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## ORIGINAL ARTICLE

### Effect of early intervention in an interdisciplinary group of children with Down syndrome in a special integration center

### *Efeito da estimulação precoce em grupo interdisciplinar de crianças com síndrome de Down em um centro de integração especial*

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## Abstract

**Objective:** To verify the effects of early stimulation on the motor and cognitive development of children with Down syndrome taking part of an interdisciplinary early stimulation group at a Special Child Integration Center. **Methods:** Prospective Observational Study carried out at a Special Child Integration Center with children from 0 to less than 1 year of age, taking part of an early stimulation group and who were not participating in any other intervention. Children included were evaluated in the rehabilitation sector of the institution. The instrument used was the Child Behavior Development Scale and the data were presented descriptively with percentage based on the answers of individual behavior and on the group average pre- and post-intervention. **Results:** The group was homogeneous regarding the characteristics and possible factors associated to developmental delay. In the motor and cognitive performance, individually all children had an improvement on their performance equal or greater than 50% in comparison to the initial assessment, and the group had a 62.5% growth in comparison to the initial evaluation. **Conclusion:** In group early stimulation brings benefits on the motor and cognitive development of children with Down syndrome in interdisciplinary care.

**Key-words:** early stimulation, child development, Down syndrome.

## Resumo

**Objetivo:** Verificar os efeitos da estimulação precoce sobre o desenvolvimento motor e cognitivo de crianças com síndrome de Down que participam do grupo interdisciplinar de estimulação precoce oferecido em um Centro de Integração da Criança Especial. **Métodos:** Estudo observacional prospectivo. Foi realizado em um Centro de Integração da Criança Especial com crianças de zero a um ano incompleto, que estivessem participando do grupo de estimulação precoce e que não participassem anteriormente de outra intervenção. As crianças incluídas foram avaliadas no setor de reabilitação da instituição. O instrumento utilizado foi a Escala do Desenvolvimento do Comportamento da Criança e os dados foram apresentados de forma descritiva com percentual baseado nas respostas do comportamento individual e da média do grupo pré e pós-intervenção. **Resultados:** O grupo foi homogêneo em relação às

características e possíveis fatores associados ao atraso do desenvolvimento. No desempenho motor e cognitivo, individualmente todas as crianças obtiveram um crescimento em seu desempenho igual ou superior a 50% comparado com a avaliação inicial e o grupo obteve crescimento de 62,5% comparado com a avaliação inicial. *Conclusão:* A estimulação precoce em grupo traz benefícios sobre o desenvolvimento motor e cognitivo de crianças com síndrome de Down em atendimento interdisciplinar.

**Palavras-chave:** estimulação precoce, desenvolvimento infantil, síndrome de Down.

## Introduction

Early childhood, from birth to three years of age, is marked by an accelerated growth rate [1]. Infant motor development is characterized by the child's motor acquisitions, from the simpler to the more complex, which allow a wide and precise succession of movements and interaction with her/his environment [1,2]. Such changes are intrinsically related to the interactions within the subject and also interactions between the subject, the environment and the proposed task [2]. In this period, movement is extremely important for the child's cognitive development, and such experiences offered to the child can positively influence the development of his/her motor skills [3].

However, there are many factors which can compromise child development, such as biological risks – which affect prenatal development and usually are associated with gestation and birth conditions; environmental risks – which include the aspects related to deficient family structure and inadequate stimulation [3]. Other factors, such as prematurity and low birthweight and inborn errors of metabolism are also found in the literature as being responsible for a higher risk for deficits in neuropsychomotor development. Thus, the child can present learning difficulties, problems with language, social interaction and motor coordination [4,5]. Down syndrome (DS), a genetic condition with specific physical and mental characteristics, also leads to neuropsychomotor developmental delay. In the realm of motor activities, children with DS reach basic motor milestones at slower times than children with normal development and, from the cognitive point of view, the language area is highly compromised [6].

Given the importance and impact of developmental delay, early identification of infants at risk is vital to minimize the consequent effects [7]. Each child has her/his own characteristics, that is, s/he is an individualized being, and genetic and environmental factors influence her/his neuropsychomotor development. Therefore, the treatment shall consider the individuality of each child, as well as the familiar context in which s/he is inserted [8]. The main goal of the Physical Therapy intervention is to stimulate motor development, in association with the acts initiated by the child herself/himself, encompassing her/his neuropsychomotor aspects and the context in which s/he lives [8].

In light of such reality, the Early Intervention Program (EIP) exists as part of the special education realm and targets children with special needs from birth to three years of age [9]. The EIP consists of a set of encouraging activities designed to provide the child with meaningful experiences, aiming at reaching the full development of her/his evolutionary process [10]. The EIP also consists of planning specific psychomotor activities, respecting the age group and encouraging the child to interact in the environment without threatening her/his freedom of expression [11]. Thus, it is important to stress that the EIP's role is not to make the child a typical one, but to make up for the deficiencies and their effects [10]. With that, the EIP's main goal has been to minimize, remedy or prevent, through actions, the adverse effects of the development of children with disabilities [9].

The human being is an integral individual that requires a care which understands her/his integrality, which meets her/his biopsychosocial needs. Thus, interdisciplinarity is fundamental because it allows for a new configuration of health knowledge and a new way to provide health [12]. Therefore, health is viewed as interdisciplinary, so, health professionals need to be ready and committed to the reality of health. In addition to that, they must be willing to share their knowledge to attain a common goal [13].

Hence, the objective of this study was to determine the effects of early intervention on the motor and cognitive development of children with Down syndrome who participated in an early intervention interdisciplinary group offered at a Special Child Integration Center.

## Methods

### *Sample*

This study had a quasi-experimental design and was devised according to the guidelines and regulatory norms for research involving human beings, presented to the Ethics and Research Committee and approved under No. 1.009.551, with the participation of 6 children of the Early Intervention Program First Steps at Kinder - Special Child Integration Center. The sample was intentional, with infants between 4 and 7 months of age. All children who participated in the study met the following inclusion criteria: 1) were under one year of age; 2) did not participate in any other intervention. The parents/guardians of each child were previously informed about the collection procedures and signed a Free and Clarified Consent Term (FCCT).

### *Instruments*

The children included in the study were assessed in the rehabilitation sector at Kinder - Special Child Integration Center, located in Porto Alegre, the capital of the State of Rio Grande do Sul. Each participant was assessed by the same trained researcher, who used the Child Behavior Development Scale in the First Year of Life [14]. The collection happened in two moments and was carried out with the presence of the person responsible for the child in a room with a tatami and the materials composing the assessment kit. Thus, the first assessment happened at the beginning of the program and, the second one, four months later.

This scale allows the assessment of an infant's development in 64 behaviors distributed month to month and in different age groups. This scale presents motor, cognitive and social behaviors, which can be axial or appendicular; stimulated or spontaneous; communicative or non-communicative. The axial motor behavior was designated as motor organization related to posture, equilibrium and movement and sound emission; the appendicular motor behavior was designated as organization in skills and dexterity, encompassing manual, hearing and visuomotor coordination.

The classification of stimulated or spontaneous motor behavior was associated to a specific stimulation, such as sounds and verbal communication, or a non-specific one, triggered by the child's position and environmental stimuli; such classifications indicated the motor behavior.

As for the communicative or non-communicative, exteriorization in relation to the child's interaction with other people was observed, indicating the activity behavior. Hence, the instrument was divided into eight subscales: Axial Spontaneous Non-Communicative (fifteen activities of movement and posture); Axial Spontaneous Communicative (eight activities of sound emission and repetition); Axial Stimulated Communicative (five activities of body games and interaction with the examiner); Appendicular Spontaneous Non-Communicative (eleven activities of perceiving and manually exploring objects); Appendicular Spontaneous Communicative (one activity of interaction with the researcher); Appendicular Stimulated Non-Communicative (eight activities of handling and recognition of object function) and Appendicular Stimulated Communicative (nine activities of task completion on request) [15].

### *Procedures*

The interventions took place once a week with the presence of a family member/responsible for the child during four months, according to the proposal offered by the institution, with each session lasting one hour and twenty minutes. The Early Intervention Program First Steps proposes group sessions with an interdisciplinary intervention model. The professionals who work in that institution and are part of the program involve a physical therapist, a psychologist, a speech therapist and an occupational therapist. The professionals work in pairs, with physical therapy being matched with psychology and occupational therapy with speech therapy, alternating their actions in the groups fortnightly. The physical therapist guides the child's proper positioning at home and explains the stages of development; teaches movements to facilitate postural changes and improve postural control (head and trunk); makes referrals, performs exams and requests lower limbs orthoses. The psychologist stimulates mother-infant bond, interaction among children, child's acceptance, and interaction and

integration of the families; establishes group routines and gives attention to the necessities of each family and helps build up a support network for the families.

The speech therapist guides the positioning when eating, watches out for food consistency, daily utensils and oral hygiene, makes exercises to facilitate eating and communication; stimulates language – comprehension and speaking – and observes hearing alteration and/or loss. The occupational therapist guides the positioning to facilitate the use of the upper limbs to play, eat and do other daily activities; indicates the adequate toy for each age group, helps with clothing, shower and makes visual stimulation; requests furniture to keep the sitting position and hand orthoses; adapts utensils – cutlery, pencil, baby bottle, wheelchair – and provides the infants with sensory and motor experiences to stimulate functionality. The program aims at providing the families, in addition to the stimulation of their children, with a moment of exchange of experiences, stories, fears and hopes, bringing them closer and creating a support network for them.

At the end of this period, a reassessment was scheduled to carry out a new collection, just like the first assessment.

### Data analysis

Motor and cognitive development was assessed through the Child Behavior Development Scale and the data are presented descriptively with percentage based on the responses of the individual behavior and the group average pre- and post-intervention. To that, a score from one to five was given to classify the child: with delay, at risk, regular, good and excellent, respectively.

## Results

Six children with Down syndrome participated in the study, being two boys and four girls, with ages between four and seven months (the mean age was 5.67 months). Only one child was born preterm (gestational age  $\geq$  36 weeks) and with low birthweight ( $\geq$  2.500g). However, for the assessment, her/his age was corrected. In relation to the Apgar score, none of the infants had a score lower than 7 in the fifth minute, and no operative vaginal delivery was performed, therefore, all babies were delivered either vaginally or by C-section. As for the parents' educational attainment, all of them had high school or a degree. In terms of housing conditions, all children lived in proper places with water and power supplies and sanitation. All children were accompanied by their mothers during the intervention period (Table I).

**Table I - Characteristics and possible factors associated with developmental delay.**

Child	Gender	Age	G. A. Weeks	Apgar	Birthweight	Type of Delivery	Syndrome	Parents' Educational Attainment	Companion
T.F.F.	M	4 months	38	9/9	3.085g	Vaginal	DS	Mom: Degree Dad: High School	Mom
A.B.A.	M	5 months	38	7/9	3.585g	C-Section	DS	Mom: Degree Dad: Degree	Mom
J.B.F.	F	6 months	40	7/8	3.468g	C-Section	DS	Mom: Inc. Degree Dad: High School	Mom
M.S.A.	F	6 months	37	9/8	2.865g	C-Section	DS	Mom: High School Dad: High School	Mom
M.C.B.	F	6 months	38	6/8	2.975g	C-Section	DS	Mom: High School Dad: Degree	Grandma or Mom
M.S.T.	F	7 months	34	9/10	1.680g	C-Section	DS	Mom: Degree Dad: Degree	Mom

M: Male, F: Female, G.A: Gestational Age, DS: Down Syndrome

Figure 1 displays pre- and post-intervention results distributed into eight subscales. The data indicate that participant A.B.A boosted his performance in five out of eight subscales

(62.5%), improving on the items related to posture and movement; auditory reaction and visual sensitivity; body games and interaction with the examiner; perception and manual exploration of objects; handling and recognition of object function. As for the sound emission and repetition activities; interaction with other people and task completion on request, it was noted that the child kept the same classification pre- and post-intervention.

The participant T.F.F. boosted his performance in five out of eight subscales (62.5%), improving on the items related to sound emission and repetition; auditory reaction and visual sensitivity; body games and interaction with the examiner; perception and manual exploration of objects; handling and recognition of object function. He kept the same classification in the activities related to movement and posture; interaction with other people and task completion on request.

The participant J.B.F. boosted her performance in four out of eight subscales (50%), improving on the items related to posture and movement; auditory reaction and visual sensitivity; body games and interaction with the examiner; perception and manual exploration of objects, while keeping the classification in sound emission and repetition; interaction with other people; handling and recognition of object function and task completion on request.

The participant M.S.A. boosted her performance in five out of eight subscales (62.5%), improving on the items related to posture and movement; auditory reaction and visual sensitivity; body games and interaction with the examiner; interaction with other people and handling and recognition of object function, while keeping the same classification in the activities related to sound emission and repetition and having a decrease in perception and manual exploration of objects and task completion on request.

The participant M.C.B. boosted her performance in four out of eight subscales (50%), improving on the items related to auditory reaction and visual sensitivity; body games and interaction with the examiner; perception and manual exploration of objects and handling and recognition of object function, while keeping the same classification in the activities related to posture and movement; sound emission and repetition; interaction with other people and task completion on request.

The participant M.S.T. boosted her performance in five out of eight subscales (62.5%), improving on the items related to posture and movement; sound emission and repetition; auditory reaction and visual sensitivity; body games and interaction with the examiner; and perception and manual exploration of objects, while keeping the same classification in the activities involving interaction with other people and task completion on request and having a decrease in the activities related to handling and recognition of object function.

As for the group, the results suggest that the post-intervention performance has significantly progressed in comparison to the initial period in five out of eight subscales (62.5%) in the activities related to posture and movement; auditory reaction and visual sensitivity; body games and interaction with the examiner; perception and manual exploration of objects; and handling and recognition of object function. The group did not get any increase or decrease in the activities related to sound emission and repetition; interaction with other people and task completion on request.

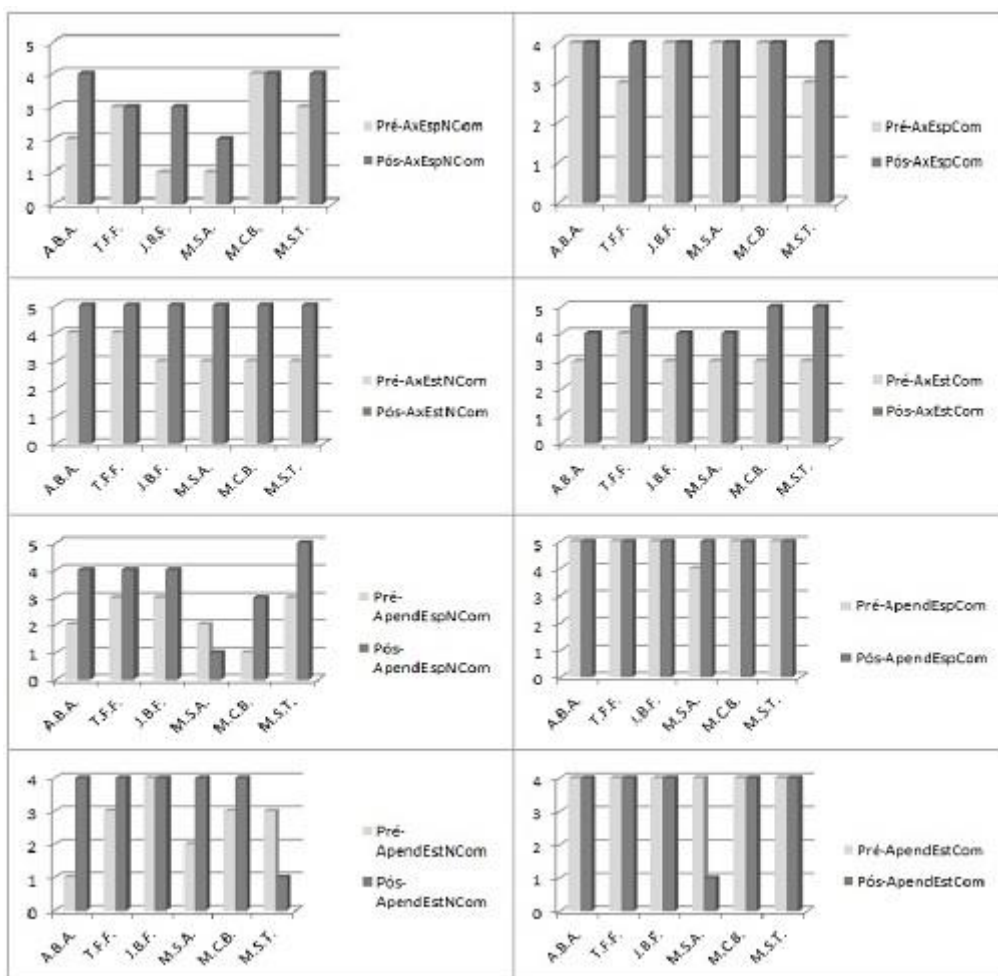


Figure 1 – Pre- and post-intervention assessment results.

## Discussion

The results are favorable concerning physical environment and family structure, because virtually all children came from structured families who had good housing conditions. Studies point to peculiar issues related to the physical structure of the house and the external environment in which the child is inserted as factors which can help or harm her/his development, as well as the interpersonal relations and the roles played by the family members [16]. Low-stimuli environments can negatively interfere, that is, the place in which the baby lives offers different formats or shapes aspects of her/his behavior [17]. Thus, the context in which the child is inserted, including social interactions and family environment, influences either positively or negatively both skill acquisition and functional independence [1,3,17,18].

This study wanted to determine the effects of early intervention on the motor and cognitive development of children with Down syndrome who currently participate in an early intervention interdisciplinary group offered at a Special Child Integration Center. Studies provide evidence on the characteristics of the motor and cognitive development of children with Down syndrome. When developing motor skills, studies indicate that this public presents a delay in basic motor milestones, which manifest at slower times than children with typical development, and cognitive developmental delay stems from the symptom manifestation of this genetic condition [6]. It is also seen in the literature that motor deficits are predominant in early childhood, whereas cognitive deficits are predominant at school age [6]. A study which evaluated the functional performance of children with Down syndrome in relation to the performance of children with typical development (with average age of 5-7½ years) suggests that, as the child with delay is acquiring skills, these are incorporated in her/his daily life and, consequently, they will increase her/his independence [19].

The intervention proposed by the institution recommends interdisciplinary and group care to provide the children and their families with a thorough follow-up. We find in the literature

the bases to structure this kind of intervention regarding the organization and the way to provide care. Thus, the work of early stimulation must be structured so as to welcome the child and her/his family. Regarding integrality, professionals need a broader view of health, including their different forms of production and the users' perception of their biopsychosocial totality. The professional must listen the user attentively, receive her/him in a humanized way, using adequate answers, and then becoming responsible, generating links, humanization, care and welcoming, actions which can contribute to the construction of integrality. The professionals must understand the context of people and identify assistance, prevention and health promotion needs, hence exchanging knowledge among professionals [20].

Therefore, the care should be weekly, lasting between twenty and forty minutes for individual care, and between one hour and one hour and forty minutes in groups. Family members play a fundamental role in this context and need to receive the due support and necessary orientations from the professionals involved to ensure the continuity of the treatment at their homes [10]. The materials and physical spaces should also be taken into account, with the former being suitable for each age group, and the latter ventilated and adapted to the child's needs [10,21]. The team of professionals must be willing to play an active part in the intervention processes, take part in triage and assessment processes, as well as provide the families with orientation and information for the program's full implementation [10]. The child with Down syndrome presents deficiency in the motor, cognitive, sensory and vestibular system, thus, the treatment with an interdisciplinary team is vital, since the therapies complement each other [22]. There is also the possibility of a single therapist, in case there is not any multidisciplinary team available, but such professional must pay attention to all the child's needs and not stick to the knowledge field of her/his speciality [10].

Motor performance, which is addressed in the activities related to posture and movement; auditory reaction and visual sensitivity; body games and interaction with the examiner; perception and manual exploration of objects and handling and recognition of object function had the highest growth when comparing pre- and post-intervention results. It is believed that, in this case, the early stimulation program has allowed for the integration of multiple systems and, therefore, made it easier for the children to reach such motor milestones more rapidly. A study concluded that children who received in group motor intervention showed a dramatic increase in their basic motor skills, such as lying down and rolling, crawling and kneeling, in comparison to children who only received individual training [23]. In a systematic review of the motor performance of children with Down syndrome, it has been found that early intervention can be used to reach motor milestones more rapidly, mainly in gait, and that such positive response in motor performance is fundamental to the child's integral development [24].

It is noted that the activities related to sound emission and repetition; interaction with other people and task completion on request kept the same classifications. These activities address areas concerning language/cognition. In regard to the activities of task completion on request, that is, to stop the activity when asked to, to clap, to stroke and to reply to the request to hand objects in, these are behaviors which usually appear at the end of the third trimester of life and normalize and stabilize in the fourth trimester [14]. It is possible to infer, from this, that the children were not able to perform such activities because, in the second assessment, most of them were at the end of the second trimester of life. Our results corroborate the findings of another study on motor performance, coordination and language which observed that language had the lowest scores than the control group and that such developmental area is the most compromised in children with Down syndrome [25,26].

It is widely known that the three first years of a child are crucial, because her/his brain potentialities are fully developing. It is fundamental to provide children with a welcoming and appropriate environment, to create strong bonds with their careers, thus forming the bases for a full development [27].

## Conclusion

In group early stimulation has brought benefits on the motor and cognitive development of children with Down syndrome in a Special Child Integration Center. It should be noted that this study has some limitations, such as the small number of children assessed and the absence of a control group. Despite these limitations, this study has raised pertinent issues concerning the interdisciplinary care of children with Down Syndrome aiming at their full development.

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