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EFFECTS OF SELECTIVE ATTENTION ON THE DEVELOPMENT OF BODY AWARENESS IN CHILDREN WITH MOTOR DEFICIENCIES

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ABSTRACT

Objective: To investigate the influence of using cognitive strategies for directing attention (learning cues) on the development of body awareness in children with motor deficiencies. Method: Twenty-two children of both sexes, aged 7 to 10 years, were selected based on their similar functional characteristics and were divided randomly into two groups: cue group (n= 11) and no cue group (n= 11). The cue group followed a methodological sequence in which attention was directed using learning cues, while the no cue group followed a different sequence, in which there was no directing of attention. These programs were followed for two weeks, with two sessions of 50 minutes each per week. Pre, post and retention tests were applied using the following instruments: body part identification test, kinetic perception test and critical body part perception test. Multivariate analysis of variance (MANOVA) and the Tukey multiple comparisons test were used to analyze possible significant differences. Results: The results indicated significant differences ($p < 0.01$), with superior performance by the cue group in the variables of kinetic perception and critical body part perception. Conclusion: These results suggest that selectivity of attention may contribute towards the development of body awareness in children with motor deficiency.

Key words: learning; attention; movement perception; disabled children.

INTRODUCTION

Autonomy in problem solving regarding movement restrictions is a necessity of children who have chronic motor problems. One of the factors which makes the solution difficult for such problems is the inadequate development of body awareness[1,2,3].

The term awareness as been defined as the capacity to organize and incorporate new stimuli into already stored information, leading to alterations of behavior patterns[4]. In the motor domain, this is associated with the sensorial integration, interpretation, activation and reinforcing capabilities[5].

Body awareness is the product of the inter-relationship among neurologic and behavioral aspects which integrate the body sensations presence in the environment, and are considered the basis of the psychomotor structure of an individual[1,4]. This is developed mainly during infancy by means of the diversity of motor experiences of the child[6,7]. Consequently, in order to facilitate the development of body awareness of a child with motor deficiencies, it is important to create activities which are playful, challenging, rich in the diversity of body actions[8-10] and that take into account the contemporary tendency of integrating the fields of neurophysiology and motor behavior in intervention strategies which adopt the problem solving approach[11-14].

An example of activity which considers this approach is the motor assessment by problem solving based on Laban Movement Analysis[15]. This type of activity produces a challenging environment, and motivates the child to use the acquired body knowledge and their movements that are aimed at problem solving during non-programmed situations, similar to those experienced in daily living. However, the presence of problems to be solved in playful activities do not seem to be capable of appropriately stimulating the perception of different manners of solving them, since it is known that the children have difficulty in focusing their attention on relevant critical factors which could help solve a given problem[16-18]. Therefore, in order to promote motor learning, it is necessary that the methodological perspective adopted for these activities consider the establishment of strategies which facilitate the selective attention.

One of the resources capable of focusing the attention of children on the relevant information of the environment is the use of learning cues[18,19]. Several studies[20-24] have demonstrated the effectiveness of the use of cognitive strategies which target attention, or learning cues, for the facilitation of the perception of critical factors of distinct motor tasks. Nevertheless, no studies were found in the literature which related the use of learning cues to the development of body awareness of children with motor deficiencies. Furthermore, the majority of the studies have been carried out in laboratory settings, and, thus, the development of studies in natural environments is needed.

Within this context, the present study aimed at verifying the influence of the use of learning cues during the application of activities of motor assessment by problem solving, performed in a natural environment, for children with motor deficiencies and the evaluation of the behavioral alterations related to the identification of their own body, to the interpretation their own body movements (kinesthetic perception) and for the direction of their attention to the body parts of another person (critical perception of body parts).

MATERIALS AND METHODS

Twenty-two children with motor deficiencies, aged between 7 and 10 years, 12 girls and 10 boys, participated in the study. The subjects were selected, considering the similarity of their functional characteristics, by a team of physical therapists of specialized school in Curitiba PR. The following inclusion criteria were used: to demonstrate functional movements with at least one of the upper extremities, trunk balance sufficient to maintain sitting posture without support, an ability to make verbal communication, to be a student in kindergarten of the first level of elementary education. The exclusion criteria were the demonstration of oscillation tonus or a diagnosed mental deficiency. The motor deficiencies which were approached were cerebral palsy and myelomeningocele. After approval given by the Research Ethics Committee of the Biological Sciences Sector from Federal University of Paraná, register nº. 005/03, and attainment of informed consent signed by the legal tutors of the child, the subjects were randomly assigned to CG group (with learning cues, n= 11) and the NCG (without learning cues n= 11). Their ages were converted to months in order to maintain the same mean age for both groups.

Pre-tests were carried out one week before the development of the procedures: 1 (P1) and 2 (P2), using the following instruments: 1) A test of identification of the body parts, adapted from Fonseca[25], in which each child was oriented to sit comfortably, at the center of a thin mattress and asked, by means of tape-recorded commands, to touch different parts of their body with one hand. The time to accomplish these behaviors was programmed in records (3 to 5 seconds for each behavior); 2) A test of kinesthetic perception, in which the children were asked to perform their natural movements using each body part, maintaining a sitting posture, on a thin mattress, during the period of time (1’ 45") determined by an hourglass positioned on a bench in front of the child; 3); A test of a critical perception of the body parts, which consisted of showing the child two natural size pictures of a boy (1.30m) with his upper extremities positioned in different manners in the pictures and the other body segments in the same position. After hearing the tape-recorded command, the child observed both pictures during 15 seconds and, subsequently, was supposed to answer questions related to the differences and similarities of the positions of the body parts of the boy presented in the pictures. The tests were carried out individually, applied by the same researcher and videotaped. The videotapes were then examined by two physical therapists and one physical educator who were equally oriented about the evaluation criteria and were not allowed to communicate between them during the evaluations. The evaluation identified if the child did or did not demonstrate the behaviors corresponding to each test. Ten points were attributed for each behavior performed by the child and the final score of each test was the sum of the obtained points corresponding to these behaviors.The evaluation forms containing the description of the expected behaviors for each tested variable, the transcription of the instructions used in each test, and the model of the pictures were previously described in detail by Bertoldi[26].

After the pre-tests, the activities of “motor assessment by problem solving” were developed using the methodological procedures: 1 (P1) for the CG group and the methodological procedure 2 (P2) for the NCG group. The procedures P1 and P2 were applied by the same researcher over two weeks, with a frequency of two 60 minute sections per week, according to the following progression of tasks: 1) Initial part: spatial displacements through joint movements and rolling on the ground with the objectives of warming-up and familiarization; 2) Main part: 2.1 manipulation of diverse toys in order to verify how the parts of each toy moved, 2.2 verbal presentation of the discovered solutions; 2.3 assessment of the possible movements for each body part; 2.4 verbal presentation of the discovered solutions; 2.5 locomotor sequences integrating the developed contents; 3) Final part: relaxing activities. In order to achieve a better control of variables it were used tape-recorded commands for each task during all sessions. The transcriptions of the commands were described by Bertoldi[26].

The only difference between the procedures for P1 and P2 was the focusing of attention adopted in P1 with the CG group, which was instructed to perform the described tasks focusing the attention on a specific body segment in each session, whereas, in P2, the NCG group performed the same tasks without a specific focus of attention. The learning cues used in P1 were: session 1: “upper parts” (performing the tasks focusing attention on the head, face and neck); session

2: “side parts” (upper extremities); session 3: “lower parts” (lower extremities); and session 4 “middle parts” (trunk).

After the development of procedures P1 and P2, post-tests and retention tests (1 month after the post-tests) were carried out. For statistical analysis a multivariate analysis of variance MANOVA was used to verify the existence of differences between the dependent variables related to the identification of body parts, kinesthetic perception and critical perception of the body parts. In order to locate these differences, a Tukey multiple comparisons test was used. Both tests were carried out with the alpha level established at 0.05, through the software *Statistica 4.3 for Windows*.

RESULTS

The variable of identification of body parts did not show significant differences between the groups, which revealed great ability to identify different parts of the body since the pre-test. Conversely, in relation to the kinesthetic perception, the groups CG and NCG demonstrated significant differences. Table 1 shows the means and standard-deviations for this variable. The results of the multivariate analysis of variance MANOVA demonstrated a significant difference ($p < 0.001$) for all factors of the analysis (group, score and group x score) and the results of the Tukey´s test, shown in Table 2, indicated that the location of the differences found did not occur between the scores of the pre-test ($p = 0.1821$), however, the results of the post-test ($p = 0.0002$) and retention test ($p = 0.0002$) revealed significant differences. There were also observed significant differences in the CG group between the mean scores of the pre-test and post-test ($p = 0.0002$) and between the mean scores of the pre-test and retention test ($p = 0.0002$). Significant differences between the mean scores of the post-test and of the retention test were not observed ($p = 0.9993$). The NCG group did not show significant differences between the mean scores of the pre-test and post-test ($p < 0.99$), pre-test and retention test ($p < 0.99$), and post-test and retention test ($p < 0.75$).

Table 1. Kinetic perception - mean and standard deviation.

Group	Pre test	Post test	Retention
CG (n=11)	23.64 ± (6.74)	111.82 ± (9.82)	110.91 ± (8.31)
NCG (n=11)	30.00 ± (10.00)	31.82 ± (14.71)	28.18 ± (11.68)
Total (n= 22)	26.82 ± (8.94)	71.82 ± (42.72)	69.54 ± (43.48)

CG: learning cue group; NCG: no learning cue group.

Table 2. Kinetic perception - Tuckey test.

	CG Post test	CG Retention	NCG Pre test	NCG Post test	NCG Retention
Pre test CG	0.0002*	0.0002*	0.1821	0.0404*	0.5325
Post test NCG		0.9993	0.0002*	0.0002*	0.0002*
Retention CG			0.0002*	0.0002*	0.0002*
Pre test NCG				0.9827	0.9827
Post test NCG					0.7446

CG: learning cue group; NCG: no learning cue group; * significant differences p< 0.05.

Table 3. Critical body parts perception - mean and standard deviation.

Group	Pre test	Post test	Retention
CG (n= 11)	21.82 ± (4.04)	126.36± (24.20)	114.55 ± (23.82)
NCG (n= 11)	26.36 ± (10.27)	30.00 ± (14.14)	26.36 ± (9.24)
Total (n= 22)	24.09 ± (7.96)	78.18± (52.97)	70.45 ± (52.97)

CG: learning cue group; NCG: no learning cue group.

Table 4. Critical body parts perception - Tuckey test.

	CG Post test	CG Retention	NCG Pre test	NCG Post test	NCG Retention
Pre test CG	0.0002*	0.0002*	0.9008	0.4317	0.9008
Post test CG		0.0959	0.0002*	0.0002*	0.0002*
Retention CG			0.0002*	0.0002*	0.0002*
Pre test NCG				0.9595	1.0000
Post test NCG					0.9595

CD: learning cue group; SD: no learning cue group; * significant differences p< 0.05.

Similar results were observed for the variable of critical perception of the body parts. Table 3 shows the mean and standard deviation of the scores obtained for this variable. The results of the multivariate analysis of variance MANOVA demonstrated significant differences between the groups ($p < 0.0000$) and between all factors of the analysis. Table 4 shows that the differences occurred in the results of the post-test ($p < 0.0002$) and of the retention test ($p < 0.0002$). It can be also observed that the CG group revealed significant differences between the pre-test and post-test ($p = 0.0002$) and between the pre-test and retention test ($p < 0.0002$). Significant differences between the pre-test and retention test were not observed ($p < 0.95$).

DISCUSSION

The results observed for the dependent variables of the present study demonstrated that the children, before the application of the intervention procedures, although both groups had a good performance in identifying the majority of their body parts, indicated difficulties both in recognizing their ability to move these body parts (kinesthetic perception) and in focusing their attention on diverse parts of the body of other people (critical perception of body parts), what confirms the inadequacy of the development of body awareness in this population[1-4].

After the development of the methodological procedures, the CG group showed a significant improvement in the kinesthetic perception and critical perception of body parts, whereas the NCG group did not evolve for the same variables. These differences were identified during the evaluations carried out immediately after the application of the procedures and were maintained during the month after the end of the procedure application, what demonstrated that the use of learning cues had positive effects on both the acquisition phase and retention of the selected behaviors, therefore, affecting the processes of motor learning[14,27,28].

No other studies were found which investigated the relationships between the use of learning cues and the development of body awareness in children with motor deficiencies. The obtained results are in accordance with the motor behavior research with respect to the effectiveness of the use of learning cues with the objective of altering other behaviors of children, in consonance with the findings of Ladewig[20] and Passeto[21], who found a better performance in groups who were given learning cues referent to the selection of dynamic information about the environment. They were also in agreement with the results related to the facilitation of learning the motor ability of rolling on the floor and of performing a backhand shot in tennis, using learning cues with people with Down Syndrome[23]. Also, the study of Winther and Thomas[24] demonstrated the effectiveness of focusing children's attention on activities which demand spatial orientation, this is a unique study.

Although the present results are in accordance with the above, it is important to highlight that the learning cues were only given during the application of the intervention procedures and not during the tests, as carried out in the other studies. Therefore, the commands used to perform the tests of identification of body parts, of kinesthetic perception and of critical perception of body parts were identical for the groups. Hence, it is possible to affirm that the obtained results reflected the learning levels of the children about the development of the learned attention strategies, as the result of the different methodologies used with the CG and NCG groups.

It can be noted that the methodology which included learning cues interfered positively with the ability to problem solve involving factors that were critical to body awareness. This occurred even after a short period of intervention which confirms that selective of attention is responsible for the retention or discarding of environmental information, and determines what is perceived and codified, and facilitates the motor learning[18,19].

The accomplishment of goals related to the development of the ability to problem solve has been the main issue of contemporary approaches for kinesthetic-functional recovery[11-13] and of the developmental perspective of motor behavior[5,6,16]. Based on this principle, the adopted methodology aimed at promoting practice based on the development of the child's capacity to identify solutions for different motor problems, considering their necessities of experiencing diverse, playful and challenging body actions which create perceptions of success. However, although the developed activities adopted in the problem solving approach, the differences observed in the CG and NCG groups demonstrated that the results related to motor learning may be significantly better if cognitive strategies are used to focus their attention on critical factors of the proposed tasks.

The analysis of these results, from the point of view of information processing[,18], indicates that the use of learning cues facilitated the establishment of strategies aimed at focusing attention on critical factors of the performance of motor tasks, fostering the processing and storing of information within long-term memory, as well as the recovering and use of the information according to the environmental demands. From the point of view of the dynamic systems theory[29,30], attentional focusing may be explained as a "noise" that is capable of distancing the system from its state of equilibrium, leading their elements to find a solution for the problem in order to reach a new equilibrium state, as observed in the alterations of behaviors demonstrated by the CG group.

Therefore, although there are various theoretical arguments to explain the better performance of the CG group compared to the NCG group, it seams that there is a consensus about the influence of attentional focusing on the of motor learning processes. Thus, it is possible to conclude that the selective attention is improved by the use of learning cues that positively affected the development of body awareness of children with motor deficiencies.

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