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Research Article

Obesity

SPATIAL-TEMPORAL PARAMETERS OF OBESE & NON-OBESE, FEMALE CHILDREN DURING WALKING

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Obesity is one of the leading health complications in the world, one of the most serious public health challenges of the 21st century it effect on every system of human body, locomotory system. The present study is a quantitative study, which was designed to investigate the variations of selected gait parameters between obese & non-obese females aged between 12-14 years. The whole sample consisted of 50 subjects with equal number of obese (50) and non-obese (50) females. The subjects were instructed to run across a pre-designed walkway at their maximum speeds. During this, they were filmed using high-resolution cameras. The criterion measures of interest were spatial parameters. Conclusion: the Step and Stride length of non-obese females is higher than obese females of same age category.

Keywords: Obesity, Non Obese, Locomotery System

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Introduction

The World Health Organization (W.H.O) considers obesity in childhood as "one of the most serious public health challenges of the 21st century". Obesity is defined as the excess of body fat. This definition may vary depending on the region however in Western countries such as U.S and in many European countries it is defined by body mass index (BMI). The BMI is calculated by dividing the weight over the square of height. If the BMI is higher than 30 kg/m2 that indicates the obesity. Kopelman, P.G. (2000). Under that range is classified as overweight, average weight and underweight depending on values Walking is the most Activity in our daily life, and thus, increasing the daily number of steps in children and adolescents has received considerable attention for combating the obesity epidemic. Obesity is known to be associated with biomechanical alterations in the gait pattern, which may predispose children and adolescents with overweight or obesity (OW/OB) to short- and long-term musculoskeletal disorders (MSKD). From early childhood, OW/OB has been associated to the development of various MSKD (i.e., musculoskeletal pain, injuries and fractures) which may be extended to adulthood with notable consequences with regard to physical disability, quality of life and healthcare economic costs. Among other suggested explanations, increased joint loads, together with biomechanical alterations during loco-motor tasks, may be underlying the higher prevalence of MSKD in this population Kopelman, P.G. (2000).

Walking is an important skill and it makes a big difference in how one's life turns out. Walking doesn't come automatically, from a young age we struggle to crawl – and then we crawl everywhere we can. Next, we try pulling ourselves to stand at a table leg, at father's leg, at the stair steps. We grunt and push and pull and fall and roll and bump, then try again and keep it up over and over again, and never quit in spite of face-falls and nose bruises – all because we want to be what we feel, persons come to be by walking (Hills, A.P., & Parker, A.W. 1991. Locomotion (walking and running) is the most common of human movements. It is one of the more difficult movement tasks that we learn, but once learned it becomes almost subconscious. The sole purpose of walking and running is to transport the body safely and efficiently Across the ground (Winter, 1984). Gait is very different between individuals and also varies from step to step within an individual. Gait consists of a harmonious set of complex and cyclical movements of the body parts through a dynamic interaction of the internal and external forces Songhua Yan, et al (2014). A complete cycle of gait comprises two consecutive contacts of the same heel with the support surface, and the time interval between these two contacts is called the length of the gait cycle.

The objective of the present study was to find the role of various spatio- parameters of walking of Obese and Non Obese

Methodology

A total 100 female children (50 obese & 50 non-obese) whose age ranges from 12-14 years were selected for the present study. Step Length, Stride Length, Cadence, subject velocity, Gait cycle duration and Double support Phase were selected for the present study. The subject's walking gait was recorded using two synchronized Legaria SF10 Cannon Camcorder. The specifications were full HD 1080, 8.1 Mega Pixels, 10x Optical Zoom, a shutter speed of 1/2000, Aperture value of maximum (F 1.8) and minimum (F8.0) and frame rate of 50 Hz. It also contains video compression format (MEEG/JPEG), having hard disk and USB cable to transport videos from the hard disk by connecting it to the computer. To analyze the clipped or slashed video recording of walking gait of school children, softwares; Xilisoft Video Converter Ultimate 6.0 and Silicon Coach Pro-7 were used. These motion analysis softwares provide to identify and quantify the angles, velocity, displacement, time, and number of frames of the selected biomechanical parameters of the study.

Table 1: Descriptive Statistics of Spatial Parameters of Obese & Non-Obese

Enclosed as Annexure 01

Table presents the means and standard deviations of 12-14 years Non-obese & Obese females aged 12-14 years for spatial parameters. The mean and SD of Step Length of Non-obese females is 66.86 ± 1.86 cms, and for obese females 59.24 ± 9.60 cms. The mean and SD of Stride Length of Non-obese females is 133.44 ± 2.39 cms, and for obese females 126.95 ± 4.75cms.

Table 2: ANOVA Summary of Spatial Parameters

Annexure 02

A one-way ANOVA was conducted to investigate the difference in spatial parameters between different Obese and non-obese females aged (12-14 years. Results of table 2 reveal that there was a statistically significant difference in Step Length and stride length between non-obese & obese females at the $p < 0.05$ level, ($F = 30.27$, $p = 0.00$) for step length and for Stride length ($F = 74.25$, $p = 0.00$).Therefore, results suggest that both the Step and Stride length of non-obese females is higher than obese females of same age category.

Figure 1: Mean Plots of Step length and Stride length of both non-obese and obese females aged 12- 14 yrs.

Enclosed as Annexure 03

Table 3: Descriptive Statistics of Temporal, Parameters of Obese & Non-Obese subjects

Enclosed as Annexure 04

Table presents the means and standard deviations of 12-14 years Non-obese & Obese females aged 12-14 years for Temporal parameters. The mean and SD of Cadence of Non-obese females is 107.76 ± 3.22 cms, and for obese females 107.76 ± 3.22 cms. The mean and SD of Subject velocity of Non-obese females is 115.58 ± 3.76 cms, and for obese females is 115.58 ±3.76cms.The mean and SD of Gait Cycle Duration of Non-obese females is 1.20 ± .23 cms, and for obese females 1.20 ± .23cms. The mean and SD of Double Support Phase of Non-obese females is 29.80 ± 3.47cms, and for obese females is 29.80 ±3.47cms.

Table 4: ANOVA Summary of Temporal Parameters

Enclosed as Annexure 05

A one-way ANOVA was conducted to investigate the difference in temporal parameters between different Obese and Non-obese females aged (12-14 years. Results of table 4.6 reveal that none of the temporal parameters showed statistically significant difference.

Variation of 'Temporal Parameters

Enclosed as Annexure 06

Result

Result is enclosed as Tabulated

Variation of 'Temporal Parameters

S. No	Parameter	Inference	Description of Inference
01	Step Length (mtrs)	statistically significant difference in Step Length between non-obese & obese females	the Step of non-obese females is higher than obese females of same age category.
02	Stride Length (mtrs)	statistically significant difference in Stride Length between non-obese & obese females	the Stride length of non-obese females is higher than obese females of same age category.
03	Cadence (Steps/min)	No statistically significant difference in Cadence was observed between non-obese & obese females	the cadence of non-obese females was same as obese females of same age category.
04	Subject velocity (mtr/sec)	No statistically significant difference in subject velocity was observed between non-obese & obese females	the subject velocity of non-obese females was same as obese females of same age category.
05	Gait Cycle Duration (Sec)	No statistically significant difference in Gait Cycle Duration was observed between non-obese & obese females	the Gait Cycle Duration of non-obese females was same as obese females of same age category.
06	Stance Phase Duration (Sec)	No statistically significant difference in Stance Phase was observed between non-obese & obese females	the Stance phase of non-obese females was same as obese females of same age category.
07	Swing Phase Duration (Sec)	No statistically significant difference in swing phase duration was observed between non-obese & obese females	the swing phase duration of non-obese females was same as obese females of same age category.

Annexure(s)

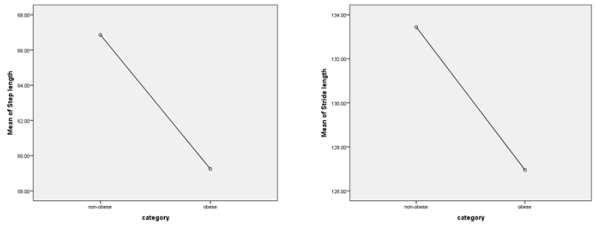
Annexure 01

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Min	Max
						Lower Bound	Upper Bound		
Step length (Cms)	non-obese	50	66.86	1.86	.2634	66.3325	67.3915	62.10	71.22
	Obese	50	59.24	9.60	1.358	56.5153	61.9767	6.70	69.50
	Total	100	63.05	7.87	.7877	61.4909	64.6171	6.70	71.22
Stride length (Cms)	non-obese	50	133.4	2.39	.3389	132.7616	134.1236	128.22	138.21
	Obese	50	126.9	4.75	.6727	125.5992	128.3032	103.00	135.24
	Total	100	130.19	4.96	.4968 3	129.2111	131.1827	103.00	138.21

Annexure 02

		Sum of Squares	df	Mean Square	F	Sig.
Step length	Between Groups	1450.086	1	1450.086	30.275	.000
	Within Groups	4693.885	98	47.897		
	Total	6143.971	99			
Stride length	Between Groups	1053.457	1	1053.457	74.258	.000
	Within Groups	1390.263	98	14.186		
	Total	2443.720	99			

Annexure 03



Annexure 04

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Cadence (steps /mint)	Non-obese	50	107.76	3.221	.455	106.851	108.6833	101.00	115.00
	obese	50	107.76	3.221	.455	106.851	108.6833	101.00	115.00
	Total	100	107.76	3.205	.320	107.131	108.4037	101.00	115.00
subject velocity (cms/sec)	Non-obese	50	115.58	3.765	.532	114.510	116.6506	105.00	121.00
	obese	50	115.58	3.765	.532	114.510	116.6506	105.00	121.00
	Total	100	115.58	3.746	.374	114.837	116.3238	105.00	121.00
Gait cycle duration (sec)	Non-obese	50	1.20	.231	.032	1.1425	1.2743	.67	1.65
	obese	50	1.20	.231	.032	1.1425	1.2743	.67	1.65
	Total	100	1.20	.230	.023	1.1627	1.2541	.67	1.65
Double support Phase (sec)	Non-obese	50	29.80	3.471	.491	28.8185	30.7919	23.30	37.50
	obese	50	29.80	3.471	.491	28.8185	30.7919	23.30	37.50
	Total	100	29.80	3.454	.345	29.1198	30.4906	23.30	37.50

Annexure 05

		Sum of Squares	df	Mean Square	F	Sig.
Cadence (steps /mint)	Between Groups	.000	1	.000	.000	1.000
	Within Groups	1017.31	98	10.381		
	Total	1017.31	99			
subject velocity (cms/sec)	Between Groups	.00	1	.000	.000	1.000
	Within Groups	1389.74	98	14.181		
	Total	1389.74	99			
Gait cycle duration (sec)	Between Groups	.00	1	.000	.000	1.000
	Within Groups	5.26	98	.054		
	Total	5.26	99			
Double support Phase (sec)	Between Groups	.00	1	.000	.000	1.000
	Within Groups	1181.32	98	12.054		
	Total	1181.32	99			

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