

Effects of the Firststart Method of Prenatal Stimulation on Psychomotor Development: The First Six Months

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Abstract: None available.

Full Text: Headnote ABSTRACT: This paper explores the effectiveness of the Firststart prenatal stimulation method applied to a sample of maternity patients at University Hospital "La Fe" in Valencia, with 71 women in the control group and 101 in the experimental group. Both groups were enrolled in the birth preparation course offered at the hospital. In addition, future mothers in the experimental group wore a waistband equipped with small speakers connected to a tape recorder which played a series of eight tapes of violin sounds. Mothers exposed the unborn babies to an average of 70 hours of music from about 28 weeks to the end of pregnancy. After birth the Observational Scale of Development" originated by F. Secadas was used by mothers to chart the onset of behaviors from 0 to 6 months. On 22 items of the scale, behaviors of the experimental group babies were significantly advanced from those of the control group. Findings reveal the superiority of prenatally stimulated children in gross and fine motor activities, in linguistic development, in some aspects of somato-sensory coordination, and in certain cognitive behaviors. INTRODUCTION Prenatal stimulation has recently become an expanding field of scientific study based on radical changes in our understanding of fetal behavior and perception. Technological advances in intra-uterine photography and ultrasonography used in an experimental context have confirmed the true capacities of the fetus. This developing being, until recently considered an amorphous entity without the slightest possibility of hearing or seeing, without tactile or gustatory sensations, and devoid of all emotion, is seen today as an individual in possession of all these basic tools necessary for learning. Inspired by a conference on Prenatal Learning and Bonding held in El Puig (Valencia) in 1992, we believed it was necessary to develop reliable methods of testing the effectiveness of prenatal stimulation. We decided to begin a longitudinal study of mothers and babies using the Firststart program, which originated in Valencia. Equipment and instructions were supplied by Firststart. THE FIRSTART METHOD The purpose of the Firststart program of prenatal stimulation is to advance the intellectual and physical development of the fetus by means of musical stimuli presented to the baby for a few minutes per day from about the twenty-eighth week of gestation to the end of pregnancy. The program simultaneously contributes to the physical and emotional well-being of the fetus through relaxation of the gestating mother. Rosa Plaza and Manuel Alonso, creators of Firststart, suggest that pregnant mothers set aside times to relax while listening to classical music selected and recommended for this purpose, which because of its macro and micro rhythms is appropriate for relaxation. The Firststart Program includes eight audiotapes containing violin sounds chosen specifically for their rich compass of harmonics which are similar to those employed by the mother and others speaking to an infant. It is well known that those who speak to infants modify their language with elevated voice, shorter words, simple and brief sentences, and constant repetitions. This is done instinctively but conforms to the needs of a baby. Therefore, the music was conceived as a series of short sounds followed by a moment of silence. An additional consideration in constructing the tapes was the natural rhythm of the heart which for the fetus is a sound of utmost importance and significance. Therefore, the musical compositions presented have a metronome marking of 65 to 80. The tapes follow a controlled learning sequence starting with the most elemental sounds and progressing over time to more complex sounds. Tape 1 repeats the first three notes of the C-major scale followed by a silent pause. Tape 2 is the same as Tape 1 but is done in C-minor. Tapes 3 and 4 are melodies of progressive complexity. Tapes 5 and 6 present the fundamentals of the occidental musical system, i.e., two Greek tetrachords. Tape 7 is a C-major trichord arpeggio with three repetitions and a silent pause. Finally, Tape

8 is a C-minor trichord arpeggio with three repetitions and a silent pause. In addition, the program urges parents to make a recording of the voices of the mother, father, siblings, or other relatives so that the unborn infant can listen and become familiar with them. Included with the tapes is an adjustable waistband containing small speakers aimed at the womb. These are attached to a small tape player which plays the music for fetuses to hear. A manual explains the method and contains a time card used to record the frequency and length of the listening sessions. Sample and Procedures An experimental and control group were formed which had to be similar on all major parameters, except on those to be tested. The study started out with 200 gestating mothers in both groups. After eliminating those who would not be delivering at Hospital "La Fe" in Valencia, and with other normal losses, the study was done with 71 mothers in the control group and 101 in the experimental group. Both groups were enrolled in the birth preparation course offered at the hospital. Chi-Squared statistical tests indicated that both groups were comparable in a number of variables (see Table 1). Characteristics of Both Groups of the Sample More than 90% were married or were living in a stable relationship. Only two were single mothers and only one was a divorcee. For more than half, this was their first pregnancy; for most of the others, it was their second birth. Only a small number had had previous abortions, and cases of infertility were rare. About 60% of mothers in both groups worked during pregnancy. The majority of mothers had received education from eighth grade to eleventh grade levels, while about 30% had technical college or University degrees. Only 15% of each group had some complication during pregnancy and about 20% during lying-in. Both groups had similar delivery and life experience records, including the form of labor onset (spontaneous or induced) and the duration of labor, the termination of lying-in, the weight of the baby at birth, Apgar scores, the age of mother, the general relationship the mother had as a girl with her own father, and the type of relationships the new mother's parents had with each other.

Table 1
Controlled Variables

1. Personal Variables
Civil status
Educational level of mother
Educational level of mother's husband or companion
Work status
Father-daughter relationship
Mother-daughter relationship
Marital relationship between the parents of new mother
Separation of the parents of new mother
2. Gestation and Lying-in variables
Parity
Gestational Age
Number of previous abortions
Sterility, infertility
Complications during pregnancy
Complications during birth
Form of labor onset (1), duration and termination of birth process (2)
Duration of expulsion of infant at birth (3)

(1) Spontaneous or induction.
(2) Forceps, vacuum, cesarean, twin delivery, breech delivery.
(3) Third stage of labor: since dilatation is finished until baby is delivered.

In the control group there were significantly more mothers who reported having a "good" relationship with her own mother than those in the experimental group ($p = .054$). In the experimental group there were more mothers (7:1) whose parents had separated during childhood. These differences, if relevant, would have favored the control group. Procedure Both groups attended the traditional birth preparation course given to

patients at the University Hospital, while in addition the experimental group participated in the Firststart Prenatal Stimulation Program. To avoid strained relations between members of the two groups, the control group was formed from class participants in 1993 while the experimental group was formed from those attending in 1994. This way there was no contact between the two groups and the control group had no reason to feel discriminated against. The Firststart program was initiated when members of the experimental group were between their twenty-eighth and thirtieth week of pregnancy. Although mothers varied widely in the amount of time they exposed their babies to the music tapes (R = 16-128), the majority employed the waistband between 50 and 90 hours, the cases below 50 and over 90 hours were very few (see Table 2). After the birth, mothers were interviewed and data taken about their work status, satisfaction with work, whether they had domestic help, were breastfeeding, any birth defects, and any illnesses during the first six months of the newborn (see Table 3). No significant differences were found in the two groups with respect to work status and work satisfaction variable. The majority of the new mothers had assistance from domestic help, nannies, day-care centers, or family members. There were slightly more illnesses among the experimental babies than controls but the number of illnesses was quite low. There were only two cases of deformity in the control group, but not relevant to intellectual development (i.e., harelip). More mothers in the experimental group chose to breastfeed their babies. (94%: 72%; $z = 4$. The difference is significant at the 1% level.)

Table 2
Number of Hours of Self-Application
(exposure to music)

<i>Average: 67.5 h</i>		
<i>Range 16-128 h</i>		
<i>Distribution</i>		
<i>Hours</i>	<i>%</i>	<i>% Accumulation</i>
More than 100	5	100
91-100	7	95
81-90	11	88
71-80	22	77
61-70	27	55
up to 60	28	28

Table 3
Controlled Variables After Birth

<i>1. The child</i>	<i>2. The mother</i>
<i>Apgar score at 1 min. and at 2 min.*</i>	<i>Breast feeding</i>
Birth weight	Work status
Postnatal illnesses	Work satisfaction
Physical deformities	Domestic assistance

*Apgar is a 0 to 10 score assigned to the newborn by evaluating from 0 to 2 the following variable: color, heart rate, breathing, muscular tone and reflexes. We didn't find any Apgar score indicating a deficient condition in any newborn.

The Observational Scale of Development From 0 to 6 Months,* adapted from that of F. Secadas (1988, 1992), was applied at home by the mothers themselves. They received the Scale by mail, and recorded at what age each behavior first appeared in their children. FINDINGS Use of Student's t-test revealed significant differences in favor of the experimental group for twenty-two items of the Observational Scale of Development; that is, stimulated babies reached the specified behavior earlier than control babies. This represents 32% of the total, a percentage that climbs to 34% if we consider only those items aimed specifically at infants from 0 to 6 months of age. It ought to be noted that the Observational Scale of Development includes certain items, previously classified as appropriate for infants over 6 months of age, in order to ascertain if the infants in our sample demonstrated any precocious behavior. The remaining items did not reveal significant difference between control and experimental groups. We did not find any significant difference in terms of total hours of exposure to the music. The highest level of significance (1% level) was obtained on the following thirteen items of the Scale: 1. Hand-mouth coordination ("Brings the hand to the mouth and sucks it.") 2. Visual tracking of the mother ("Follows the mother across the room with the eyes.") 3. Object exploration with the mouth ("Explores toys by sucking them.") 4. Anticipation behavior ("Stops crying when somebody comes near.") 5. Facial imitation ("Shows the tip of the tongue, imitating the mother.") 6. Tactile and visual exploration (Takes one hand with the other and looks at them.") 7. Gross motor activity ("Lying on the back, can turn the head both ways.") 8. Babbling ("Enjoys trying to articulate syllables.") 9. Motor activity game ("Moves to take a handkerchief away from the face.") 10. Imitation ("Imitates simple actions, e.g., clapping hands or agitating arms.") 11. Gross motor activity ("Can stay seated upright a few instants without leaning.") 12. Fine motor activity ("Holds feeding bottle with both hands.") 13. Concept that a hidden object still exists ("Looks for an object that has seen covered beneath a pillow or cloth.") Also, at a 5% level of significance, the stimulated babies proved to be more advanced on the following nine items of the Scale: 1. Eye-ear coordination ("Turns the head at a noise.") 2. Emission of sounds in response to a human voice ("Responds with sounds when human voice is heard.") 3. Differentiation between known and unknown persons ("upsets in the presence of unknown persons.") 4. Binocular convergence ("Eyes converge to follow an object when moved towards his face.") 5. Reaction before a mirror at seeing his image ("Smiles and vocalization at seeing his image in a mirror.") 6. Gross motor activity ("Sitting upright with support, turning head from side to side.") 7. Tertiary circular reaction/intentionality ("Pulls at a tablecloth to bring something on the cloth within reach.") 8. Motor activity, rhythm, musicality ("Hits objects such as a drum, xylophone or two spoons to hear the resulting sound.") DISCUSSION These items taken as a whole show significant differences in somato-sensory coordination, gross and fine motor activity, prelinguistic behavior, and certain aspects of cognitive development in favor of the experimental group. When results are

analyzed month by month it can be seen that the differences become greater at 4, 5, and 6 months, increasing little by little by age. The mothers were making and recording the observations as they appeared to them for the first time. Our results support the superiority of prenatally stimulated children in gross and fine motor activities found in previous investigations using other methods of stimulation (Manrique 1989, 1993, Panthuraamphorn 1993, 1994, and Sallenbach 1993, 1994). Likewise, our findings are consistent with the precocious linguistic behavior found earlier in the pilot study of Logan (1987, 1991), and in the research of Manrique (1989, 1995), Panthuraamphorn (1993, 1994), Sallenbach (1993, 1994), and Van de Carr and Lehrer (1986, 1988). Similarly, our results confirm aspects of somato-sensory coordination and certain cognitive gains found by Van de Carr and Lehrer (1986, 1988) and Manrique (1989, 1995). Prenatal stimulation probably helps the nervous system to mature during fetal development because the uterus becomes a more stimulating environment, and the reason why fetuses until recently have not learned more in utero is not a lack of learning ability but because the conditions there did not make it necessary. Besides, mothers participating in stimulation programs by dedicating a few hours every day to stimulate the unborn baby, earlier make a place for the baby in their life and begin their active relationship sooner. This helps them to deal more adequately with the child after birth, favoring postnatal development. Footnote * See Appendix I for the "Observational Scale of Development." References

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APPENDIX I. Observational Scale of Development from 0 to 6 months, adapted from that of F. Secadas (1988, 1992)

1. Automatically picks objects that brush the palm of the hand (like other person's finger, a pencil...)
2. If held upright by the armpits over a hard surface moves the legs like walking.
3. Hints defensive reactions when facing intense stimulation (like closing the eyes or turning the face when we approach a very bright light).
4. Reacts at the sound of a bell or a rattle.
5. When touched on the cheek, turns the head to that side.
6. Follows with the eyes a moving bright-colored object.
7. Turns the head at a noise.
8. Emits guttural sounds (GGGG), like if clearing the throat or growling.
9. Brings the hand to the mouth and sucks it.
10. Raises the chin when lying face down.
11. Stares at mother's face when sucking or feeding from the bottle.
12. Tears appear when crying.
13. Closes eyes when hands are clapped near face.
14. Looks at watching or talking face.
15. Emits

confuse vocal sounds ("a", "u", "o"). 16. Rests on the forearms when lying face down, and raises chin and chest. 17. Answers with smile to other smiling person. 18. Smiles when we talk at him. 19. Pulls hair or touches face of person holding him in arms. 20. Smiles when shaking rattle. 21. Follows the mother across the room with the eyes. 22. Responds with sounds when human voice is heard. 23. Touches and hits objects hanging at his reach. 24. Explores toys by sucking them. 25. Stops crying when somebody comes near. 26. Uncovers by shaking legs strongly. 27. Turns head toward person talking to him. 28. Shows the tip of the tongue, imitating the mother. 29. Takes one hand with the other and looks at them. 30. Rubs and hits objects against hard surfaces. 31. When lying face up, tries to get hold of a ring within his reach. 32. When held seated the head is well supported, and doesn't fall forward or to the sides any more. 33. Lying on the back, can turn the head both ways. 34. Lying on the back, can turn the body towards one side, then returns to the first position. 35. If held upright by the armpits over a hard surface, folds legs and doesn't move them anymore like walking. 36. Upsets in the presence of unknown persons. 37. Eyes converge to follow an object when moved towards his face. 38. Enjoys trying to articulate syllables. 39. Pushes objects with the palm of the hand. 40. Moves to take a handkerchief away from the face. 41. Can move by crawling, that is, dragging on the stomach. 42. Can stay seated upright a few instants, if has something to lean on. 43. Smiles and vocalization at seeing his image in a mirror. 44. Imitates simple actions, e.g., clapping hands or agitating arms. 45. Doesn't pick automatically anymore objects brushing the palm of his hand, but selects objects he wants to take that are within his reach, and does it using the thumb together with the other fingers. 46. Takes a handkerchief away from his face. 47. Sitting upright with support, turning head from side to side. 48. Reacts with laugh to tickling. 49. Hits table with spoon, imitating other persons. 50. Starts picking objects that are not within reach. 51. Differentiates between known and unknown persons, with different behaviors towards the former and the latter (i.e., smiles more to known persons, they comfort him easier...). 52. Recognizes preliminaries to go out for a walk. 53. Follows with the sight the fall of objects. 54. Changes objects from one hand to the other. 55. Enjoys throwing everything to the floor. 56. Shakes objects if they make noise, like the rattle. 57. Can stay seated upright a few instants without leaning. 58. If held upright by the armpits over a hard surface, jumps up and down. 59. Stretches out the hand towards the mirror in front of him, to touch his image. 60. Pushes aside an obstacle to reach an object he has seen being hidden. 61. Pulls at a tablecloth to bring something on the cloth within reach. 62. Hits objects such as a drum, xylophone or two spoons to hear the resulting sound. 63. Takes two objects, one in each hand. 64. If shown rattling keys, picks them up. 65. Holds feeding bottle with both hands. 66. Starts going on all fours or sliding on the backside. 67. Takes part in games like covering the face with the hands, then uncovering it saying "cu-cu". 68. Looks for an object that has seen covered beneath a pillow or cloth. 69. Chews a biscuit. 70. Picks rather small objects, like a necklace's head or a crumb of bread, using the thumb and the forefinger as a pincer. 71. Learns to clap hands. 72. Inserts the finger into slots and holes. 73. Stands upright leaning on the railing of the crib or the playpen. 74. Open and closes mouth, imitating persons. 75. Learns to kiss. 76. Links syllables ("ba-ba-ba", "da-da-da"). 77. Understands a prohibition (No!) and stops when hearing it. 78. Imitates words ("mama", "papa"...). 79. Imitates sounds (i.e., cracking the tongue, "prrr"). 80. Drinks from glass or cup if helped to hold it. 81. Can stand seated for 10-15 minutes without leaning. 82. Can seat by himself after crawling. 83. Cries if mother leaves. 84. Hums alone. 85. Looks attentively to the drawings.

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