41 - EVALUATION OF MARCHING IN DOWN SYNDROME CHILDREN CARRIERS

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INTRODUCTION

The Down Syndrome (DS) is the most common and known of the malformed syndromes in the human species, being the first identified chromosomic aneuplodia in man which can be characterized by the trissomy of pair 21 (Cotran, 2000). Carriers of this syndrome possess physical characteristics that affect motor development, amongst which may be cited the size of the long bones being smaller than normal, articular hypermobility, muscular hypotony, immaturity of the hand and an increased space between the two first anklets (Burns, 1999). Besides the physical alterations, a delay in the acquisition of motor patterns is also observed. Having acquired bipedestation , the subject will take on a posture with the open legs and the feet directed slightly outwards. The subject may also have the medial plantar arch sufficiently diminished or even altogether absent (Zausmer, 1999). It is asserted that by the 12th month the normal child is capable of ramble alone, whereas in the DS carrier such activity begins to appear around the 19th month (Shepherd, 1998), while some have march without support from 24 months on (Kokubun, 1995). The alterations present in those children may be functionally manifested, interfering in their capacity to play independently the activities of daily life (Mancini, 2003).

The children suffering from locomotive disturbances represent the great portion of the population treated by physiotherapists, including, in this context, the children with DS, however, it's been observed that, after having acquired such pattern, the children are released from treatment, having as focus the pure acquisition of such pattern. However, when the DS child starts to walk, it becomes necessary to work on balance, posture and coordination of movements (Health department, 1994).

Facing such situation, the work's objective consists of evaluating the march, with regard to the aspects of step's length, passing step's length, cadence and speed, in these children, after being submitted to a program of motor stimulation and aftewards high physiotherapy.

MATERIAL AND METHODS

10 children with Down Syndrome have been evaluated, age ranging 3 to 7 years, who were at free marching phase, did not present osteomioarticulatory deformities, auditory impairment, visual and/or cognitive deficiencies, did not make use of any medicine and who had been released from the treatment, selected from a certain clinic in the city of Natal-RN, being treated by the same professional. For evaluation, a 300 x 60 centimeter track was used, idealized by the authors, built of wood, corvin leather, an iron plate, nails and staples, supported by a wooden matress. A digital photographic camera, a video recorder, a chronometer, a metric ribbon, ink and bristol boards were also utilized. The track was installed, together with the recorders and the rest of the apparatus, in a 6.90 x 5.80 meters room, remaining mounted during the whole period of data gathering. The recorders were placed to the front, on the side and at the trach's diagonals, being the data of time and distance grouped in a registry board. The evaluation having been done, the children would wear bathing clothes, aiming at better visualizing the various bodily segments. Thereafter, they would walk along the track (spotted in its inferior face), being the steps thus registered on the bristol board. In such a way, it was possible to evaluate the size of the step, the passing and alignment. After that, the collected data were submitted to statistical analysis, using Student's T Test.

RESULTS AND DISCUSSION

Based on the data's sampling and posterior statistical analysis obtained with the evaluation of the march of these 10 children who composed the population of study, it was possible to demonstrate through tables and figures, as will be shown below, the results obtained and to analyze considering not only referring literature, but also the average values found for the group of 10 children with normal motor development, involved in the research. For the presentation of the results and the discussion it was established that the group of the children carrying the Down Syndrome would be labelled "group A" and the group of children that presented normal motor development would be labelled "group B". Itens illustrated in table 1 refer to the lengths' average values of the steps (right and left) from the group of children afected by the Down Syndrome, and from the group of children with normal motor development, besides presenting the statistical values of standard deviation and p-value.

Table 1: Comparison of the Averages of the Lengths of Right and Left Steps in Groups A and B

Group	Evaluated Items	Average	Standard Deviation	P-value
A	STEP - D (cm)	36.23	12.64	0.352
	STEP - E (cm)	32.74	4.69	
B	STEP - D (cm)	43.65	7.31	0.758
	STEP - E (cm)	43.94	7.74	

SOURCE: Research Data

In this table, it can be observed that there wasn't a difference statistically significant when comparing the averages of right and left steps from the group of Down Syndrome children carriers, once the found average values were of 36.23 centimeters, having a standard deviation of 12.64; and of 32.74 centimeters, presenting standard deviation of 4.69, respectively, with p value of 0.352. For the group of children with normal motor development the same comparison a statistically significany difference was not verified either when carrying through the same comparison between right and left steps averages, as the average values, respectively, had been of 43.65 centimeters with standard deviation of 7.31; and of 43.94 centimeters, demonstrating standard deviation of 7.74, with p value of 0.758.

According to literary reports of Skinner (1998) and Strike (1999), the lengths of the steps of the inferior members are essentially identical, under normal conditions. This can be proven by observing the results obtained for the analyzed population, since they were symmetrical between themselves. The average values found for the sizes of the steps right and left, confirming, in this way, that the children of the group A lied within the expected analyzed item.

The values demonstrated in table 2 refer to a comparison between the average results of the lengths, in centimeters, of the steps and the passing steps of the group of Down Syndrome children carriers, and of the group of children with normal

motor development, along with the respective statistical values of standard deviation and p-value.

Table 2: Comparison of the Averages of the Lengths of the Steps and Passing steps of the Children of the Groups A and B

	Group A		Group B		
Evaluated Items	Average	Standard Deviation	Average	Standard Deviation	P-value
Steps (cm)	31.82	4.40	43.47	7.65	0.0006
Passing steps (cm)	64.52	10.53	87.80	14.46	0.0007

SOURCE: Research Data

The average data obtained for Group A, in relation to the steps were of 31.82 centimeters, with standard deviation of 4.40; and for group B, was of 43,47 centimeters, presenting standard deviation of 7.65; being possible, in this way, to conclude that there was a significant difference, because the p value was 0.0006. In respect to the values of the passing steps, for Group A it was verified the average of 64.52 centimeters, having standard deviation of 10.53, and, for group B, it was found an average of 87.80 centimeters in stadard deviation of 14.46, with p value 0.0007, this test being this considered of statistic significance. As Rossi reports (1998), Skinner (1998) and Blanc (2001), as the process of marching maturation occurs it is possible to verify an increase in the length of the passing steps.

From the results above described, it can be inferred that the reduction in the averages of length of the steps and, consequently, of the passing ones, for the children who had formed Group A, is indicative of a delay in the process of marching maturation. It is important to stand out that, when initiating the independent deambulation, the child presents small steps and passings. As the central nervous system matures and the muscle-skeleton system grows, there occurs an increase in the lengths of the steps and the passing steps, thus indicating the acquisition of the ability of the mature march. However, this gradual growth was not observed for the group of Down Syndrome children carriers, since the average values for items "STEPS" and "PASSING STEPS", described in table 2, show a considerable difference when compared to the average results obtained for the group of children with normal motor development.

Table 3 shows the comparison of the averages of cadence, registered in steps per minute, as well as that of speed, in centimeters per seconds, reached during the march, of the group of Down Syndrome children carriers and of the group of children with normal motor development, and also presents the statistical values of standard deviation and p-value.

Table 3: Comparison of Averages of Cadence and Speed of Marching Between Groups A and B

	Group A		Group B		
Evaluated Items	Average	Standard Deviation	Average	Standard Deviation	P-value
Cadence (steps/minute)	101.20	6.88	87.90	12.65	0.0091
Marching speed (cm/s)	56.00	5.16	72.00	6.32	0.0000

SOURCE: Research Data

The average value obtained, for Group A, in relation to cadence, was 101.20 steps/minute, with standard deviation of 6.88, and, for Group B, was of 87.90 steps/minute, having a standard deviation of 12.65, presenting statistical significance (p value equal to 0.0091). As for the average value found for the speed of the march, in the Group A, was of 56 centimeters/seconds (cm/s), standard deviation of 5.16; and for group B, this average value was of 72 centimeters/seconds, with standard deviation of 6.32, represented for p value of 0,0000; in this way, the test revealed itself statistically significant. Sutherland, Olshen, Biden and Wayatt (1988), Skinner (1998), Braces (2001) and Viel (2001) report that when the independent deambulation is reached, the child will present an increase of speed and cadence. This occurs due to mielinization , to the maturation of the central nervous system and a better neurological control over the inferior extremities. According to Blanc (2001), the average values for the cadence must be between 85 and 90 steps/minute, considering the age range of the children who had participated in the study.

Itens found in table 3 have a narrow relation in what concerns the development of the march, since the cadence diminishes when there's an increase in the values of speed and step lengths and the passing steps. However, the children evaluated in the Group A had presented results contrary to the literary sources, because, through the values described in the referred table, the obtained results for Group B children, as well as the descrease in average values describe in table 2, related to items "STEP LENGTHS" and "PASSING STEPS". It is important to note that the speed, cadence and the lengths of steps and passing steps are considered essential determinants for the process of march maturation. Moreover, due to the fact that the Down Syndrome children carriers possess certain characteristics, such as generalized muscular hypotony and weakness in the antigravitational muscles, in the trunk and the inferior members, these present delay in the process of maturation of the march. In this way, it is possible to infer that the population involved in the research has delay in reference to the acquisition of the mature marching standards, confirming, once again, the results previously obtained.

CONCLUSION

Bearing in view that human marching is considered a complex process, and that the professional physiotherapist is of fundamental importance in the evaluation and training for marching in children suffering from locomotive alterations and presenting delay in development, it becomes necessary the analysis of this motor standard so much in the quantitative aspect as in the qualitative, since this bases the elaboration of more adequate fisioterápicos treatments, raising oportunity for more efficient interventions, as well as supplying subsidies for the accurate time for physiotherapy release. By means of the found results, it can be inferred that the children carriers of DS involved in the research presented a reduction in step lenghts, in passing steps and in the speed's average and an increase in cadence average. Therefore it was noted, in the evaluated sample, that although the children had reached independent deambulation and had been released from treatment, they had not acquired maturity for the marching standards. Then it is suggested that, in the process of release, it be considered not only the fact that the child has the ability to perform according to standards, but also an analysis approaching their quantitative and qualitative aspects, thus preventing decisions solely based on observation.

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EVALUATION OF MARCHING IN DOWN SYNDROME CHILDREN CARRIERS

ABSTRACT

Down Syndrome (DS) is the most common and well known of the malforming syndromes in the human species, being the first identified chromosomic aneuplodia in humans which can be characterized by the trissomy of pair 21. Amongst the many alterations found in the carriers of this pathology, they present a delay in the acquisition of the motor standards. This study consists of an analysis of free marching in down syndrome children carriers after physiotherapy release. This was a field research of combined exploratory-descriptive types having a sample consisting of 10 down syndrome children carriers, and a comparative group, formed by 10 children presenting normal development, both of ages ranging from 3 to 7 years. A board was used where marching would take place, that was painted in its inferior face to be marked the steps in bristol board; data with regards to time and distance were written down for posterior analysis. For the analysis of the results obtained, A Test t Student with significance level of up to 5% was used ($p<0.05$). After the results were evaluated, it was possible to infer that it did not present significant statistical differences in the lengths of the right-left steps; it presented statistical significance in the comparison of the average values of steps, passing, cadence, speed. Therefore, it has been noted, in the evaluated sample, that although the children had reached the independent deambulation and had been released from treatment, they had not acquired maturity of the marching standards. It is suggested then, that, in the process of treatment release, to be considered not only the fact that the child has the ability to perform accoring to standards, but also an analysis approaching their quantitative and qualitative aspects, thus preventing from making decisions solely based on observation.

Keywords: Marching evaluation, Down Syndrome, Physiotherapy

ÉVALUATION DE LA MARCHE CHEZ LES ENFANTS ATTEINTS DU SYNDROME DE DOWN

RÉSUMÉ

Le syndrome de Down (SD) est le plus commun et le plus connu des syndromes malformatifs dans l'espèce humaine, c'est la première aneuploïdie chromosomique identifiée chez l'homme qui peut être caractérisée par la trisomie de la 21ème paire. Parmis les nombreuses altérations retrouvées chez les personnes atteintes de cette pathologie, il y a le retard des acquis psychomoteurs. Cette étude a découlé d'une analyse de marche libre chez des enfants atteints du syndrome de Down après la fin d'un traitement kinésithérapique. L'enquête de terrain, de type combiné exploratoire et descriptif, a été menée auprès d'un échantillon de 10 enfants atteints du syndrome de Down, et d'un échantillon comparatif formé par 10 enfants présentant une croissance normale, les membres des deux groupes étant âgés de 3 à 7 ans. Une planche, peinte sur sa face interne pour délimiter les pas sur feuilles de carton fin, a été utilisée pour marcher dessus; les données sur le temps et la distance ont été notées pour analyse ultérieure. Le test t-Student avec un seuil de significativité allant jusqu'à 5% ($p<0,05$) a été utilisé pour l'analyse des résultats obtenus. Après évaluation des résultats, il a été possible de conclure qu'il n'y a pas eu de différence statistiquement significative par rapport aux longueurs des pas droite-gauche; il y a eu une différence statistique significative quant à la comparaison des valeurs moyennes de pas, passages, cadences, vitesse. Ainsi, il est possible de percevoir dans l'échantillon évalué, que malgré le fait que les enfants aient atteint un stade de déambulation indépendante et qu'ils aient terminé le traitement, ils n'avaient pas acquis la maturité du standard de la marche. Il est alors suggéré que, dans le processus de fin de traitement, il soit considéré non seulement le fait de l'enfant avoir l'habilité d'effectuer le standard, mais aussi une analyse abordant les aspects quantitatifs e qualitatifs de celle-ci, évitant une prise de décisions basée à peine sur l'observation.

Mots clés : Évaluation de la Marche, Syndrome de Down, Kinésitherapie.

EVALUACIÓN DE LA MARCHA EN NIÑOS PORTADORAS DE SINDROME DE DOWN

RESUMEN

La Síndrome de Down (SD) és el campo más común y conscido dentre las síndromes malformativas en especie humana, siendo la primera aneuplodia cromosomica identificada en el hombre, que puede ser caracterizado por el trissomia del par 21. Entre las muchas alteraciones encontradas en los portadores de esta patología, tienen retrasan en la adquisición de los padrones motores. Este estudio consistió en un análisis del marcha libre en niños que portaban la Síndrome de Down, después de alta fisioterapêutica. La investigación fue de campo del tipo exploratória-descriptiva combinadas teniendo una muestra

consistida de 10 niños que portaban la Síndrome de Down, y de un grupo comparativo, formado por 10 niños que presentaban el desarrollo normal, ambos de edad de 3 a 7 años. Una placa fue utilizada donde la llevaron a través del marcha, eso fue manchada en su cara inferior donde se demarcó los pasos en el tablero de cartulina; los datos con respecto al tiempo y a la distancia fueron anotados para el análisis posterior. Para el análisis de los resultados conseguidos, la prueba t Student con el nivel de la significación de el hasta 5% fue utilizada ($p<0,05$). Para evaluar después los resultados, fue posible deducir que no habia diferencia significativa estatistica cuánto a las longitudes de los pasos de derecha a izquierda; tenía significación estatistica cuánto la comparación de los valores medios de pasos, passada, cadencia, velocidad. De tal manera fue percibida, en la muestra evaluada, que aunque los niños haber alcanzado el deambulation independiente y haber recibido alta del tratamiento, los mismos no habían adquirido la madurez del padrone de marcha. Sugierese entonces, que en lo processo de alta del tratamiento, debese considerar no sólo el hecho del niño tener la capacidad de desarrollar el padron, pero también un análisis que acerca a los aspectos cuantitativos y cualitativos de el mismo, preveniendose la tomada de decisiones establecidas solamente por observacion.

Palabra-llave: Evaluación de Marcha, Síndrome de Down, Fisioterapia

AVALIAÇÃO DA MARCHA EM CRIANÇAS PORTADORAS DE SÍNDROME DE DOWN

RESUMO

A Síndrome de Down (SD) é a mais comum e conhecida das síndromes malformativas na espécie humana, sendo a primeira aneuplodia cromossômica identificada no homem que pode ser caracterizada pela trissomia do par 21. Dentre as muitas alterações encontradas nos portadores desta patologia, têm-se o atraso na aquisição dos padrões motores. Este estudo constou de uma análise da marcha livre em crianças portadoras de Síndrome de Down pós alta fisioterapêutica. A pesquisa foi de campo do tipo exploratória-descritiva combinadas tendo uma amostra constituída por 10 crianças portadoras de Síndrome de Down, e um grupo comparativo, formado por 10 crianças apresentando desenvolvimento normal, ambos na faixa etária de 3 a 7 anos. Foi utilizada uma prancha onde era realizada a marcha, que era pintada em sua face inferior para ficarem demarcados os passos em cartolina; dados com relação ao tempo e distância eram anotados para posterior análise. Para a análise dos resultados obtidos, utilizou-se o teste t de student com nível de significância de até 5% ($p<0,05$). Após avaliar os resultados, foi possível inferir que não houve diferença estatisticamente significativa quanto aos comprimentos dos passos direito-esquerdo; houve significância estatística quanto a comparação dos valores médios de passos, passadas, cadência, velocidade. Desta forma percebeu-se, na amostra avaliada, que apesar das crianças terem atingido a deambulação independente e terem recebido alta do tratamento, as mesmas não haviam adquirido a maturidade do padrão de marcha. Sugere-se então, que, no processo de alta do tratamento, seja considerado não apenas o fato da criança ter a habilidade de desempenhar o padrão, mas também uma análise abordando aspectos quantitativos e qualitativos da mesma, evitando tomada de decisões baseada apenas na observação.

Palavras-chave: Avaliação da Marcha, Síndrome de Down, Fisioterapia.