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INTRODUCTION OF PLAY AND IMPROVEMENT IN THE MOTOR DEVELOPMENT OF INFANTS ENROLLED IN A PUBLIC DAYCARE CENTER: A PRE-EXPERIMENTAL STUDY

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ABSTRACT

Aims: to verify if the introduction of activities, centered on playing, in the routine of a nursery in a public daycare center, mainly focused on care, would favor the motor and cognitive development of children under two years old. Material and Methods: A pre-experimental study with twenty children aged between 10 and 22 months enrolled in a nursery of a public daycare center and 6 teachers. The intervention took place twice a day, 15 minutes each, for 9 weeks, following a routine established in partnership with the teachers. A practical intervention was established, aiming not to encumber the teachers' routine. In each session the children played on a carpet placed on the floor, with the same toys for each one, but different between the sessions. The teachers provide support (talking about play, adding to children's play and preventing safety problems) during the playing. The instrument used to assess children's cognitive and motor development was Bayley III. Affordances in the Home Environment for Motor Development was used to assess the opportunities offered in the home environment and the Infant/Toddler Environment Rating Scale Revised Edition was used to check the quality of the daycare environment. Results: After the intervention, the children had better results in the motor domain ($p = 0.019$) with effect size of 0.57 (at a power of 68%; $p < 0.05$). Conclusions: the proposed intervention proved to be feasible within the reality of the daycare center and positively influenced the motor development of children under two years old.

Keywords: Child development. Motor skills. Daycare center.

INTRODUÇÃO DO BRINCAR E O IMPACTO NO DESENVOLVIMENTO MOTOR DE BEBÊS MATRICULADOS EM UMA CRECHE PÚBLICA: UM ESTUDO PRÉ-EXPERIMENTAL

RESUMO

Objetivos: verificar se a introdução de atividades, centradas no brincar, na rotina de uma creche pública, principalmente voltada ao cuidado, favoreceria o desenvolvimento motor e cognitivo de crianças menores de dois anos. Material e Métodos: Estudo pré-experimental com 20 crianças de 10 a 22 meses matriculadas em creche de creche pública e 6 professoras. A intervenção ocorreu duas vezes ao dia, 15 minutos cada, durante 9 semanas, seguindo uma rotina estabelecida em parceria com os professores. Foi estabelecida uma intervenção prática, com o objetivo de não sobrecarregar a rotina dos professores. Em cada sessão as crianças brincavam em um tapete colocado no chão, com os mesmos brinquedos para cada uma, mas diferentes entre as sessões. Os professores forneciam apoio (conversando sobre as brincadeiras, acrescentando algo, a partir da demanda das crianças e evitando problemas relacionados à segurança) durante a brincadeira. O instrumento utilizado para avaliar o desenvolvimento cognitivo e motor das crianças foi o Bayley III. A *Affordances in the Home Environment for Motor Development* foi usada para avaliar as oportunidades oferecidas no ambiente doméstico e a *Infant / Toddler Environment Rating Scale Revised Edition* foi usada para verificar a qualidade do ambiente da creche. Resultados: Após a intervenção, as crianças obtiveram melhores resultados no domínio motor ($p = 0,019$) com tamanho do efeito de 0,57 (poder de 68%; $p < 0,05$). Conclusões: a intervenção proposta mostrou-se factível considerando a realidade da creche e influenciou positivamente no desenvolvimento motor de crianças menores de dois anos.

Palavras-chave: Desenvolvimento infantil. Habilidades motoras. Creche.

INTRODUTION

Child development is a process of continuous and ordered emergence of interdependent skills of motor, cognitive and social-emotional, resulting of a relationship between genetic, biological, environmental and cultural factors (ENGLE *et al.*, 2007). From a bioecological point of view, human development is the result of the processes of interaction between the person and the environment, from those where there is direct interaction, such as microsystems, as those of indirect interaction, such as macrosystems. This theory considers that the insertion of the child into the various environments in which he/she participates, including the daycare center, encompasses his/her knowledge, allows socialization and promotes his/her development (BRONFENBRENNER, 2011).

The insertion of children into daycare centers has become an increasingly common reality in Brazil (CAMPOS *et al.*, 2011). A large proportion of children spend most of the day in daycare centers and preschools, which can have a great influence on the skills acquired during childhood (FUNDAÇÃO MARIA CECÍLIA SOUTO VIDIGAL, 2017).

The first three years of life, called very early childhood (FUNDAÇÃO MARIA CECÍLIA SOUTO VIDIGAL, 2017) are fundamental for the development of all domains (ENGLE *et al.*, 2007). At this moment, children develop their potential through exploration of all learning possibilities, which are favored by brain plasticity, the so-called sensitive period of brain development (ENGLE *et al.*, 2007; FUNDAÇÃO MARIA CECÍLIA SOUTO VIDIGAL, 2017).

Playing is an activity that helps in the formation, socialization, development of motor, social, emotional and cognitive skills (KIZILDERE *et al.*, 2020). The daycare center teacher has an important role in introducing play in this environment. It is up to him/her to know if he/she should intervene, integrate him/herself as a participant, give information and select the quality and variety of materials (FUNDAÇÃO MARIA CECÍLIA SOUTO VIDIGAL, 2017).

One of the guidelines of the Brazilian National Plan for Early Childhood (BRASIL, 2010) reports that education and care must be considered aspects of the same reality in the context of institutions in early childhood education. Although national standards emphasize the inseparability between caring and educating in daycare centers, the demand for basic care, added to the high number of children attended by each teacher, becomes the main focus of the day's routine in many public institutions (CAMPOS *et al.*, 2011). Considering that the daycare center is one of the environments in which the child spends most of the time and the importance of stimulation through playing in the first years of life, this study aims to verify whether the introduction of activities in the routine of a nursery in a public daycare center, mainly focused on hygiene and food care, would favor the motor and cognitive development of children under two years old. A practical intervention was established, aiming not to encumber the teachers' routine.

MATERIAL AND METHODOS

A quantitative pre-experimental study was carried out. The data collection took place from September to December 2018. The study was approved by the Research Ethics Committee from the University Federal dos Vales do Jequitinhonha e Mucuri (UFVJM) (2.931.889).

The sample was of the convenience and 20 children, aged 10 to 22 months, enrolled in the only nursery of a public daycare center in a small town located in the Jequitinhonha Valley, Minas Gerais. All the children whose parents agreed to participate in the research and signed the free and informed consent form were included. Children diagnosed with cerebral palsy or other health conditions that could influence the results were considered as non-inclusion criteria.

The children spent about 8 hours in the daycare center. The nursery was spacious, but all occupied by baby cribs. The routine was focused on hygiene and food, most of the time, performed with children in the cribs, with rare and random moments of child stimulation.

Six teachers also participated in this study, 3 in the morning shift and 3 in the evening shift. The teachers were between 25 and 56 years old, had experience in teaching early childhood education between 15 months and 28 years and the education varied between complete high school and graduation in the pedagogy course.

For the economic classification of families, the Brazilian Economic Classification Criterion (BECC) from Associação Brasileira de Empresas de Pesquisa was used (available in: http://www.abep.org/criterio-brasil). This criterion is an economic classification that considers household durable goods, the number of bathrooms and the education level of the head of the family. A score is assigned and the family's economic

level is classified on an increasing ordinal scale ranging from E (equivalent to R$ 719.81 household income average) to A1(equivalent to 25,554.33 household income average).

To assess child development, the third version of the Bayley Scales of Infant and Toddler Development (Bayley III) (BAYLEY, 2006) was applied before and after the intervention. Bayley III is a gold standard test for assessing child development. The test has as main objective to identify children with developmental delay in the age group from one to 42 months in the Social-Emotional and Adaptive Behavior, Cognitive, Language and Motor domains. For the present study, considering the feasibility of applying it in a single moment and minimizing children's stress, only motor and cognitive scales were applied. Each scale is scored based on the sum of tasks performed by the child, generating raw scores, which are converted into different types of scores, such as composite. For the composite score, 100 is the average score with a standard deviation of ± 15 points.

In order to check the quality of the daycare environment, the Infant/Toddler Environment Rating Scale-Revised Edition (ITERS-R) (HARMS *et al.,* 2003) was used. It is a scale to assess the quality of educational environments that receive children from zero to 30 months of age. ITERS-R is composed of 39 items distributed in seven subscales: (1) Space and Furnishings; (2) Personal Care Routine; (3) Listening and Talking; (4) Activities; (5) Interaction; (6) Program Structure; (7) Parents and Staff. Each quality indicator must be marked, considering its presence or absence in each collective environment that is intended to be evaluated in the daycare center. From the marking of the indicators, the items are scored from 1 to 7. The final score of the scale is given by the average of the seven subscales. The values are assigned as an ordinal scale, increasing, from 1 to 7, which quality interpretation is 1: inadequate, 3: minimal (basic), 5: good and 7: excellent.

Whereas the home environment can influence child development (BRONFENBRENNER, 2011; ENGLE *et al*., 2007), the Affordances in the Home Environment for Motor Development (AHEMD) translated and validated for Brazil by Caçola *et al*. (2015). This instrument allows to explain how the influence of the opportunities provided in the home environment act on the child's motor development (CAÇOLA *et al*., 2015). The version used for children aged between 3 and 18 months (AHEMD-IS) consists of 35 items subdivided into four dimensions: Physical Space, Variety of Stimulation, Toys for Fine Motor Skills and Gross Motor Skills; which, like the total score, are categorized as less than adequate, moderately adequate, adequate and excellent (CAÇOLA *et al*., 2015). The version aimed at children aged between 18 and 42 months has 67 items subdivided into five subscales: Indoor Space, Outdoor Space, Variety of Stimulation, Gross Motor Skill and Fine Motor Skill Materials, which are categorized as very weak, weak, good and very good. For this study, the average score was considered before and after the intervention.

For the intervention, EVA rugs, a toy ball play tunnel and classic to age toys, allowing enough practical and symbolic games for all children, were provided. The toys chosen were those that could favor the global development of early childhood children. They were new toys, bought by the researchers, with funding, exclusively for this purpose. They were separated and kept in transparent organizing boxes and labeled by type of toys to facilitate organization.

The children's parents were approached at the entrance to the daycare center where the intention to research was presented and the invitation to participate in the study and to sign the informed consent form took place. On this occasion, the BECC and AHEMD questionnaires were presented and delivered to make it possible to fill out in a timely manner and minimize the possibility of embarrassment. The 48-hour deadline was applied for the delivery of the questionnaires.

Initially the ITERS-R was applied and the next the BAYLEY III assessments took place at the daycare center and were carried out by of a team of four assessors who were blinded to the ITERS-R and AHEMD results. The assessors` interrater reliability was assessed prior to study onset and shown to be good (Intraclass Correlation Coefficient 0,99).

During this period, the teachers participated in three training sessions related to child stimulation in the nursery, taught by specialized professionals (physiotherapist, speech therapist and pedagogue): (1) Importance of playing with the child in early childhood: sensitive period of development childish; (2) How to read books and tell stories to babies; (3) The adult roles in child's play.

A program of daily activities, focused on playing, was proposed among researchers and the nursery teachers:

- Monday morning - soft rubber blocks
- Monday afternoon - dolls and cars
- Tuesday morning - lego blocks
- Tuesday afternoon - babies books
- Wednesday morning - star pick
- Wednesday afternoon - dolls and cars

- Thursday morning - lego blocks
- Thursday afternoon - babies books
- Friday morning - star pick
- Friday afternoon - soft rubber blocks

The objective was to propose something simple to be reproduced daily and viable, a program that did not require major changes in the routine of teachers, focused on care. Another highlight of the program is the performance of the intervention without the direct participation of the researchers, something that would bring autonomy and the possibility of continuing the intervention after the end of the research.

The physical space for the interventions was structured with a toy ball play tunnel and an EVA mat placed in a corner of the nursery. During the 9-week period, the teachers performed daily games with the children on the floor, for 15 minutes in the morning and 15 minutes in the afternoon. At each moment of play, toys were offered, just like all children, who played freely under the teachers' supporting (talking about play, validating their efforts, adding to children's play and preventing interpersonal conflicts and safety problems).

Once a week, one of the researchers compared a daycare center to see if the intervention was taking place as scheduled. At the end of the intervention, the assessment instruments were applied again to verify the efficiency of the intervention.

The collected data were initially transferred to the Statistical Package for the Social Sciences (SPSS) version 19.0, when an exploratory analysis of the database was performed. The measures of central tendency and dispersion were applied, in addition to the frequency distribution used for the characterization of the participants and daycare centers (ITERS-R). In order to verify the results before and after AHEMD and the result of the intervention (Bayley III before and after), the T Test for paired samples was performed, considering that the sample had a normal distribution analyzed using the Shapiro-Wilk test. The calculation of the size of the effect/power of the study was done using the GPower 3.1.9.2 software.

RESULTS

Initially the nursery was composed of 24 children aged between 10 and 22 months, however, there was a sample loss throughout the study and 20 children completed all phases. One child did not participate in the initial assessment; another withdrew from the daycare center before the intervention; two more children were sick during the reevaluation period. The twenty children aged between 10 and 22 months (average 16.4 and ± 4.096), 14 and 27 months (average 20.65 and ± 4.416), before and after the intervention, respectively. Table 1 shows the biological and socioeconomic characteristics of the participants.

Table 1 - Biological and socioeconomic characteristics of children. Minas Gerais. n=20.

Characteristics		No. (%)
Children (n=20)		
Gender	Female	11 (55)
	Male	9 (45)
Birth Weight	Low weight	3 (15)
	Adequate weight	17 (85)
Prematurity	Yes	3 (15)
	No	17 (85)
Fathers (n=20)		
Education	1st to 4th grade	4 (20)
	5th to 8th grade	5 (25)
	High School	11 (55)
Mothers (n=20)		
Education	1st to 4th grade	1 (5)
	5th to 8th grade	3 (15)
	High school	11 (55)
	Higher Education	5 (25)

Families (n=20)		
Economic level	C1 Class	7 (35)
	C2 Class	7 (35)
	D/E Class	6 (30)

No.: absolute number; %: percentage. average household income equivalent to classes (in brazilian currency): A: 25,554.33; B1: 11,279.14; B2: 5,641.64; C1: 3,085.48; C2: 1,748.59; d/ e: 719.81 (available in: http://www.abep.org/criterio-brasil).

Source: research data.

Therefore, it is observed that there was a slight predominance of girls in the group in relation to boys. A small percentage of premature children were also considered to be underweight, it is noteworthy that these children had their ages corrected, to apply the Bayley test. Most fathers and mothers attended High School and some mothers had higher education. The sample was homogeneous in terms of socioeconomic status, none of the children belonged to the upper economic classes (A and B).

Table 2 shows the results of the ITERS-R for the quality of the nursery environment, before, immediately after and three months after the intervention. It is possible to observe that the items of "Personal Care Routine", "Listening and Talking" and "Activities" obtained a slight improvement in the score immediately after the intervention, these same items maintained their score after three months of the intervention, except for "Activities" that obtained a higher score. The items Program Structure and Interaction maintained the same score before and immediately after the intervention, but three months after the intervention, there was an increase in the score of these items.

Table 2 - Quality of the daycare environment. Minas Gerais. n=20.

Environments	Range Reference	Score	
		Before	After
ITERS-R			
- I. Space and Furniture	(1-7)	1.6	1.6
- II. Personal Care Routines	(1-7)	1.00	1.16
- III. Listening and Talking	(1-7)	2.66	3.00
- IV. Activities	(1-7)	1.00	1.80
- V. Interaction	(1-7)	3.5	3,5
- VI. Program Structure	(1-7)	1.66	1.66
- VII. Parents and Staff	(1-7)	1.57	1.57
- Total	(1-7)	1.85	2.04

Source: research data.

The AHEMD average before (47.77 ± 9.95) and after (49.25 ± 10.09) the intervention at the daycare center, did not demonstrate, through the T for paired samples, that there was a statistically significant change ($p = 0.531$) about the opportunities present in the children's home.

Table 3 shows the results of the Bayley III test before and after the intervention at the daycare center. It was observed that there was a change in the average before and after the intervention in both domains, but statistically significant only in Motor. The calculation of the statistical power for the composite motor domain was 68%, considering an effect size of 0.57 ($p = 0.05$) demonstrating that the difference before and after the intervention was moderate.

Table 3 - Domains of the Bayley III test before and after the intervention. Minas Gerais. n=20.

Bayley III	Average (SD)	Paired T Test	p value
Bayley composite cognitive (before)	94.00(±9.1)		
Bayley composite cognitive (after)	97.(±10.88)	- 1.003	329
Bayley motor composite (before)	95.(±13,22)		
Bayley motor composite (after)	101.65 (±11,93)	- 2.576	019*

* significance level p <0.05.
Source: research data.

DISCUSSION

This study aimed to verify if the introduction of activities, centered on playing, in the routine of a nursery in a public daycare center, focused mainly on care, would favor the cognitive and motor development of children under two years. The experiences lived in early childhood have an influence on child development (ENGLE *et al.*, 2007) and may have long-term repercussions on the individual's life course (FUNDAÇÃO MARIA CECÍLIA SOUTO VIDIGAL, 2017).

As the home environment can influence child development (BRONFENBRENNER, 2011; ENGLE *et al.*, 2007), it is important to note that the results found in the application of AHEMD indicated that there were no changes in the home environment during the intervention period, that is, the changes that occurred after the intervention, possibly, did not occur due to changes in the children's home environment.

From the proposed intervention, it was observed an improvement of the children's motor performance, since there was a statistically significant change in performance after the intervention.

This result is similar to the study conducted by Veldman; Okely and Jones (2015) in which children under two years of age who participated in a program of stimulation of gross motor function, for 8 weeks, 10 minutes a day, obtained better results in motor development compared to those who did not participate in the intervention group. A Brazilian study with 59 babies from a public daycare center, with an average age of 11 months, using the Alberta Infant Motor Scale (AIMS) after the implementation of a motor intervention program, showed that the children who participated in the intervention obtained better results in motor development when compared to the group of children who did not participate in the intervention (GERZSON *et al.*, 2016).

The change occurred in motor development is possibly because the proposed intervention allowed the experience of more periods per day outside the crib. Before the intervention the routine was focused on care, most of the time, performed with children in the cribs. Caregivers support and constrain motor behavior by structuring the physical environment in which motor skills develop and this provide the backdrop for motor skill acquisition (ADOLPH; HOCH, 2019).

Hallam *et al.* (2018), when conducting a study on the use of confinement devices in 38 maternal environments, they warned of the high rate of confinement, such as in cribs, existing in collective environments for infants. The authors also pointed out that equipment limits exploration by the children, and this can have implications for child development and childhood obesity. Similarly, the study conducted by Ribeiro *et al.* (2018) from the report of thirty-five parents or caregivers of children aged between 12 and 24 months, observed that practices related to freedom of movement, such as not placing the child in the crib and placing the child on the floor instead, favored the emergence of motor milestones such as staying on four supports, crawling and taking steps.

In this research, there was not statistically significant change in the average before and after cognitive development. The development of motor skills instigates and guides children's learning about objects, surfaces, people and events, allowing changes in the development of skills in other domains of development, such as cognitive (ADOLPH; HOCH, 2019). Therefore, it is believed that this development domain is indirectly influenced by the motor, with significant changes possibly being observed later. According Adolph and Hock (2019) "motor skill acquisition can instigate cascades of development that are so far-flung from motor behavior and so far removed in time." (ADOLPH; HOCH, 2019, p. 16).

In this study, on the one hand, high parental education, an important socioeconomic indicator for child health, growth and development, proved to be favorable (ENGLE *et al.*, 2007). On the other hand, it was observed that the economic classifications corresponded to the lower-middle class. Interventions in public children's daycare institutions are relevant for several aspects, among them the presence, in the majority, of children of lower socioeconomic class (FUNDAÇÃO MARIA CECÍLIA SOUTO VIDIGAL, 2017), as the data found in this research.

According to Crosnoe *et al*. (2010) children from higher socioeconomic strata generally perform better at school compared to their economically less privileged peers because they are normally stimulated in various environmental contexts. Children from poor socioeconomic backgrounds benefited more from stimuli at home when these were combined with other stimulating environments. The authors, in a longitudinal study conducted with 1364 children from birth to six years of age, found that those who were stimulated in the first years of childhood, at home and also in daycare, had better results in learning to read and in mathematics.

The place where the children spent a large part of their day, that is, in the local public daycare center, presented inadequate quality, before and after the intervention. This finding confirms others presented by the Brazilian literature for public daycare centers (CAMPOS *et al*., 2011; BARROS *et al*., 2011). Campos *et al*. (2011) evaluated 147 early childhood education institutions in seven Brazilian capitals, using adapted versions of the Infant/Toddler Environment Rating Scale Revised Edition and Early Childhood Environment Rating Scale Revised Edition questionnaires. It was found that, on average, daycare centers and preschools showed unsatisfactory levels of quality. The worst results were related to the following items: Activities, Personal Care Routine and Program Structure.

The quality dimension of the daycare center chosen for the present intervention study was the "Activities". Barros *et al*. (2011) when using a random sample of 500 children from 100 daycare centers in the city of Rio de Janeiro, verified the impact of the quality of daycare centers on child development. The authors concluded that the dimensions with the lowest financial costs, as "Activities" and "Structure of the Program", were those that had the greatest impact on child development.

Although the focus of the intervention was the domain of "Activities", it is observed that some of the other aspects showed an increase in the score after the intervention: "Personal Care Routines", "Listening and Talking" and "Interaction". It is possibly that the moments of activities brought opportunities for greater interaction between the children and between them and the teachers. In addition to promoting amusement and distraction favoring children's communication. Playing is an important tool for social interactions as well as for language development (KIZILDERE *et al*., 2020).

In addition, this study focused on the teacher carrying out, rather than the researchers, the activities with the children, contradicting similar studies (VELDMAN; OKELY; JONES, 2015; GERZSON *et al*., 2016). In this way, teachers became independent from researchers in order to continue the intervention after the end of the study.

The results of this study should be viewed with caution and taking into account the following limitations. Firstly, the sample was for convenience, however, an effect calculation was made showing that there was a change considered moderate. Second, the intervention was short-term. In addition, for ethical and logistical reasons, it was not possible to obtain a control group. It is expected that, in the near future, with international (ENGLE *et al*., 2007) and national (FUNDAÇÃO MARIA CECÍLIA SOUTO VIDIGAL, 2017) promotion about the importance of investment in early childhood for society, governmental and private investments will take place in Brazil, enabling more experimental and longitudinal studies.

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