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Comparison between female and male in regard to selected gait variables while walking with slow speed

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Abstract
A study conducted with the objective to comparison between female and male in regard to selected gait variables while walking with slow speed. The study was delimited to female and male subjects (N=75), age ranging from 17 to 25 years. The study delimited to selected spatio-temporal variables namely as Gait Line Length (mm), Contact Time (sec), First/ Second Peak Force (N), First/ Second Peak Pressure (N/cm^2), First/Second Peak Force Time (ms), First/Second Peak Pressure Time (ms), Difference Peak Force Time (ms), Difference Peak Pressure Time (ms). The Data Recording and quantification were administered by Pressure Plate with model FDM-S was performed. Collected data were computed with mean, standard deviation and independent t-test. There was significant difference between male and female while walking with slow speed in regard to selected gait variables namely as Gait Line Length (mm), Contact Time (sec), First/ Second Peak Force (N), First/ Second Peak Pressure (N/cm^2), First/Second Peak Force Time (ms), First/Second Peak Pressure Time (ms), Difference Peak Force Time (ms), Difference Peak Pressure Time (ms) at 0.05 level.

Keywords: Gait, Spatio-Temporal

Introduction
Walking is one of the simplest ways to get active and stay active. With each step you take, you travel further down the path to a healthier lifestyle. Research has shown that walking can have a significant impact on your health by lowering your chances of heart disease. Learn more about the benefits of walking and how incorporating it more can lead to healthier living[1]. It is a regular and simplest exercise of human beings. In the gait cycle involving steps and strides makes a complete gait cycle. A step is only one single step and a stride is a complete gait cycle. The step time is the time taken from one foot touching the floor to the other foot.
Gait means Locomotion. It is the way in which an individual ambulates (Morgan, 2012) [1].
Sandra J. Shultz describes gait as, "someone's manipulation or locomotion, involves the total body. Gait speed determines the contribution of each body segment. Normal walking speed primarily involves the lower extremities with the arms and trunk providing stability and balance. The faster the speed, the more the body depends on the upper extremities and trunk for propulsion as well as balance and stability. The legs continue to do the most work as the joints produce greater ranges of motion trough greater muscle responses. In the bipedal system the three major joints of the lower body and pelvis work with each other as muscles and momentum move the body forward. The degree to which the body's centre of gravity moves during forward translation defines efficiency. The body's centre moves both side to side and up and down during gait" (Shultz, 2005) [2].
Gait is the walking pattern of an individual. Medical professionals can tell a lot about a person's neurologic, muscular and skeletal problems and health from their gait (Steiner, 2018) [3].

[1] ***Walking, take the first Step***. (2018, March 03). Retrieved from http://www.heart.org: http://www.heart.org/HEARTORG/HealthyLiving/PhysicalActivity/Walking/Walking_UCM_460870_SubHomePage.jsp

Human Gait

Human gait refers to locomotion achieved through the movement of human limbs. Human gait is defined as bipedal, biphasic forward propulsion of center of gravity of the human body, in which there are alternate sinuous movements of different segments of the body with least expenditure of energy. Different gait patterns are characterized by differences in limb movement patterns, overall velocity, forces, kinetic and potential energy cycles and changes in the contact with the surface (ground, floor, etc.). Human gaits are the various ways in which a human can move either naturally or as a result of specialized training (Minetti, 1998).

Methodology

For the purpose of the study 75 (37 females and 38 males) subjects were randomly selected (age ranged from 17 to 25 years) from Indra Gandhi Institute of Physical Education and Sports Sciences, University of Delhi, B-block, Vikaspuri, New Delhi-110018. The subjects were explained about the research, objectives and benefit of the research and also motivated to put their best as per their consent. The sample statistics of 75 subjects (N=75) has been detailed in table- 1.

Table 1: Sample Statistics

Variables	Sex	N	Mean	S.D.
Height(cm)	Female	37	159.92	6.19
	Male	38	172.55	7.95
Weight(kg)	Female	37	53.05	8.80
	Male	38	67.74	11.71
BMI(kg/m^2)	Female	37	20.69	2.72
	Male	38	23.69	6.72
Ponderal Index (Ratio)	Female	37	12.92	1.68
	Male	38	13.16	1.73

Note: N=75, Cm= Centimeters
Kg= Kilograms
S.D.= Standard Deviation

Testing Protocol

In the biomechanics Laboratory (Indira Gandhi Institute of Physical Education and Sports Sciences, University of Delhi, B-Block, Vikaspuri, New Delhi-110018) the Zebris FDM-S pressure plate was used for the purpose of the study. A length of area for gait measurement was used for the study was Ten meters (Fig: 1). The walking area had marked at six meters. Three meters on each side from the pressure plate. The free open area of two meters had been given to the subject on each side after the walking area. The subject was taught to walk at slow speed as per the pace of the subject. Three trials was taken from each subject.

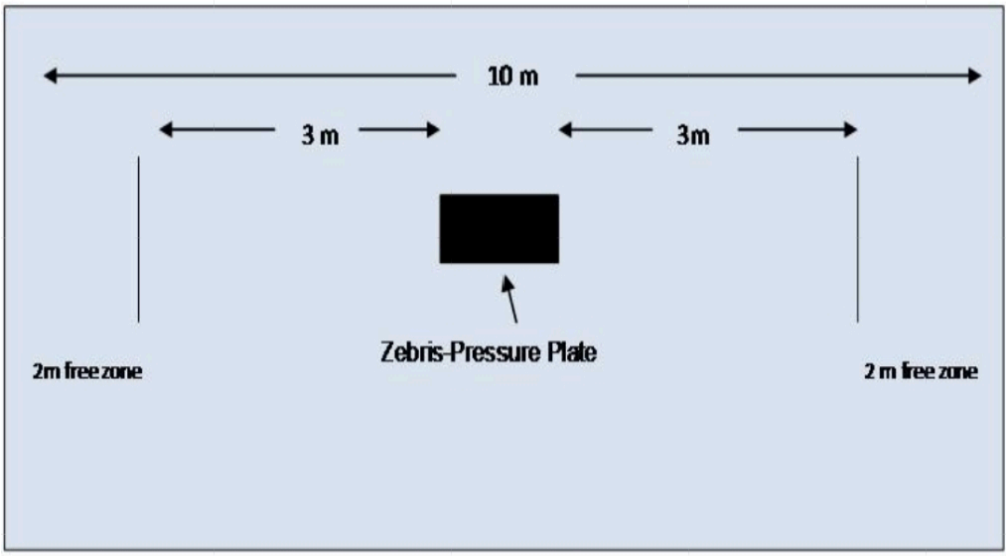

Fig 1: Pressure Plate Recording Protocol

Statistical Procedure

The data obtained was analyzed by using the following statistics

- Mean
- Standard Deviation
- Independent t-test of large sample was computed for comparing between male and female in regard to the selected spatio-temporal variables and walking gait variables at slow speed.
- The level of significance chosen was 0.05 for testing the hypothesis.

S.No	Abbrevations	Variables
1	GLLL	Gait Line Length of Left Foot
2	GLLR	Gait Line Length of Right Foot
3	CTL	Contact Time of Left Foot
4	CTR	Contact Time of Right Foot
5	FPFL	First Peak Force of Left Foot
6	SPFL	Second Peak Force of Left Foot
7	FPFR	First Peak Force of Right Foot
8	SPFR	Second Peak Force of Right Foot
9	FPPL	First Peak Pressure of Left Foot
10	SPPL	Second Peak Pressure of Left Foot
11	FPPR	First Peak Pressure of Right Foot
12	SPPR	Second Peak Pressure of Right Foot
13	FPFTL	First Peak Force Time of Left Foot
14	SPFTL	Second Peak Force Time of Left Foot
15	FPFTR	First Peak Force Time of Right Foot
16	SPFTR	Second Peak Force Time of Right Foot
17	FPPTL	First Peak Pressure Time of Left Foot
18	SPPTL	Second Peak Pressure Time of Left Foot
19	FPPTR	First Peak Pressure Time of Right Foot
20	SPPTR	Second Peak Pressure Time of Right Foot

Results

Table 2: Comparison between Female and Male in Regard to Sele”cted Gait Variables at Slow Speed

Variables	Code	N	Mean (mm)	Std. Deviation	F	Sig.	V	T
GLLLS	Female	37	203.4249	16.90345	.084	.773	1	-5.909*
	Male	38	227.2279	17.94821			2	-5.914
GLLRS	Female	37	204.8616	18.36294	1.38	.244	1	-6.040*
	Male	38	228.8537	15.98277			2	-6.029
CTLS	Female	37	.7878	.12186	.25	.621	1	-1.425(NS)
	Male	38	.8276	.12001			2	-1.424
CTRS	Female	37	.7781	.10860	.055	.816	1	-2.312*
	Male	38	.8368	.11136			2	-2.313
FPFLS	Female	37	599.4554	93.60307	5.728	.019	1	-6.230
	Male	38	761.9189	128.96339			2	-6.256*
SPFLS	Female	37	611.6492	96.54941	1.863	.176	1	-6.012*
	Male	38	762.4516	119.17806			2	-6.029
FPFRS	Female	37	604.5773	94.82993	5.644	.020	1	-5.881
	Male	38	760.8308	131.75932			2	-5.906*
SPFRS	Female	37	601.8741	94.91153	4.551	.036	1	-6.161
	Male	38	762.9774	128.56096			2	-6.185*
FPPLS	Female	37	27.9408	6.14831	1.259	.266	1	.541(NS)
	Male	38	27.0874	7.42687			2	.543
SPPLS	Female	37	37.4005	8.18969	.735	.394	1	.266(NS)
	Male	38	36.8689	9.05786			2	.267
FPPRS	Female	37	28.6754	6.58935	.625	.432	1	.504(NS)
	Male	38	27.9605	5.67010			2	.503
SPPRS	Female	37	37.7749	10.26460	1.645	.204	1	.512(NS)
	Male	38	36.6932	7.91353			2	.510
FPFTLS	Female	37	224.59	72.211	.128	.722	1	-.130(NS)
	Male	38	226.58	59.013			2	-.130
SPFTLS	Female	37	567.84	89.292	.060	.808	1	-2.222*
	Male	38	610.00	74.544			2	-2.217
FPFTRS	Female	37	223.30	69.672	2.349	.130	1	-.349(NS)
	Male	38	228.16	49.640			2	-.347
SPFTRS	Female	37	579.08	83.010	.075	.784	1	-1.905(NS)
	Male	38	613.42	72.867			2	-1.902
FPPTLS	Female	37	141.35	63.077	.897	.347	1	-.172(NS)
	Male	38	143.68	54.447			2	-.171
SPPTLS	Female	37	609.46	84.818	.128	.721	1	-1.934(NS)
	Male	38	648.16	88.405			2	-1.935
FPPTRS	Female	37	138.92	69.354	1.103	.297	1	-1.907(NS)
	Male	38	168.95	67.013			2	-1.906
SPPTRS	Female	37	621.35	84.267	.000	.997	1	-1.258(NS)
	Male	38	645.00	78.525			2	-1.257

*Significant at .05 level, NS = Not Significant at .05 level

1= Equal Variances Assumed, 2= Equal Variances Not Assumed N= Sample Size, ‘F’= F-Ratio, t= t ratio

Conclusions

According to the above mentioned table, there was significant difference between female and male in regard to variables namely GLLL (t = -5.909), GLLR (t=-6.04) CTRS (t= -2.312), FPFLS (t= -6.256), SPFLS (t= -6.012), FPFRS (t= -5.906), SPFRS (t= -6.185), SPFTL (t= -2.222) at 0.05 level. Therefore, we can say that there are significant differences between male and female in selected gait variables while walking with slow speed.

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