139 - CINEMATIC DESCRIPTION THE LOCOMOTION PERFORMED IN DEEP WATER: A CASE STUDY

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INTRUDOCTION.

Currently, new trends of exercises and physical activities has emerged with the aim of finding a better quality of life and emphasis on different options, among them, cited were the activities performed in liquid medium using as a basis different forms of locomotion, as walking and running (SANCHEZ, MURCIA, VIDAL, 2000). The march, as a natural movement and learned from early childhood, causes has been the assumption that everyone already understand how this form of locomotion is, however, since the nineteenth century researchers has analyzed the variations in the processes of locomotion on the ground (RAB, 1994). Although there is already a model of what is considered normal or abnormal gait, the current preoccupation of some researchers is to transfer this movement performed on land to water, with the main objective of minimizing the impact. However, these studies already conducted have their models or patterns of movement in the legs, as if there was interference during locomotion in the net by senior members.

From the model already established for walking on land, which is also used in the liquid when the subject has the support of the feet at the bottom of the pool came to understand the concern as an individual if this move means he is suspended. The floor, so it's a complex movement and a broader approach can be used to understand, in parts, patterns of movement that are influenced by the system, for the task and the environment that is practiced. Therefore, this research is justified by the absence of a model that features the locomotion in water held in suspension as both the lower and upper limbs that can simulate the motion on the earth. This means that there is a concern to understand what happens with the upper limbs during locomotion matter and it differs from studies on march so far made. Therefore, the objective of this research was to characterize the cinematic locomotion held in suspension in the liquid medium in order to describe how this movement occurs.

MATERIALS AND METHODS

This research was characterized as descriptive of the kind of case study and design of pre-trial agreement with [3] Campbell and Stanley (1979), and intra-subjects, type AB, where A = the baseline (prior to intervention) And B = intervention established as Nunes (1991), Tawney and Gast (1984) and Matos (1990). After the research project be approved by the Ethics Committee on Human Research with the UFSC, is that it has initiated the collection of data. Data were collected in the pool at the Center for Sport, Federal University of Santa Catarina, with dimensions of 50m x 25m and depth of 1.80 m discussed in the Biomechanics Laboratory of the CDS / UFSC.

The sample consisted of 01 subject, male, aged 45 years, adapted to the water environment. This subject has been characterized from the values of body density (Siri, 1961), obtained by measuring the skin folds under the Protocol Petroski (1995), to detect the buoyancy of the subject. So this was the body density of 1.07 g / ml. The procedures for data collection were divided into four stages: the calibration of the system; placement of external reference marks along the lines proposed by the Anatomical Institute of Biomechanics of Cologne, as Kalfhues (RIEHL, 1979), the filming and instructional program. All sessions of the instructional program had duration of 50 minutes / lesson and frequency of three times per week, and that all activities carried out in liquid medium had the main exercise the locomotion matter, the guy with the water level at the time of the shoulders , Always using a float belt. The instructional program aimed at stabilizing the main position, allowing subject to a lower slope of the trunk during locomotion. The instructional program had its start after the first collection (shooting) and six sessions were held another collection, corresponding to four shots to get the variables of cinematic movement, with an interval of two weeks between the shooting and six weeks of action. After completion of the procedures were done before the processing of images and digitization of anatomical points.

From the digitization of reference points, the segments were determined to be analyzed and their angular variations during the 03 cycles of locomotion in suspension in liquid medium, by shooting two-dimensional (2D). The angles of the joints were examined knee, hip, elbow, shoulder (for angles) and inclination of the trunk, right in the sagittal plane. The determination of the angle of inclination of the trunk was referring to normal. The beginning of each round was to reference the position of maximum knee flexion and extension of State (segment) opposite. For the record the images was used a camera's digital camcorder model ® brand SONY DCR-TRV830, with digital recording system to tape-type Hi8MP (8mm) and frequency of acquisition of images from 30Hz. The positioning of the camera made by a professional tripod Brand Manfrotto ® model 3047.

For the treatment of images and data generation, was using the system of two-dimensional Cinemetry DMASCoach ® - version 6.0 SPICAtek that generated information spatial and temporal analysis of the movement, and a computer with an AMD Athlon XP-A 1100Mhz, Microsoft Windows operating system XP Professional, card acquisition of images with port of entry such as "DV";

The capture of the images was referring to three cycles of locomotion. The perimeter was bounded traveled in the pool corresponding to 42 meters long each and capture the images was 15 minutes.

Data analysis was used to Pearson's linear correlation ($p < 0.01$). The calculations were made using the package SPSS version 10.0.

RESULTS

From the data obtained during the three cycles of locomotion held in suspension in the liquid medium, it can be observed through the correlations presented an inverse relationship that existed between the knee and elbow ($r = -0.404$) where, when the knee is flexed characterizing the rehabilitation period, the elbow extension is in characterizing the propulsive phase during the process locomotion. Already, relations put forward by direct correlation coefficient were between the angle of the elbow to the shoulder ($r = 0.728$); elbow to the hip ($r = 0.306$); elbow to the chest ($r = 0685$); knee with the hip ($r = 0607$); knee with the trunk ($r = 0.264$); shoulder with the hip ($r = 0.841$); shoulder with the trunk ($r = 0.975$) and hip with the trunk ($r = 0.887$). The

description of the movement can be seen in Figure 1.

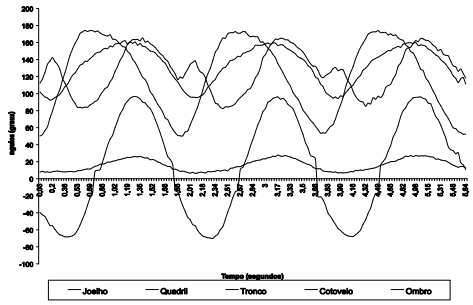

Figure 1- Model final locomotion of, corresponding to the values of all angles articular searched during the three cycles. Already, Table 1 will present data relating to changes of angular segments surveyed during the three cycles of locomotion and their amplitudes.

Table 1: Mean values for the amplitudes of cycles in the three joint locomotion

Articulation	Extended maximum	Flexion maximum	Amplitude
Knee	174ÿ	52ÿ	122ÿ
Hip	160ÿ	98ÿ	62ÿ
Trunk	7ÿ	27 ÿ	20ÿ
Elbow	165ÿ	84ÿ	81ÿ
Shoulder	59ÿ	96ÿ	155ÿ

DISCUSSION

As of the end product analyzes the full description of the move was that at the beginning of the cycle showed his knee bending up and then the extension of this, regarded as a recovery phase to its maximum extent. At the time that the angle of the knee hit the maximum extent, work began on the phase-propelled knee, returning the maximum flexion, completing a cycle. Already, for the articulation of the hip early in the cycle, this presented a small flexion of approximately 10 degrees returning to the motion for extension to reach their maximum length, which was considered the propulsive phase. The flexing of the hips until your maximum flexion was considered the rehabilitation period. Compared with the trunk, at the beginning of the cycle, this has presented its lower slope (lower angle) and increased the values of angles, reaching its maximum tilt, returning to the starting position, completing a cycle. For the articulation of the elbow early in the cycle the angle was about 120 degrees and then doing a stretch of about 20 degrees, returning to the movement of flexion of approximately 60 degrees to achieve after the extension (approximately 170 degrees). The start of recovery was up to the maximum extent, now, the phase-propelled was that moment until the elbow flexion. It is important to stress that the propulsive phase occurred in flexion and extension of the elbow in the same motion. Finally, the shoulder at the beginning of the cycle, met in the transitional phase between the end of propulsion and early recovery. This phase was characterized by the position of approximately 40 degrees, driving up to 70 degrees, which reached its maximum extent. After the maximum extent the movement of a shoulder held up a return of about 90 degrees flexion (bending maximum). The propulsive phase was considered when the subject has reached the maximum flexion of the shoulder until the. The extension, returning to bending, it was considered the rehabilitation period. It can be observed that, with regard to synchrony of movement, the model of locomotion matter presented is similar to the model of motion cited by [10] Inman, Ralston & Todd (1998), who claim that during the march on moderate speed, synchronous movements occurring in almost all parts of the body, there is an inclination of the pelvis, rotating and oscillating as moving forward, the segments of the lower limbs went to the three spatial plans, whereas the shoulders and arms rotate rock unlike the displacement of the pelvis and legs. Now, as regards the range of joint motion researched, these data do not confirm the figures given by the literature when referring to the model's gait on land.

Still, as [11] Rose & Gamble (1994), six cycles are present in normal running: double initial support; support simple; second double support; opening balance sheet, stock and stock average terminal, all references to support the foot on the soil, which does not happen in the model presented in this research that describes its movement without any support of the foot and yes, the important participation of senior members as a way to support and pull for the guy who can move.

CONCLUSION

The motion analysis can not be called march or walk, because there is no continuous presence of forces of reaction soil that support the body and regular movement of each foot from a position of support for the following in the direction of progress. Therefore, one can say that it is a form of locomotion, that the second [12] Cooper and Glassow (1973), includes all activities in which the body moves by actions of its own levers and with the help of gravity, and has Successive changes in national support and the forces of Propellant upper and lower limbs.

Characterized the model and determined the nomenclature of motion study concluded that the majority of authors who have been studying this form of locomotion is the biomechanical or physiological variables at different speeds, appear to be wrong about the nomenclature used for locomotion matter, naming as walk, walk, trot or race, implying the existence of the contact of the feet at the bottom of the pool. Based on the description of the movement will be possible to understand the professionals who work in the water environment and who enjoys this medium, how is this form of locomotion and the difficulty of achieving correct these movements, both in recreational activities, from physical to prevention or remediation of certain musculoskeletal diseases.

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CINEMATIC DESCRIPTION THE LOCOMOTION PERFORMED IN DEEP WATER: A CASE STUDY

Abstract: This study aimed at characterizing the kinematics locomotion held in suspension in the liquid medium. This case study was to sample a man of 45 years. The angles of the joints were examined knee, hip, elbow, shoulder (for angles) and inclination of the trunk. The angular variations were measured during 03 cycles of locomotion, by shooting two-dimensional. Data analysis was used Pearson's linear correlation ($p < 0.01$). It can be observed correlations presented by that, with regard to the synchrony of movement, the movement performed during locomotion matter was similar to that motion on land, by synchronous movements of nearly all body parts, because, for range of motion joint researched, this data comes from meeting the figures given by the literature when referring to the model's gait on land. Still, you can see differences between support made while walking on land and those found in this study.

Key words: Locomotion, Suspension, Deepwater.

DESCRIPTION CINEMATIQUE LOCOMOCION EFFECTUE RUÉ QUESTION DANS LA MOITIÉ NET: UNE ÈTUDE DE CAS.

Résumé: Cette étude vise à caractériser la cinématique de locomotion qui s'est tenue en suspension dans le milieu liquide. Cette étude de cas à l'échantillon a été un homme de 45 ans. Les angles des articulations ont été examinés genou, hanche, coude, épaule (pour les angles) et l'inclinaison du tronc. Les variations angulaires ont été mesurées au cours de 03 cycles de locomotion, par le tir en deux dimensions. Data analysis Pearson a été utilisée de corrélation linéaire ($p < 0,01$). Il peut être observé par les corrélations présentées, en ce qui concerne la synchronie de mouvement, le mouvement étant réalisé au cours de locomotion question était similaire à la motion sur la terre, par des mouvements synchrones de presque toutes les parties du corps, déjà, en ce qui concerne l'amplitude de mouvement articulaire recherches, ces données proviennent de la réunion chiffres fournis par la littérature lorsque l'on se réfère au modèle de la démarche sur la terre. Cependant, vous pouvez voir les différences entre le soutien atteint en mars à terre et à ceux trouvés dans cette étude.

Mots clés: Locomotion, suspension, mi-net.

DESCRIPCIÓN CINEMÁTICA DE LA LOCOMOCIÓN EN SUSPENSIÓN EN EL MEDIO LIQUIDO UN ESTUDIO DE CASO.

Resumen: Este estudio tuvo como objetivo caracterizar la cinemática locomoción celebrada en suspensión en el medio líquido. Este estudio de caso se muestra a un hombre de 45 años. Los ángulos de las articulaciones se examinaron la rodilla, cadera, codo, hombro (para los ángulos) y de la inclinación del tronco. Las variaciones angulares se midieron durante 03 ciclos de locomoción, por disparos en dos dimensiones. El análisis de los datos se utilizó Pearson de la correlación lineal ($p < 0,01$). Se puede observar las correlaciones presentadas por que, en lo que respecta a la sincronía de movimiento, el movimiento realizado durante la locomoción cuestión era similar a la moción sobre la tierra, por los movimientos sincrónicos de casi todas las partes del cuerpo, porque, por la amplitud de movimiento articular de investigación, estos datos provienen de la satisfacción de las cifras dadas por la literatura al referirse a la del modelo de andar sobre la tierra. Sin embargo, usted puede ver las diferencias entre el apoyo al tiempo que hizo caminar sobre la tierra y los que se encuentran en este estudio.

Palabras clave: Locomoción, Suspensión medio liquido.

DESCRIÇÃO CINEMÁTICA DA LOCOMOÇÃO REALIZADA EM SUSPENSÃO NO MEIO LÍQUIDO: UM ESTUDO DE CASO.

Resumo: O objetivo desta pesquisa foi caracterizar cinematicamente a locomoção realizada em suspensão no meio líquido. Este estudo de caso teve como amostra um homem de 45 anos. Os ângulos analisados foram das articulações do joelho, quadril, cotovelo, ombro (ângulos relativos) e inclinação do tronco. As variações angulares foram mensuradas durante 03 ciclos da locomoção, por filmagem bidimensional. Para análise dos dados, foi utilizada correlação linear de Pearson ($p<0,01$). Pode-se observar pelas correlações apresentadas que, no que se refere à sincronia de movimento, o movimento realizado durante a locomoção em suspensão assemelha-se à marcha em terra, pelos movimentos sincrônicos de quase todas as partes do corpo, já, em relação às amplitudes articulares do movimento pesquisado, estes dados vem de encontro aos valores apresentados pela literatura quando se refere ao modelo da marcha em terra. Ainda, pode-se observar diferenças entre apoios realizados na marcha em terra e os encontrados nesta pesquisa.

Palavras Chave: Locomoção, Suspensão, Meio líquido.