Spatial-Temporal Parameters running Gait of Obese & Non-Obese female children

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Abstract

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 temporal parameters. Conclusion: the result shows that significant difference was found between obes and non obese subject in all selected spatial temporal parameters except Swing Phase in seconds

obesity is a condition of abnormality in which body begin to store excessive fat in the adipose tissue that may leads to serious medical complications thereby impair the quality of life for an individual (Kopelman, 2000). Must and Strauss, (1999) recommended that overweight/ obesity can be characterized by having more chance of developing various kinds of medical conditions like strokes, type 2 diabetes, hypertension, cardio respiratory disease, gout, osteo-arthritis, musculoskeletal disorders to feet and lower limbs certain cancers Devita 2005. Obesity has not limited to adults of age group of above 40 but is also seen in children thus it is very important to children from overweight/obesity.

Overweigh/Obesity is accepted as global disease for causing major health complications in developed and underdeveloped countries. The frequency of this condition is increasing at an alarming rate. (Raj 2010). A survey was conducted by National Health &

Nutrition Examination Survey (NHANES) in USA in the year 2003-04, it shows that the prevalence of over-weight and obesity in USA among children and adolescents has increased many folds. It is estimated 17.1% were overweight and 32.2% of adults aged 20 years or older were obese. Same trend is seen in other counties, this increase in obesity rate and especially in childhood obesity, probable will be challenge to worldwide medical health system. A significant change responsible for obesity is the lack of exercise Earlier, children had more time to play, run about or work out compared to the children of this generation. Long school hours, the ordeal of getting ready for school and tuitions increases inactivity. Without activity, even the recommended calories lead to a positive energy balance, which accumulates as body fat contributing to obesity. Physically inactive and sedentary lifestyles are thought to be associated with increases in overweight and obesity

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

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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,

		N	Mean	S.D	S. E	95% Confidence Interval for Mean		Min	Max
						Lower Bound	Upper Bound		
Step length (cms)	Non-obese	50	99.70	3.67	.51	98.65	100.74	92.00	110.00
	Obese	50	68.88	2.83	.40	68.07	69.68	63.00	73.00
	Total	100	84.29	15.82	1.58	81.14	87.43	63.00	110.00
Stride length (cms)	Non-obese	50	201.89	5.43	.76	200.34	203.43	189.00	212.00
	Obese	50	127.86	2.50	.35	127.14	128.57	123.00	134.00
	Total	100	164.87	37.44	3.74	157.44	172.30	123.00	212.00

displacement, time, and number of frames of the selected biomechanical parameters of the study.

Table 1 Descriptive Statistics of Spatial Parameters Females (Obese & Non-Obese) aged 12-14 years

Table 1 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 99.70 ± 3.67 cms, and for obese females 68.80 ± 2.83 cms. The mean and SD of Stride Length of Non-obese females is 201.89 ± 5.43 cms, and for obese females 127.86 ± 2.50 cms.

Analysis of the variance (ANOVA) Summary of Spatial Parameter

		Sum of Squares	df	Mean Square	F	Sig.
Step length (cms)	Between the groups	23746.81	1	23746.81	2208.41	.00
	Within the groups	1053.78	98	10.75		
	Total	24800.59	99			
Stride length (cms)	Between the groups	137025.82	1	137025.82	7640.75	.00
	Within the	1757.48	98	17.93		

groups						
Total	138783.31	99				

*Significant level at the 0.05 level.

A one-way analysis of the variance (ANOVA) was conducted to investigate the difference in spatial parameters between different Obese and Non-obese females aged (12-14 years. Results of table 4.4 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 = 2208.4, p =0.00) for step length and for Stride length (F = 7640.7, 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.
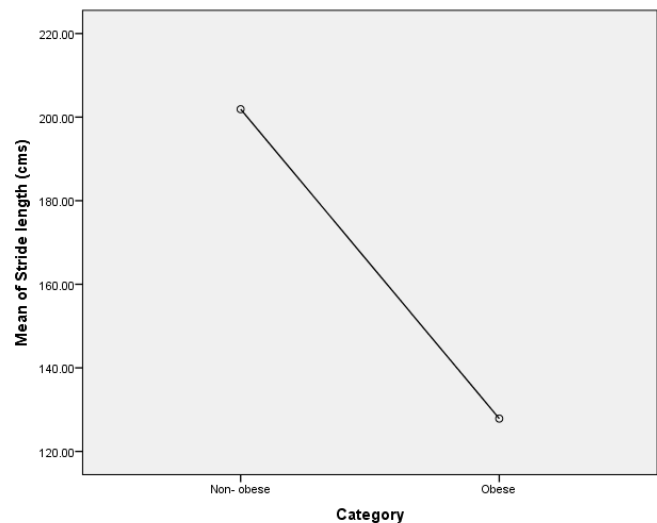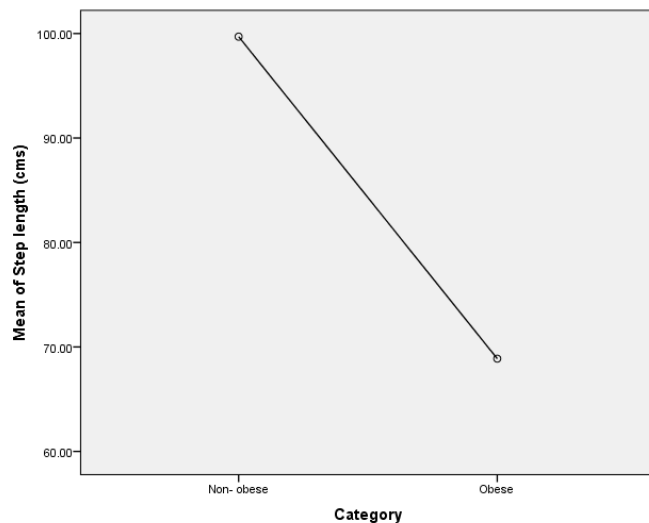
Table 2 Descriptive Statistics of Temporal Parameters Females (Obese & Non-Obese) aged 12-14 years

		N	Mean	S. D	Std. Error	95% Confidence Interval for Mean		Min	Max
						Lower Bound	Upper Bound		
Cadence (Steps/mint.)	Non-Obese	50	111.64	4.77	.67	110.28	112.99	101.00	121.00
	Obese	50	116.42	3.74	.53	115.35	117.48	109.00	124.00
	Total	100	114.03	4.90	.49	113.05	115.00	101.00	124.00

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Subject velocity (cms/sec.)	Non-Obese	50	129.70	2.29	.32	129.05	130.36	122.00	135.00
	Obese	50	119.18	2.50	.35	118.47	119.89	114.00	125.00
	Total	100	124.44	5.80	.58	123.29	125.59	114.00	135.00
Gait Cycle Duration (Sec.)	Non-Obese	50	82.10	3.76	.53	81.03	83.17	73.00	92.00
	Obese	50	1.16	.25	.03	1.09	1.24	.92	1.70
	Total	100	41.63	40.75	4.07	33.54	49.72	.92	92.00

Table 3 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 111.64 ± 4.77 steps/mint, and for obese females 116.42 ± 3.74 steps/mint. The mean and SD of Subject velocity of Non-obese females is 129.70 ± 2.29 cms/sec, and for obese females is 119.18 ±2.50 cms/sec. The mean and SD of Gait Cycle Duration of Non-obese females is 82.10 ± .3.76 sec, and for obese females 1.16 ± .25 sec.

Table 4 Analysis of Variance (ANOVA) Summary of Temporal Parameters.

		Sum of Squares	df	Mean Square	F	Sig.
Cadence (Steps/mint.)	Between the Groups	571.68	1	571.68	31.021	.00
	Within the Groups	1806.02	98	18.42		
	Total	2377.71	99			
Subject velocity (cms/sec.)	Between the Groups	2770.23	1	2770.23	479.17	.00
	Within the Groups	566.55	98	5.78		
	Total	3336.79	99			
Gait Cycle Duration (Sec.)	Between the groups	163759.42	1	163759.42	22976.86	.00
	Within the Groups	698.46	98	7.12		
	Total	164457.88	99			

*Significant level at the 0.05 level.

One-way analysis of the variance (ANOVA) was applied to check the difference in temporal parameters between different Obese and Non-obese females aged (12-14 years. Results of table 4.19 reveal that there was a statistically significant difference in Cadence, Subject velocity and gait Cycle Duration between Non-obese & obese subject was at the $p < 0.05$ level, (F = 31.02 , p =0.00) for Cadence and for Subject velocity (F = 479.17, p =0.00) and for Gait Cycle Duration (F= 22976.8, P= 0.00).Therefore, results suggest that the cadence, subject velocity and gait cycle duration of Non-obese subject was higher than obese subject was of same age category.
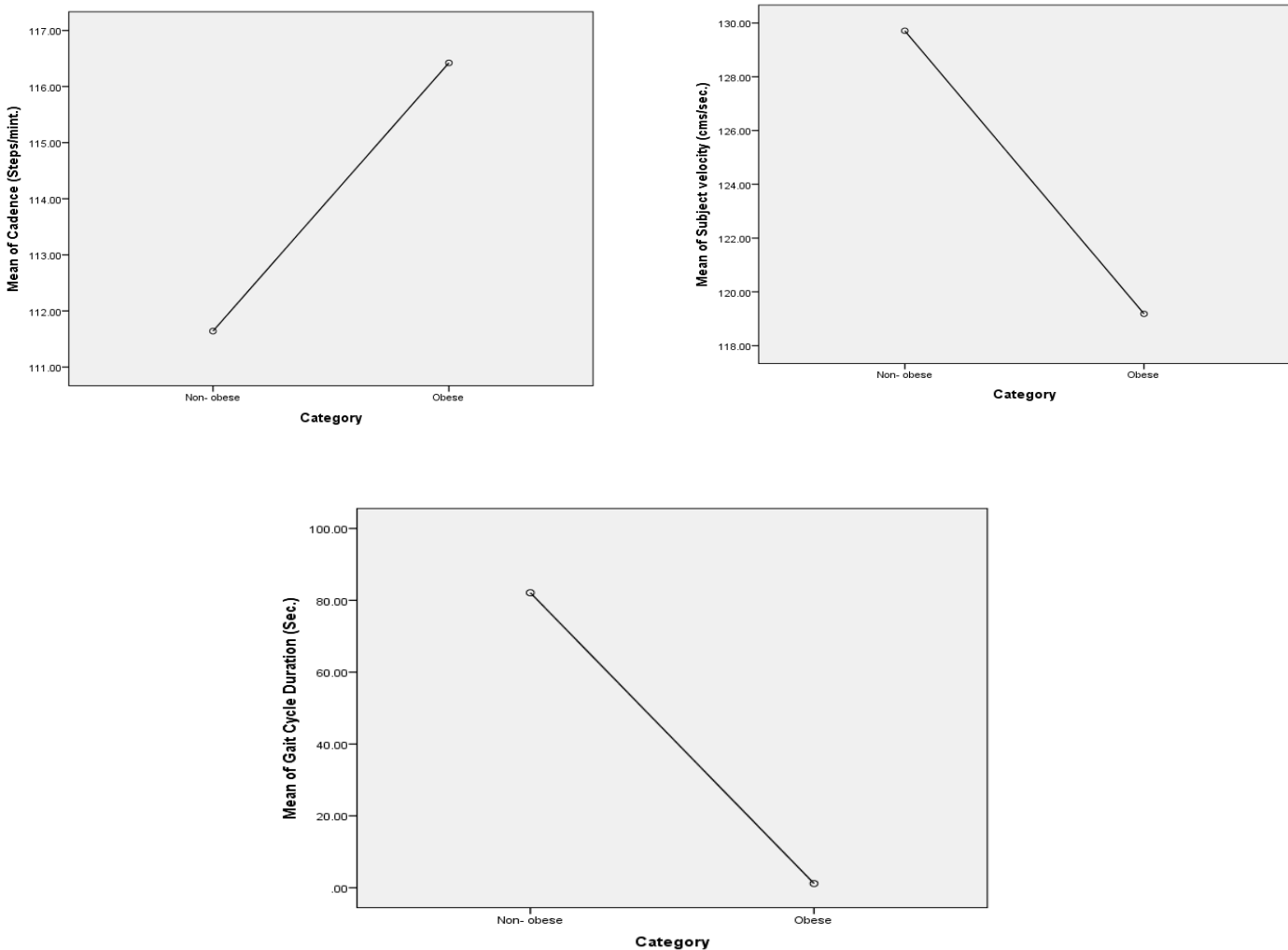

Figure Mean Plots of cadence, Subject velocity, Gait Cycle Duration and Double Support Phase of both Non-obese and obese females aged 12- 14 yrs

Results

S. No	Variables	Result	Description of results
01	Step Length in (mts)	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.
2	Stride Length (in 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.
3	Cadence (Steps/min)	statistically significant difference in cadence between non-obese & obese females	the cadence of non-obese females is higher than obese females of same age category.
4	Subject velocity (mtr/sec)	statistically significant difference in subject velocity between non-obese & obese females	the subject velocity of non-obese females is higher than obese females of same age category.
5	Gait Cycle Duration (Sec)	statistically significant difference in gait Cycle duration between non-obese & obese females	the Gait Cycle Duration of non-obese females is higher than obese females of same age category.
6	Stance Phase in Seconds	statistically significant difference in Stance Phase Duration between non-obese & obese females	the Stance Phase Durationof non-obese females is higher than obese females of same age category.
7	Swing Phase in seconds	No significant difference in Swing Phase Duration between non-obese & obese females	the Swing Phase Duration of non-obese females is higher than obese females of same age category.

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