to non-obese individuals. Additionally, obese individuals spend more time with their feet on the ground during each step and have a longer time when both feet are in contact with the ground. (8).
De Vita and his team discovered that overweight adults have a straighter back when they walk at a normal speed, compared to adults who are not overweight. This is because their knees and hips don't bend as much (8)
This position helps overweight people stay stable by preventing their weight from shifting too far forward, which is common in obesity. This reduces the effort needed to stay balanced (8).
Spyropoulos and his colleagues suggest that people who are obese need to walk slowly, take smaller steps, and stay in a balanced position for longer in order to maintain their balance. Additionally, obese individuals tend to have a wider step width while walking, which gives them a larger base to support their balance (9).
Surprisingly, there have been very few studies on how being overweight affects the stress on your body when you walk. (10).

This study wanted to see if there was a difference in balance between children who are overweight and children who are not overweight.

MATERIALS AND METHODS

This study involved 30 children who were randomly selected and placed into two groups. The children were between 10 and 13 years old. There were 15 children who were not overweight and 15 children who were overweight.

A group of 15 people who are not obese was used as a control group, while a group of obese people was used as the experimental group.

The study included children who could stand and walk without help and could move all of their body parts freely.

Children with neuromuscular diseases, contractures in their lower limbs, or any visual impairment were not included in our study.

We measured basic things about people's bodies like how much they weigh, how tall they are, and their BMI.

BMI is a number that is figured out by dividing the weight of a person by their height squared. The weight should be in kilograms and the height should be in meters.

According to the World Health Organization (WHO), a body mass index (BMI) between 18. 5 and 24.9 is normal weight, a BMI between 25 and 29. 9 is overweight, and a BMI of 30 or higher is considered obese.

Procedure:

All the kids went to one test and they were taught about the tests beforehand.

Balance testing

Dynamic balance parameters, such as front-back (AP), side-to-side (ML), and overall stability, can be measured using the Biodex Balance System. This system is a tool used for screening and training in order to improve balance. It is made by a company located in Shirley, New York, USA.

The Biodex Balance System has a platform that can move and tilt in different directions. It can tilt up to 20 degrees and can move in a full circle.

The system has different levels of stability. The most stable level is 8 and the least stable level is 1.

The Biodex proprioceptive protocol was used while in a standing position.

The kids didn't have shoes and were told to look at the screen in front of them. They had to try to keep the cursor in the middle of the screen while standing on a wobbly platform that was pretty unstable (level 6).

STATISTICAL ANALYSIS

Data calculation used SPSS version 23. We used a test called unpaired t-test to see if there was a significant difference in balance between non-obese children and obese children, p value considered significant if was less than 0.05.

RESULTS

Table 1: Stability indices for the non-**obese** children group versus obese children group at stability level six.

Stability Index (SI) Level six	$\bar{x}$ ±SD		T value	Sign.
	Non obese children	obese children		
Overall stability index	2.57 ± 1.74	4.67±0.54	0.000	P<0.05
Anteroposterior stability index	1.26 ± 1.34	3.88±0.38	0.000	P<0.05
Mediolateral stability index	1.77 ± 1.36	3.65±0.64	0.00 0	P<0.05

Balance testing parameters are presented in Table 1.

In table (1), the average stability indices for normal children and obese children at stability level six were as follows:

Overall stability index

The average stability index for normal children at level six was 2. 57 ± 174, while for obese children it was 4. 67 ± 054.

Anteroposterior stability index

The average values of stability for normal children were 1. 26 ± 134, while for obese children it was 3. 88 ± 038 at stability level six.

Mediolateral stability index

The average values of how stable children were during side-to-side movements were compared between two groups: normal-weight children and obese children. At a stability level of six, the average value for normal-weight children was 1. 77 ± 136, while the average value for obese children was 3. 65 ± 064**.**

Table 2: Subject's characteristics.

Subjects	n	BMI (kg/m^2)	Weight (kg)	Age (year)
Non obese children	**15**	20.92 ± 1.43	39.20 ± 5.09	11.6 ± 0.3
Obese children	**15**	25.50 ± 2.78	57.76 ± 10.15	12.0 ± 1.2

Values are means ± standard deviation. *P<0.05; **P<0.01.

The average BMI for the normal children group was 20. 92 with a variation of 1. 43, while for the obese children group it was 36. 54 with a variation of 0. 23 The average age of normal children group was 11. 6 years (with a small range) and the average age of obese children group was 12. 0 years (with a larger range).

DISCUSSION

Being very overweight is the biggest danger for knee osteoarthritis. Combining exercise and changes in diet seems to be the most effective way to fight the obesity problem (12).

Obese people have more difficulty moving and doing tasks compared to those who are not obese (13).

Our research showed that overweight children have worse balance and posture compared to children who are not overweight. This was demonstrated by higher average values of stability indices measured using the Biodex balance system at level six of stability.

Our research had the same findings as another study in which authors found that people who are obese have worse balance and lower test scores compared to people who are not obese (14).

Another study found that people who are overweight are more likely to experience falls and have difficulty keeping their balance compared to those who are not overweight. (15)

Higher levels of obesity have been found to have a strong connection with problems with maintaining balance, even in young people.

The people in the study improved their balance after losing weight and doing exercises to improve their balance (16).

In our study, we discovered that obese children have more balance problems than non-obese children. This was shown by higher Stability index values for obese children compared to non-obese children, specifically at stability level six.

Children who are very overweight are more likely to have problems with falling down. The most significant impact of body weight on increased pressure in obese individuals was observed in the arch of the foot and under the toes. (17)

Obese children have more pressure on their feet when they stand compared to obese men. This might be because the ligaments in their feet are weaker (18).

Obesity changes the shape of the body by adding weight to different areas and affects how the body moves during everyday tasks (4).

It seems that when obese children gain weight, they become unsteady in their posture.

Conclusion:

We found that being overweight affects the ability to balance in children who are obese.

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