50 - BIOMECHANIC ANALYSIS OF THE MARCH IN GESTANTES THROUGH KINEMATIC 0 VARIABLE AND ANTROPOMÉTRICAS IN THE CITY OF PONTA GROSSA - PR

AUTHOR: OELSON GUIMARÃES HEIL
STATE UNIVERSITY OF PONTA GROSSA/UEPG
RESERVE - PARANÁ - BRAZIL
oelsongheil@ibest.com.br
ORIENTING: CELSO BILYNKIEVYCZ DOS SANTOS
STATE UNIVERSITY OF PONTA GROSSA/UEPG
PONTA GROSSA - PARANÁ - BRAZIL
bilynkievycz@uepg.br
ORIENTING: MARCUS WILLIAM HAUSER
STATE UNIVERSITY OF PONTA GROSSA/UEPG
CENTER OF SUPERIOR EDUCATION OF FIELDS GERAIS/CESCAGE PONTA GROSSA - PARANÁ - BRAZIL
mwhauser@cescage.com.br
ORIENTING: JORIN SOUZA OF THE VIRGINS SON
STATE UNIVERSITY OF PONTA GROSSA/UEPG
PONTA GROSSA - PARANÁ - BRAZIL
jvirgens@.uepg.br

1.Introduction

Among all the mammals the man is who posses the most efficient antigravitational mechanism in the custo/benefício relation for your biped nature, seen the quadrupeds they need one without number of joints for the accomplishment of many flexões and partial extensions during the execution of the march. The march can be considered as one of the more automatized motor acts. Its regularity allows that if establishes objective criteria for the distinction between normal and pathological standards, as well as for the discrimination of those qualitative changes caused by the development of the individual (Wolf of the Coast, Duarte and Amádio, 1995). Rose & Gamble (1994) say the first inquiries to it on the march and place that these emphasize, among others, the necessity to have access to the forces that are acting in the human body to understand as walking it is occurring. Therefore for analysis of the march two factors must be consider: the existence of continuous forces of reaction of the ground that support the weight of the body and the periodic movement of each foot in position of support in the direction of movement progression. The locomotion moviments are highly changeable, not only between individuals, but for one exactly individual the different speeds and of support, being that, moreover, it is a process that needs one elaborated control of the esqueletic, muscle and nervous system. Being, therefore, not an only phenomenon, but many phenomena, consisting in a movement of complex structure for analysis and interpretation (Silveira Son et there, 1997). The march is a locomotion process where the body is supported alternatingly by the inferior members, being that the feet alternate the contact with the ground. This alternation has a time interval that if becomes minor the measure that if increases the speed of the march (Hauser, 2003).

2.Considerations on the variable of the march the Biomechanics

Has identified to the kinematic and kinetic variable of the march human being and the race in individuals to the different speeds. The locomotion movements are highly changeable, not only between individuals, but for one exactly individual the different speeds and of support for support, being that, moreover, it is a process that needs one elaborated control of the esqueletic, muscle and nervous system. Being, therefore, not an only phenomenon, but many phenomena, consisting in a movement of complex structure for analysis and interpretation (Silveira Son et there, 1997). Some authors, in also cited the values of the force medium-lateral during the march and the race, determining the limits from which the march start to be pathological and the speed race does not result in satisfactory results for an extreme oscillation of the gravity center (C.G.) on the main direction of the movement (Chou, 1996). For Keller & cols. (1996) the speed of the march is one of the many external factors that can influence the force of reaction of the ground vertical, where the analysis of the time of contact with the ground, had taken the verification of a not linear reduction of the time of contact with the ground in relation the speed of walking. In the case of the pregnants the execution of the march can be modified in first analysis for the new position of the center of gravity caused for the increase of the corporal mass in specific place (abdomen) and this to contribute for the probable disequilibrium during the cyclical movement of the march. We can cite that the postural modification would be the first minimization compensatory mechanism of the on effect to the increase of mass in the pregnant.

3. Employed methodology

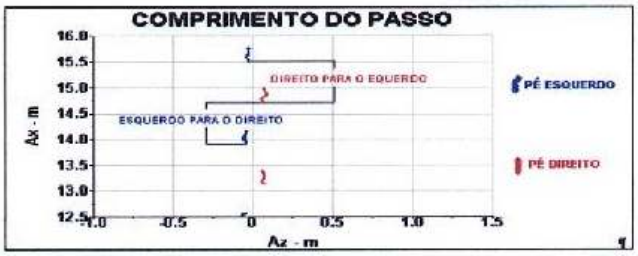
The used sampling was de17 pregnants with pregnancy periods varying between 5 and 38 weeks, all patient they of the Center of Health of the Woman of the city of Ponta Grossa, situated tip in the region of the state of the Paraná, in the south region of Brazil. The analyzed pregnants had been communicated of the procedures of security comonly adapted, being that for the acquisition of the kinematic parameters of the march an electric mat and ergometric EMBREEX was used - equipment 42055405, executive model 550 formerones, being the same one in the horizontal position with inclination of 0° in relation to the floor also leveled horizontally. In the sample they had been collected given referring: weeks of gestation, stature, corporal mass, index of corporal mass, abdominal diameter, sistolic and diastolic arterial pressure, cardiac frequency for 2 constant speeds of km/h (0,556 m/s) and 3 km/h (0,833 m/s) in the mat. The frequency of the step is taken in 60 seconds counting itself the number of times that the right foot is supported in the ground and proceeding which had it multiplication for factor 2. The used footwear was not taken in consideration in this type of taking of data, prevailing only the physical 0 variable in the analysis. After the taking of the data, was applied the following mathematical relation:

v = cp. fp
v = speed of the mat (km/h or m/s).
cp = length of the step (meters - m).
fp = frequency of the step (steps/minute or steps/second).

The antropometrics variable related the corporal mass, stature and abdominal diameter of the pregnants had been quantified by means of the following protocol: - Mass: The evaluated one will have to go up in the scale locating itself in the center of the same one in ortostatic position, being the unit of used measure the kilogram (kg) with approach of 10-1, when necessary one. - Stature: Evaluated in ortostatic position, the head guided in the plan of Frankfurt, bare-footed and joined feet, the cursor in an angle of 900 will touch the point highest of the head, being the unit of used measure the centimeter (cm). relative

4.Variáveis the execution of the march

The variable selected for analysis of the march in ergometric mat (length of the step and cadence or frequency of the step) are defined, graphically described and showed below:



Length of Step (cp)
Defined as in the distance of the beginning of the contact of heel of a foot until the beginning of the contact of the heel of the foot against-lateral.
Cadence or Frequency of Step (fp)
Defined as the number of steps for unit of time.

5.Planilhas of Results

Table 01 Data Collected and Calculated Before the Tests

Code	Age	Weeks of Gestation	Height	Weight	ICM	Arterial Pressure		Cardiac Frequency		
								Predicted Max	Rest	
						Sistolic	Diastolic		Number of Beatings for min	Intensity (%)
1	27	5	1,68	75	26,57	120	80	193	74	38,34
2	24	38	1,57	91,5	37,12	140	80	196	100	51,02
3	21	32	1,62	90	34,29	130	80	199	85	42,71
4	21	12	1,65	66	24,24	110	60	199	60	30,15
5	21	20	1,75	74,5	24,33	110	70	199	86	43,22
6	39	25	1,6	62	24,22	140	80	181	80	44,20
7	33	17	1,64	55	20,45	100	60	187	96	51,34
8	24	30	1,63	73	27,48	140	110	196	95	48,47
9	30	35	1,44	63	30,38	130	80	190	80	42,11
11	30	16	1,54	61	25,72	120	70	190	60	31,58
12	23	20	1,7	61	21,11	110	70	197	85	43,15
13	40	17	1,63	62	23,34	120	80	180	103	57,22
14	21	20	1,54	66	27,83	110	60	199	84	42,21
15	27	35	1,6	69	26,95	140	80	193	80	41,45
16	19	34	1,67	73	26,18	150	100	201	88	43,78
17	24	8	1,53	63	26,91	110	70	196	65	33,16

Table 02 Data Collected and Calculated During the Tests

Code	Cardiac intensity Walking 2Km/h (%)	Cardiac frequency Walking the 2 Km/h (bpm)	Passed the 2 Km/h			Passed the 3 Km/h		
			Amount	Frequency (bpm)	Length (m)	Amount	Frequency (bpm)	Length (m)
1	41,45	80	76	1,27	0,44	96	1,60	0,52
2	58,16	114	80	1,33	0,42	96	1,60	0,52
3	54,27	108	88	1,47	0,38	112	1,87	0,45
4	40,20	80	92	1,53	0,36	100	1,67	0,50
5	49,25	98	64	1,07	0,52	72	1,20	0,69
6	54,70	99	88	1,47	0,38	96	1,60	0,52
7	64,17	120	108	1,80	0,31	116	1,93	0,43
8	50,51	99	92	1,53	0,36	96	1,60	0,52
9	63,16	120	100	1,67	0,33	112	1,87	0,45
11	37,89	72	84	1,40	0,40	100	1,67	0,50
12	52,28	103	108	1,80	0,31	116	1,93	0,43
13	65,56	118	80	1,33	0,42	92	1,53	0,54
14	50,25	100	96	1,60	0,35	100	1,67	0,50
15	47,67	92	88	1,47	0,38	96	1,60	0,52
16	62,69	126	92	1,53	0,36	104	1,73	0,48
17	37,76	74	86	1,43	0,39	96	1,60	0,52

Table 03 Statistical results of the Data Collected Before the Walked one

Code	Age	Weeks of Gestation	Height	Weight	ICM	Arterial Pressure		Cardiac Frequency		
								Predicted Max		
						Sistolic	Diastolic		Número de Batimentos por min	Intensidade (%)
Média	26,50	22,75	1,61	69,06	26,69	123,8	76,88	194	82,56	42,76
Maior	40,00	38,00	1,75	91,50	37,12	150	110	201	103	57,22
Menor	19,00	5,00	1,44	55,00	20,45	100,00	60,00	181	60,00	30,15
Desvio Padrão	6,40	10,28	0,08	10,19	4,34	15,00	13,52	6,40	12,99	7,23

Table 04 – Statistical results of the Data Collected During the Walked one

Code	Cardiac intensity Walking 2Km/h (%)	Cardiac frequency Walking the 2 Km/h (bpm)	Passed the 2 Km/h			Passed the 3 Km/h		
			Amount	Frequency (bpm)	Length (m)	Amount	Frequency (bpm)	Length (m)
Média	51,87	100,2	88,88	1,48	0,38	100,00	1,67	0,51
Maior	65,56	126	108	1,80	0,52	116,00	1,93	0,69
Menor	37,76	72,00	64,00	1,07	0,31	72,00	1,20	0,43
Desvio Padrão	9,33	17,12	11,29	0,19	0,05	10,83	0,18	0,06

6.Discussão of the Results and Conclusion

The weeks of gestation had not made with that the performance of the gestantes was modified, or either, pregnancy weeks had not caused interference in developing of the walked one in the mat, therefore the shunting line standard in all the collected variable if showed low to e the values minimum, average and maximum of the results they are relatively next.

Used statistical software was the SPSS from the Method of the Linear Regression Multivariada, where if it established the data of the spread sheet above and a mathematical equation for the constant data in the same one and that through the same one it was possible to predict the cardiac frequency in activity (Fca) for the pregnants, searching with the lesser possible number of 0 variable (collected and calculated) to find resulted with great trustworthiness ($p < 5\%$). The considered 0 variable had been the cardiac frequency in activity of the pregnants (Fcag), the pregnancy weeks (Sg), the index of corporal mass (IMC), the cardiac frequency in rest (fcr), sistolic pressure () and the 2 the frequencies of passed km/h (fp2) and 3 km/h (fp), being that the developed equation was:

Fca = 22,05 + 88,57 Sg 10^{-2} 1,05 IMC 15,72 Ps 10^{-2} + 84 Fcr 10^{-2} 29,41 Fp 2 km + 47,75 Fp 3 km

We conclude that the weeks of gestation had not made with that the performance of the gestantes was modified, or either, gestante weeks had not caused interference in developing of the walked one in the mat, therefore the shunting line standard in all the collected variable if showed low to e the values minimum, average and maximum of the results they are relatively next.

BIBLIOGRAPHICAL REFERENCES

BARROS, R.; CUNHA, S.A.; ZAPELINI, K.; RASP SON, E.C. **Measured quantitative applied to the analysis march kinematics**. In: Annals of XX the International Symposium of Sciences of the Sport, p. 151, 1996. CROWE,; SAMSON, M.M; HOITSMA, M. J; Van-ginkel, **To the The influence of walking speed on parameters of gait symmetry determined from ground reaction you force**. Human Mov. Sci., 1996. GIAKAS, G.V B. **Variability and Inter-trial symmetry of ground reaction you force during walking using teams and frequency domain parameters**. Gait and Posture, 1997.

HAUSER, M. W. **Variáveis For Biomechanic Analysis of Marcha and the Race in the Sensorizada Mat in Athlete**. Annals of XV the Symposium of Physical Education and Sports of the South of the Paraná, Thick Tip, p.56-61, 2003.

LIPPERT, L.S. **Clinical Cinesiologia for Physiotherapists**. Rio De Janeiro: Guanabara Koogan, 2003.

MILLER, D.I. **Ground reaction you force in distance running**. En Cavanagh, P.R.: Biomechanics of distance running: Human Kinetics Publisher, 1990.

ÖZKAYA, N. **Fundamentals of biomechanics: equilibrium, motion, and deformation**. New York: Van Nostrand Reinhold, 1991.

SOTO, análisis V.M. **Desarrollo of un system for el three-dimensional biomecánico del deports y la representación graphical human realist del cuerpo**. Tesis Doctoral. Universidad of Granada, 1995.

VAGENAS, G; HOSHIZAKI, B. **Iateral Functional asymmetries and dominance in the to lower limbs of distance runners**. Int. J. Sports Biomech, 1991.

ZAPELINI, K.; BARROS, R.; BOMBARDI, M.; BRENZIKOFER, R.; CUNHA, S.A.; RASP SON, E.C. **Study of metric for the quantification of assimetrias in the march based in kinematic variable**. In: Annals of VII the Brazilian Congress of Biomechanics, p. 310-314, 1997.

MARCUS WILLIAM HAUSER
(42) 3223 9797 e (42) 9972 0190
mwhauser@cescage.com.br
Rua: Almirante Wandercolck, 130 Bairro Uvaranas
CEP. 84020 250
Ponta Grossa Paraná

BIOMECHANIC ANALYSIS Of the MARCH IN GESTANTES THROUGH KINEMATIC 0 VARIABLE And ANTROPOMÉTRICAS In the CITY OF PONTA GROSSA - PR

ABSTRACT

The way of execution of the march can be modified by a series of factors as the age, the stature, the corporal mass, the speed of displacement and other 0 variable. In the gestacional period the woman has a great number of alterations that are imposed to its organism and that they can excessively contribute for the alteration in the way of execution of the march. The main objective of this work was to collect a series of kinematic and antropométrics data of a group of gestantes for the analysis statistics and correlation of such 0 variable in an electric mat calibrated for 2 the constant speeds of km/h (0,556 m/s) and 3 km/h (0,833 m/s) and to proceed the statistical treatment with determination from the extremities of the measures and the shunting line standard, detaching the largenesses most significant and that they had had the biggest variations in the two calibrated airspeed in the mat.

ANALYSE DE BIOMECHANIC DE MARS DANS GESTANTES PAR 0 CINÉMATIQUE VARIABLE ET ANTROPOMÉTRICAS DANS LA VILLE DE PONTA GROSSA - SOMMAIRE DE P.R.

RÉSUMÉ

La manière de l'exécution de la marche peut être modifiée par une série de facteurs en tant que l'âge, la stature, la masse corporelle, la vitesse du déplacement et 0 autre variables. Dans la période de gestacional la femme a un grand nombre de changements qui sont imposés à son organization et qui ils peuvent excessivement contribuer pour le changement de la manière de l'exécution de la marche. L'objectif principal de ce travail était de rassembler une série de cinématique et les données d'antropométrics d'un groupe de gestantes pour les statistiques d'analyse et la corrélation d'une telle 0 variables dans une natte électrique calibrée pour 2 les vitesses constantes de km/h (0.556 m/s) et de 3 km/h (0.833 m/s) et pour procéder le traitement statistique dans la détermination à partir des extrémités des mesures et de la manoeuvre rayent la norme, détachant les largenesses les plus significatifs et cela elles avaient eu les plus grandes variations dans les deux vitesses anémométriques calibrées dans la natte.

ANÁLISIS DE BIOMECANICA DE LA MARCHA EN GESTANTES CON 0 CINEMÁTICO VARIABLE Y ANTROPOMÉTRICAS EN LA CIUDAD DE PONTA GROSSA - PR

RESUMEN

La manera de la ejecución del marzo se puede modificar por una serie de factores como la edad, la estatura, la masa corporal, la velocidad de la dislocación y otra 0 variables. En el período del gestacional la mujer tiene una gran cantidad de alteraciones que se impongan a su organismo y que puedan contribuir excesivamente para la alteración de la manera de la ejecución del marzo. El objetivo principal de este trabajo era recoger una serie de cinemático y los datos del antropométrics de un grupo de los gestantes para la estadística del análisis y la correlación de tal 0 variables en una estera eléctrica calibrada para 2 las velocidades constantes de km/h (0.556 m/s) y de 3 km/h (0.833 m/s) y proceder el tratamiento estadístico con la determinación de las extremidades de las medidas y del desvío alinean el estándar, separando los largenesses más significativos y eso habían tenido las variaciones más grandes en las dos velocidades aéreas calibradas en la estera.

ANÁLISE BIOMECÂNICA DA MARCHA EM GESTANTES ATRAVÉS DE VARIÁVEIS CINEMÁTICAS E ANTROPOMÉTRICAS NA CIDADE DE PONTA GROSSA - PR

RESUMO

A maneira de execução da marcha pode ser alterado por uma série de fatores como a idade, a estatura, a massa corporal, a velocidade de deslocamento e outras variáveis. No período gestacional a mulher tem um grande número de alterações que são impostas ao seu organismo e que podem sobremaneira contribuir para a alteração no modo de execução da marcha. O objetivo principal deste trabalho foi coletar uma série de dados cinemáticos e antropométricos de um grupo de gestantes para a análise estatística e correlação de tais variáveis em uma esteira elétrica calibrada para as velocidades constantes de 2 km/h (0,556 m/s) e 3 km/h (0,833 m/s) e proceder o tratamento estatístico com determinação dos extremos das medidas e o desvio padrão, destacando as grandezas mais significativas e que tiveram as maiores variações nas duas velocidades calibradas na esteira.