Effectiveness of an Early Stimulation Program to develop Intelligences in Children under 3 years of age, José Leonardo Ortiz-2018

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Abstract
The research was of a pure quasi-experimental type since the independent variable was deliberately manipulated to achieve its effect and relationship with the dependent variable. The population consisted of 340 children under 3 years of age who attended the growth and development clinic and met the selection criteria. For data collection, a pre-test was applied to determine the intellectual development in the children under study and a post-test after applying for the Early Stimulation program. In addition, the T-student test was used to determine its effectiveness. Conclusion: after 6 months of exposure to the Stimulation Program in children under 3 years of age, a great increase was observed in the evaluation of the development of the 4 evaluated areas; 81% of 3-year-old children obtained a high qualification and 19 % of normal; for which the great usefulness of the program is determined. The application of the Stimulation Program is highly effective (p= 0.00). At the end of the investigation, great progress is observed in the children, besides the parents' motivation about the importance of adequate techniques that will help in the development of their children at early stages, considering that the first 3 years of life are much more beneficial.
Keywords: Early Stimulation Program, Doman Method, Multiple Intelligences, Neuroscience.

RESUMEN
La investigación fue de tipo Cuasi experimental puro ya que se manipuló deliberadamente la variable independiente, para lograr su efecto y relación con la variable dependiente. La población estuvo conformada por 340 niños menores de 3 años, quienes se atienden en el consultorio de crecimiento y desarrollo, y cumplieron los criterios de selección. Para la recolección de los datos se aplicó un pre test para determinar el desarrollo de la inteligencia en los niños en estudio y un post test después de aplicar el programa de Estimulación Temprana. Para determinar su efectividad se utilizó la prueba "T-Student". Conclusión: después de los 6 meses de exposición al Programa de Estimulación en los niños menores de 3 años de edad, se observó un gran incremento en la evaluación del desarrollo de las 4 áreas evaluadas, el 81 % de niños de 3 años, ellos obtuvieron un calificativo alto y un 19 % normal; por lo cual se determina la gran utilidad del Programa, la aplicación del Programa de Estimulación, es altamente efectivo (p= 0.00), al finalizar la investigación se observa un gran avance en los niños, además de la motivación de los padres sobre la importancia de técnicas adecuadas que ayudarán en el desarrollo de sus niños y a etapas temprana, considerando que los 3 primeros años de vida son mucho más beneficiosos.
Palabras clave: Programa de Estimulación Temprana, Método Doman, Inteligencias Múltiples, Neurociencia.

1. introduction

The growing relevance of early childhood care in recent years has led to early stimulation being considered one of the priorities for study. At birth, the brain has a weight of 300 to 350 grams, reaching its maximum growth in the adult stage with a weight of 1250 to 1500 grams. However, birth is also a significant moment for the child's brain. On the one hand, there is the achievement of the whole process of growth and development, which allows having the conditions to reach birth and face the new environment, and on the other hand, the fragility of the moment.[1]

Early childhood is the most difficult stage that the brain faces; therefore, what happens from the embryonic period and the first years of life has a transcendent influence on healthy development, adaptation and social skills[2]. From 0 to 3 years, the child achieves maximum brain progress; neuronal proliferation occurs; later pruning occurs, and children have greater plasticity to learn[3].

The World Health Organization (WHO) is promoting new guidelines to improve the development of children, recommending that parents hug, watch, sing and talk to them. Stimulating the child during the first years of life is essential and the deprivation of vital experiences can lead to an excessive elimination of synaptic connections. Extraordinary vitality, first steps, first words and phrases, mischief, exploration, discovery, physical, social and emotional skills that become more significant daily

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are evidence of a constantly developing brain[4].

The study worked with an early stimulation program based on generally playful activities according to the type of multiple intelligence to be developed. These playful activities help the child to improve affective relationships since, in this way, he/she will be able to interact effectively with the environment that surrounds him/her and improve the development of the child's intelligence, being careful with the excessive abuse of technology, which can cause problems of an extraordinary nature to today's children. Furthermore, early stimulation programs need the participation of parents; the mother is considered an essential agent since the mother-child bond contributes to the integral and complete development of her baby.

Monitoring and working with a multidisciplinary team is of great importance to achieve full child development, growth and development. Education on early stimulation is helpful to motivate mothers about the different actions that should be taken to increase the potential of children. These should be carried out with quality and on time to provide the child with the necessary experiences to help him face challenges during his learning process. In the course of his life, in addition, it will have a positive impact on his personality. It is important to keep in mind that intelligence can be developed by stimulating the child's brain from a very early age, taking advantage of brain plasticity to generate a greater number of neuronal connections, facilitate learning and develop the skills and cognitive mechanisms that favor comprehensively in the formation of the individual.

Health personnel plays an important role in early development and early detection of children's physical, psychological and social problems. So, it is important to consider that during the process of brain construction, not only the physical needs must be satisfied, but it is also necessary to promote the early stimulation of the different intelligences, through the use of playful activities and active participation of the parents. Furthermore, considering that the external environment and its growth process directly influence the child's development, in this way, they can cope with the demands of the modern world using their intelligence and creative mind.

2. Material and Methods

The children selected are part of the Early Stimulation Center of CAP III Manuel Manrique Nevado and are within the selection criteria. The 80 children were divided into 4 groups according to age range: 0 to 8 months, 9 to 15 months, 16 to 23 months, 24 to 35 months.

At the beginning of the workshop, a pre-test was applied to evaluate the basal development of the children; then, the stimulation workshops were carried out for 6 months. Three months after the beginning of the workshop, a first post-test was applied to evaluate the progress achieved and then at 6 months to determine the program's effectiveness.

Two instruments were used, one based on Margarita Ramos' developmental observation chart14, and the second was the evaluation scale of the Memphis Project's Pre-Academic Guide to determine the child's development in the different areas.

In order to apply the instruments, it was necessary to have didactic materials such as blocks, puzzles, colored handkerchiefs, balls, and textures, among others. Likewise, the researcher carried out detailed observation of the participants with a table of Development of Intelligences and a field notebook that allowed recording the children's progress.

The researcher developed the first instrument and validated it using an expert judgment by a psychologist, a teacher and a Licentiate in Nursing with a Ph.D. degree.

The second instrument was the Memphis Project Developmental Assessment Scale, developed in 1972 by doctors Alton Quick, Thomas Little and Ann Campbell[15]. Again, Alegria applied the validity and reliability of the instrument, and it was ratified by the opinion of two psychologists who are experts in psychomotor development in children.

The early stimulation program was carried out with the help of a Guide prepared by the researcher, according to the perspective of Glenn Doman and Howard Gardner to achieve the development of intelligences in children under 3 years of age, with a duration of 1 hour per week according to the age group to which it corresponds.

Parents were educated about the importance of early stimulation during the first years of life, thus achieving active participation and empowerment during the different stimulation workshops.

The program followed a series of steps, from preparing the environment and materials to the execution of the workshop and the evaluation. The way of working was done in a dynamic and participative way by the parents and children who attended the early stimulation workshop, where different areas of the development of the Intelligences were reinforced.

To obtain the results of this study, the program's effectiveness was conceptualized as the capacity or ability that the child can demonstrate by reaching an average of 2 months to more than its chronological age on the development in the time of application of the early stimulation program.

In addition, the following classification was used to evaluate effectiveness:

LOW: According to Memphis, the child is below 2 months of chronological age of psychomotor development.

NORMAL: According to Memphis, the child reaches up to 2 months above or below his or her chronological developmental age.

HIGH: According to Memphis, the child is above 2 months in their chronological age of development.

Immediately after the delivery of the pre-test and

post-test, the quality of the instrument was evaluated by verifying that all the questions had been correctly completed.

For the statistical analysis, the data were sorted using Microsoft Excel 2013, then coded, tabulated, and processed using SPSS version 23.0 statistical software.

To determine whether the early stimulation program was effective, T-student test was used for paired data[16]. It is worth mentioning that no control group was used for this study due to ethical issues specific to the university and the institution.

3. Results

This section describes the results obtained on the effectiveness of an early stimulation program to develop intelligences in children under 3 years of age, at José Leonardo Ortiz, in 2018.

Table 1. Developmental level of children under 3 years of age before starting the early stimulation program in the experimental groups.

LEVEL OF DEVELOPMENT	CHILDREN		GIRLS		TOTAL	
	FC	%	FC	%		
UNDER	25	71.4	20	44.4	45	56%
NORMAL	10	28.6	25	55.6	35	44%
TOTAL	35	100	45	100	80	100%

Source: Memphis test applied to CAPIII Manuel Manrique Nevado (experimental group)- 2018.

Table 1 shows that the highest percentage of children have a low developmental level (56%), followed by a significant percentage that is normal (44%); however, the low developmental level is noteworthy and should be addressed.

Brain development involves the millions of cells that are called neurons and the connections of each of these. Brain plasticity in children under 3 years of age is greater, but its environmental influence contributes in the best possible way; sensitive periods of brain development have been identified in which the organism is susceptible to external stimulation at this stage depends a lot on the quality of stimulation, which will favor the acquisition of knowledge.

In many cases, parents are aware of good early stimulation but often overlook fundamental aspects such as focusing on all areas of intelligence to be developed and not just one, the abundance of stimuli, and the regularity of time.

Table 2. Developmental level in children under 3 years of age, after 3 months of applying for the early stimulation program in the experimental groups.

LEVEL OF DEVELOPMENT	CHILDREN		GIRLS		TOTAL	
	FC	%	FC	%		
UNDER	0	0	1	2.2	1	1%
NORMAL	30	85.7	30	66.7	60	75%
ALTO	5	14.3	14	31.1	19	24%
TOTAL	35	100	45	100	80	100%

Source: Memphis test applied to CAPIII Manuel Manrique Nevado (experimental group)- 2018.

Table 2 shows that the highest percentage (75%) of children reach the normal category and the percentage of low (1%) decreases; the most important thing is the percentage of high development, which is very significant (24%), after 3 months of participating in the early stimulation program.

Each child is different, and they have their own pace of development, also keep in mind that each stimulation session should be a positive experience for each one, always using strategies for the reincorporation of the child and the parents to reinforce the emotional bond between them, which will be a plus for their development.

Table 3. Developmental level in children under 3 years of age, 6 months after applying for the early stimulation program in the experimental groups.

LEVEL OF DEVELOPMENT	CHILDREN		GIRLS		TOTAL	
	FC	%	FC	%		
NORMAL	5	14.3	10	22.2	15	19%
ALTO	30	85.7	35		65	81%
TOTAL	35	100	45	100	80	100%

Source: Memphis test applied to CAPIII Manuel Manrique Nevado (experimental group)- 2018.

Table 3 shows the benefits of the effectiveness of early stimulation, where it can be seen that the highest percentage (81%) had a high level of development and a lower percentage (19%) had normal development, and most importantly, no child had low development.

Parents with prior knowledge of the normal development of their children and the initial evaluation carried out contribute to implementing activities appropriate to their age and abilities; in

this way, they can improve and obtain the expected results.

Table 4. Comparison of the evaluation results of the development level in children under 3 years of age, at the beginning, 3 and 6 months after the application of the early stimulation program.

LEVEL OF DEVELOPMENT	EVALUATION 0		EVALUATION 1		EVALUATION 2	
	FC	%	FC	%	FC	%
UNDER	45	56	1	1	0	0
NORMAL	35	44	60	75	15	19
ALTO	0	0	19	24	65	81
TOTAL	80	100	80	100	80	100

Source: Memphis test applied to CAPIII Manuel Manrique Nevado (experimental group)- 2018.

Table 04 summarizes the previous tables, where the progress of early stimulation is observed, with a higher percentage in the high level of development that progressed at 3 months and 6 months.

Table 5. Increase according to age group of children under 3 years old, before and after applying the early stimulation program, according to experimental group.

Grupo etáreo	N° de niños	ANTES (meses)	DESPUÉS (meses)	INCREMENTO	Prueba estadística	Significancia
		x±D.S	x±D.S	x±D.S	t	p
0-8 meses	20	4.895±1.062	14.055 ±1.524	9.1600±0.946	43,297	0.0000
9- 15 meses	20	9.35±12.668	19.690 ±16.843	10.340 ±0.9698	47,684	0.0000
16- 23 meses	20	15.220±14.259	26.200±15.114	10.9800±0.7488	65,581	0.0000
24- 35 meses	20	25.285±13.160	36.775±29.565	11.4900±2.0354	25,245	0.0000

Source: Memphis test applied to CAPIII Manuel Manrique Nevado (experimental group)- 2018.

In Table 5, after 6 months of applying the early stimulation program, an increase was obtained in all the groups worked, with a greater predominance in those corresponding to children from 24 to 35 months (11.5 months) and a smaller increase in those from 0 to 8 months (9.2 months).

In the groups from 0 to 8 months of age, this is attributed at the beginning to the fear of the group's parents in the realization of activities during the stimulation process due to the fragility of the baby during its first months. Despite this, they contribute to the realization of the sessions and are clear about the importance of early stimulation in their babies.

In the case of the 24 and 35-month-old groups, which are older and represent a significant increase due to their active participation, their development of the social area contributed to the reincorporation of play activities during the development of the stimulation activities.

Table 6. Increase according to areas of development of children under 3 years of age in the experimental group, before and after applying the early stimulation program.

DEVELOPMENT AREAS0	BEFORE (months)	AFTER (months)	INCREASE	Statistical test	Significance
	x±D.S	x±D.S	x±D.S	t	p
THICK MOTOR	14.169 ±8.0560	23.544±8.4622	9.3750±1.9992	41,943	0.0000
THIN ENGINE	14.169±7.6807	25.244±9.4698	11.0750±2.6387	37,541	0.0000
COGNITIVE	13.150±7.9143	24.353±8.8721	11.2125±2.0849	48	0.0000
LANGUAGE	13.150±7.9143	24.363±8.8721	10.3250±2.0793	44	0.0000
SOCIAL	13.538±7.6621	24.013±8.7214	10.4750±2.1640	43	0.0000

Source: Memphis test applied to CAPIII Manuel Manrique Nevado (experimental group)- 2018.

In Table 6, after 6 months of applying for the early stimulation program, an increase is obtained in all areas, with a greater predominance in the cognitive area (11.2 months) and a smaller increase in the gross motor area (9.4 months).

The challenge of putting the stimulation plan into practice depends on each parent, keeping in mind that the child's brain development decreases with age. Thus, the first 3 years are fundamental because there is a maximum neuronal development, to diminish then and practically perish at 6 years, when the neuronal connections are already established, and the learning mechanisms are similar to those of the adult.

The increase in the cognitive area is because parents placed greater emphasis on activities that are part of logical-mathematical intelligence, but even so, they did not neglect the different types of intelligence and managed to improve the various areas of development.

To achieve the effectiveness of early stimulation, harmony must be sought. Therefore, it must be both physically and intellectually complete.

Intelligence rarely operates in isolation, but all of them simultaneously tend to complement each other, not denying that there is a genetic component and highlighting the importance of the environment, experiences, and stimulation received.

Table 7. Effectiveness of the early stimulation program in the development of children under 3 years of age in the experimental group. CAPIII Manuel Manrique Nevado.			
PARAMETERS	BEFORE	AFTER	INCREASE
	n= 80	n=80	
Average in months	13.69	24.2	10.5
Standard Deviation	7.8	8.7	1.5
Minimum value	-7	1	
Maximum value	0		
Paired data t-test			61.34
Significance""			0.000
Source: Memphis test applied to CAPIII Manuel Manrique Nevado (experimental group)- 2018.			

In Table 7, the early stimulation program has a high significance, and at the beginning of the stimulation program, the average age was 13.69 months and after 24.2 months, with an increase of 10.5 at the end of 6 months after the stimulation workshops, with an increase of 4 months in age for the chronological age on average of all participants (t= 61.34, p 0.000).

4. Discussion

The educational program shows that it was effective and was progressing at 3 and 6 months. These results are similar to Flores J. (2014), who indicated a significant increase in psychomotor development at 4 months after the application of the stimulation program; for ethical reasons, there is no a control group, but significance is observed in the results observed in which it could indicate that a child without stimulation and in a suitable environment follows its normal development processes, but if it receives external stimulus could improve the conditions of development in a comprehensive manner in the child raising its performance, especially if it is done during the first years of life.

Also, the results are similar to Garza (2014), who emphasizes that the age between 0 to 3 years is the ideal stage due to the great growth observed in brain plasticity.

In the first years of life, the neuronal capacity in the cerebral cortex reaches a great development, and trillions of connections are formed in different areas of the brain and at different times. By the age of two years, two-thirds of the brain has already been formed. Between birth and the first 3 years of life, the brain creates more synapses than it needs, so it is considered more active, connected and flexible brain activity than older children[1].

It can be affirmed that if the child receives stimulation during the first years of life, positive results are obtained and reach superlative development. Comparing the results of the evaluation of the children before and after applying for the program, a significant difference is observed. In table 2, 56% of the children are diagnosed with low development, and 44% are normal. Three months after the program's application, good progress was observed; 75% of the children had a normal diagnosis, 24% had a high diagnosis, and only 1% had a low diagnosis. After 6 months of applying for the Intelligence Program, a very significant change is shown in Table 4, in which we observe that the majority of children, 81%, are at a high level and 19% managed to reach normally.

It is observed that the proportion of girls and boys at 6 months is similar, as for normal diagnosis 5 are boys and 10 are girls; with high diagnosis, 30 are girls and 35 girls, corresponding to a total of 35 boys and 45 girls. Some studies indicate the difference between boys and girls, indicating that boys are more socially adept.

According to a study: "Boy and Girls on the playground: Sex differences in social development are not stable across Early Childhood 42, considering play as the main point of social development, this research was carried out through a cross-sectional design of 164 children from 2 to 6 years old who were observed during free outdoor play in the daycare center. It showed that sexual differences change over time, which evidences a developmental gap between girls and boys. Forms of social and structured play emerge systematically earlier in girls than in boys, leading to later sex differences in favor of girls at some ages. Preschool boys also show more solitary play than preschool girls; however, as boys catch up and girls move toward more complex play, sex differences in social play patterns reverse in favor of boys at later ages, such as in associative play at 4-5 years and cooperative play at 5-6 years. This developmental perspective helps to resolve apparent discrepancies between single snapshot studies. A better understanding of the dynamics of sex differences in typical social development should also provide insight into atypical social developments that exhibit sex differences in prevalence, such as autism[44].

According to Mainieri's study, on the various methodological knowledge and strategies used to develop the 8 intelligences and their importance[44]. The Stimulation Program worked based on the development of intelligences, through Gardner's perspective, which proposes a broad and multiple vision of the mind that recognizes many different facets of cognition, considering that people have different potentialities and cognitive styles, which help to develop in various fields of life, in which he synthesizes his study through the existence of 8 types of intelligence[27].

In other words, Doman's studies emphasize motor areas such as mobility, language and social skills;

the former being the key to the development of intelligence in all its expressions, i.e., working on the development of the brain's two hemispheres as a whole[30].

The stimulation sessions were carried out in the company of the mothers since we clarified the phrase: "no exercise, no technique can improve muscle tone or visual tracking, if there is no maternal agent that, supported by a paternal one, cuts out a child from that place where there is only a child," allowing in this way to increase the effective and positive relationship between parents and children[32].

Table 5 shows an increase in the evaluation of children's development, according to the groups formed in the Stimulation Program.

That is why it is imperative to provide adequate physical, motor and cognitive development for the child. This, in turn, implies good nutrition and health care, and the environment must provide adequate stimulation for the child to learn and develop his or her skills.

Table 6 shows an increase in the different areas of development to be evaluated. In the most predominant area, there is the cognitive area, since during the first months, the knowledge of the world is made through the senses, which with movement, build the development of thought. As the months go by, the child associates the information received through the different sensory channels "join" what he sees with what he hears, feels or smells to achieve more complex skills, anticipate situations or responses from the environment and adjust his actions. Taking this into account, the program focuses on sensorimotor stimulation through activities that help children relate to the external environment and their senses; through touch, the child experiences various characteristics of objects; a vision where light, colors, and movements are discovered; hearing that provides a means to discriminate sounds, as well as smell and taste, through smell and flavors. The experiences offered will later allow him to recognize and differentiate.

The vestibular and proprioceptive senses are related to kinesthetic and spatial intelligence and movement, space, balance and posture[37].

All of these interrelated are of great importance in developing intelligences.

Moreover, the motor and language areas are in smaller but very significant increase because a good score was obtained compared to the first evaluation.

As far as language is concerned, this is a main characteristic of human beings, which differs from animals; its evolution is not easy and needs stimulation and the influence of the environment to improve it. Therefore, the motivation for literature is a very important point in achieving the integral development of language. It is also important to clarify that language and cognitive development are closely related, and we see how thought is realized in language; thus, the more precise the language, the higher the mental level and the better the cognition and creative activity in children[41].

Regarding the participation of parents during the program, it should be emphasized that families are the main actors during the stimulation process because they are the ones who evidence the progress and setbacks in the child's development (Machuca, 2017), which indicates that changes can be observed in the level of knowledge of mothers, which will be reflected in the child with optimal psychomotor development and a significant difference is evidenced after the application of the program.

Esteves (2018), during his research process on the weaknesses and strengths of the early stimulation process, points out four basic areas (cognitive, linguistic, motor and social), the same that have served as support during the process of evaluation and learning of the child and that are fundamental bases to provide a promising future of their skills comprehensively ensuring their development. In this way, it can be determined that optimal results are obtained if quality early stimulation is provided through this program.

Martinez (2019) and the results found in the research allow for verifying the influence and effectiveness of early stimulation in the evolutionary development of infants, as well as the importance of the professional who teaches the workshops to have knowledge both in the preparation and execution of appropriate techniques and thus obtain results that are favorable for the development of the child.

Table 7 shows great significance regarding the evaluation of the children before and after applying the Stimulation Program. Through early stimulation, the child acquires better self-confidence, leaving behind his fears and apprehensions and facing problems and experiences with greater ease. The child can face challenges, respect rules of coexistence, and improve their relationship with other children, achieving the fullness of their development. With the help of the family as the main point, the activities are carried out through games and exercises that combine with stimuli and repetitively manage to increase and strengthen brain functions in the social, sensory and physical aspects.

5. Conclusions

After 6 months of exposure to the Stimulation Program to children under 3 years of age, a great increase was observed in the development evaluation, obtaining 81% of high diagnosis and 19% normal. Furthermore, it is observed that the proportion in both sexes at 6 months is similar, as for the normal diagnosis, 5 are boys and 10 are girls; with high diagnosis, 30 are boys and 35 girls, which determines the usefulness of the program.

The application of the Stimulation Program is highly effective (p= 0.00); at the end of the research great

progress is observed in the children, in addition to the motivation of the parents about the importance of adequate techniques that will help in the development of their children and at early stages, considering that the first 3 years of life are much more beneficial.

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