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CLINICAL EVALUATION OF EFFECT OF MUSIC ON NEUROLOGICAL DEVELOPMENT OF THE FOETUS

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ABSTRACT

One of the most beautiful aspects of being a woman is the fact that she can give birth to another life. Within her, a new life takes shape, is molded and then is born to be nurtured into a good human being. The qualities of "*Sreyasi Praja*" described by Ayurvedic science should imbibe better psychological aptitude (type of *satva*), and cognitive abilities (*buddhi, smruti, vijnana* etc…). Music, because of its nature and qualities, is most suitable for the task of nurturing the physical, emotional, mental and spiritual development of the unborn baby. Music stimulates the development of the brain and its ability to reason, through the establishment of a network of neurons that allows the brain to function better. About 20 weeks of gestation, the first sense that the human fetus develops is hearing. Through its sense of hearing, the baby receives the first evidence that something to which it can relate exists outside of its environment. Music serves as a means of communicating with the unborn child through sounds and voices. Prenatal stimulation is a process that encourages learning in unborn babies by optimizing mental and sensory development.

Keywords: *Sound, Shabda, Learning, Classical conditioning, Cognitive abilities, Prenatal education, Postnatal observations.*

INTRODUCTION:

"After silence, that which comes nearer to expressing the inexpressible is Music."

The prenatal period is one of the most fascinating & eventful period of a child's life. In the vast majority of pregnancies the environment exerts a positive effect shaping the individual's development. The fetus is active participant in its own development. Its end is marked by a beginning; the birth of a newborn baby.

Acharya Charaka in Jati Sutreeya Adhyaya explains about the upliftment of human race by getting Sreyasi Praja, a baby meant for social and spiritual welfare, who is worthy enough to elevate himself / herself to higher places and to impart positive impact on society. To achieve this, apart from physical care of pregnant women Ayurveda explains about maintaining sound psycho emotional condition of the mother which gives a positive impact upon the child.

According to Acharya Kashyapa and Sushruta, pregnant women should be subjected to Vedic chants and other rhythms of music.

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Learning is defined as the modification of behavior by experience. Developments of the senses & of the brain are prerequisites to prenatal learning. The brain of a child is much more active than that of an adult. Even before birth babies can assimilate maternal emotions that, as in the case of music, are determining factors in their formation.

OBJECTIVE OF THE STUDY

- Conceptual study of antenatal care w.s.r to Psycho-emotional care of pregnant woman and its effect on fetal development.
- To study the effect of sound on psychological condition of expectant mother and fetus and their interrelationship.
- Clinical study of effect of sound on Prenatal and Neonatal outcome.

MATERIALS & METHODS

The clinical study entitled "Clinical evaluation of effect of Music on neurological development of the fetus" was carried out on 20 patients selected from OPD section of Prasooti Tantra & Stree Roga, SDM College, Udupi.

Source of data:

The female during antenatal period, fulfilling the inclusion criteria was selected for the study from the OPD of SDM College, Udupi.

Method of collection of data:

A special format was prepared with all points of history taking, obstetric examination, antenatal assessment of fetal movement and the course of labor .The babies were analyzed and selected accordingly**.**

Design of the study:

It is a single blind control clinical study where minimum of 20 pregnant women without any complications who are undergoing common antenatal care were selected and categorized into 2 groups of 10 patients each.

Control group - Where 10 pregnant women were not subjected to music.

Trial group - Where 10 pregnant women were exposed to music and had normal delivery without any evidence of fetal asphyxia.

Duration of study: From 5th month till delivery.

INCLUSION CRITERIA:

- 20 weeks of Gestational age.
- Patients within the age group of 18 - 35 yrs.
- Primi and multipara, who are undergoing simple antenatal care with normal course of pregnancy.

EXCLUSION CRITERIA:

- Pregnancy more than 35 years of age.
- Systemic disorders like HTN, DM, T.B, etc.
- Severe anemia, eclampsia, pre-eclampsia, previous BOH.
- Grand multi gravida.
- Previous caesarian section.

INTERVENTIONS:

- Gestational age – music will be started from 20 weeks up to delivery.
- Instrumental & vocal music.
- Listening to music for ½ an hour.
- Once in a day between 7.00Am– 8.00 Am or 7.00Pm – 8.00 Pm.

ASSESSMENT:

Parameters which are assessed as follows:

1. Prenatal period
2. Postnatal period

1. Prenatal Assessment:

Fetal movements were checked daily for about ½ an hour in the same environment.

2. Post natal Assessment:

Scoring was given for the following examinations:

MOTOR EXAMINATION:

- ✓ Glabellar tap reflex
- ✓ Sucking reflex
- ✓ Moro's reflex

SENSORY EXAMINATION

- ✓ Staring
- ✓ Auditory

These were checked soon after the birth and on the 2nd day.

The scoring was done as:

2 – Perfect
1 – Moderate
0 – Mild

MOTOR EXAMINATION:

Glabellar tap reflex

2-Brisk blink
1-Slow blinking
0-Just movement of eyelashes

Sucking reflex

2-Responds when nipples are touched to its cheeks/lips by vigorous rhythmic sucking in the direction of stimulus.

1- Responds feebly when nipples are touched to its cheeks/lips by rhythmic sucking in the direction of stimulus.

0-Does not respond in the direction of stimulus & are not vigorous & rhythmic sucking.

Moro's reflex

2-Where the abduction, extension of arm, flexion of thumb, flexion & adduction of upper extremities are seen randomly.

1-Where the above said movements are seen in incomplete random manner.

0-Where any 1 of the above 5 movements is missing & not in randomness.

SENSORY EXAMINATION

VISUAL

Staring

2 – Stares
1 – Just gives a look
0 – Won't stare

AUDITORY

2-Responds immediately by looking towards the direction of sound produced.

1-Responds just by moving the head.

0-Does not move head, but blink its eyes.

SECONDARY EXAMINATION:

Weight gain: Maternal weight check up for every 15 days.

INVESTIGATIONS:

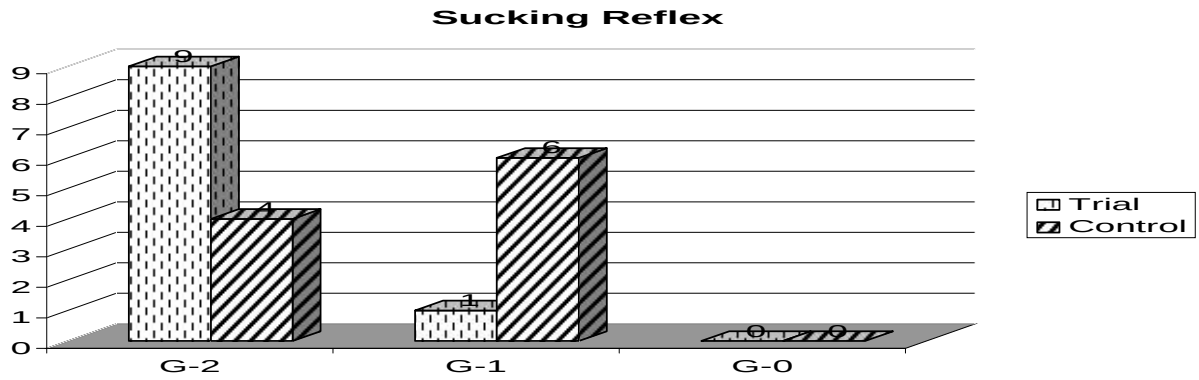
HB%, ABORh, RBS, HIV, VDRL, HbsAg, Urine Routine and USG

RESULTS:

❖ **Table1: Showing grading of sucking reflex in trial & control group**

Grade	*No. of pts in trial group*	*%*	*No. of pts in control group*	*%*
2	**9**	**90%**	**4**	**40%**
1	**1**	**10%**	**6**	**60%**
0	**0**	**0%**	**0**	**0%**

Graph 1:



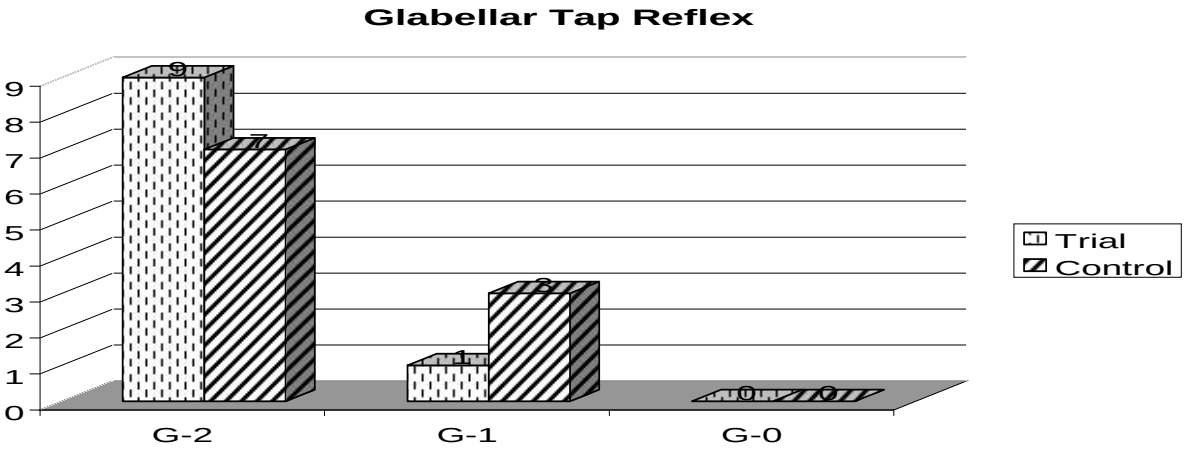
- This study show that majority of pts in trial group fall in the category of Grade 2 (90%) & 10% in Grade 1, whereas only 40% of pts in control group fall in the category of Grade 2 & 60% in Grade 1.

Group	Mean	Difference in mean	S.D	T	P
Trial	1.900	0.500	0.316	2.611	0.018
Control	1.400		0.516		

- The difference in the mean values of the two groups is greater than would be expected by chance; there is a statistically significant difference between the input groups (P = 0.018).
- **Table 2: Showing grading of glabellar tap reflex in trial & control group**

Grade	***No. of pts in trial group***	***%***	***No. of pts in control group***	***%***
2	**9**	**90%**	**7**	**70%**
1	**1**	**10%**	**3**	**30%**
0	**0**	**0%**	**0**	**0%**

Graph 2:



- This study show that majority of pts in trial group fall in the category of Grade 2 (90%) & 10% in Grade 1, where as 70% of pts in control group fall in the category of Grade 2 & 30% in Grade 1.

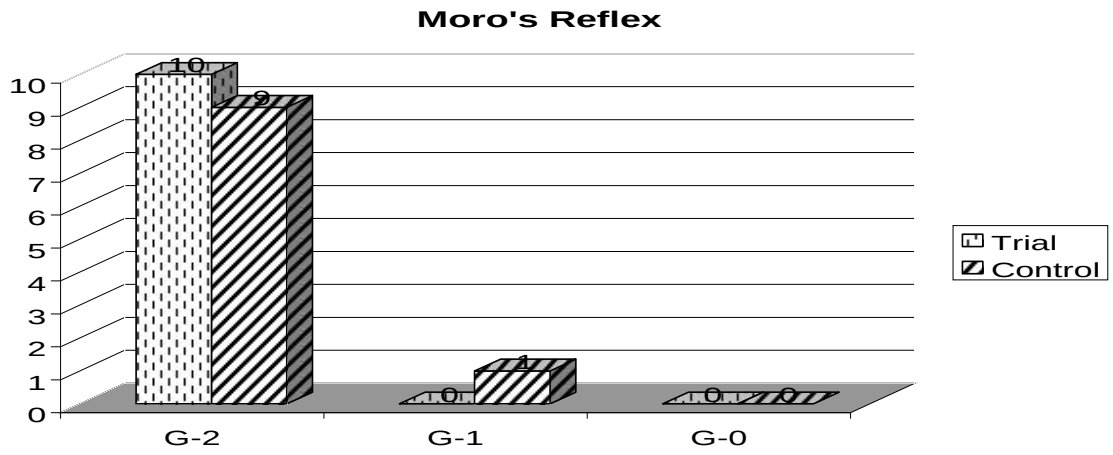
Table :

Group	Mean	Mean difference	SD	T	P
Trial	1.800	0.100	0.422	0.493	0.628
Control	1.700		0.483		

- The difference in the mean values of the two groups is not great enough to reject the possibility that the difference is due to random sampling variability. There is not a statistically significant difference between the input groups (P = 0.628).
- **Table 3: Showing grading of Moro's reflex in trial & control group**

Grade	No. of pts in trial group	%	No. of pts in control group	%
2	**10**	**100%**	**9**	**90%**
1	**0**	**0%**	**1**	**10%**
0	**0**	**0%**	**0**	**0%**

Graph 3:



- This study show that all the pts in trial group fall in the category of Grade 2 (100%), where as 90% of pts in control group fall in the category of Grade 2 & 10% in Grade 1.

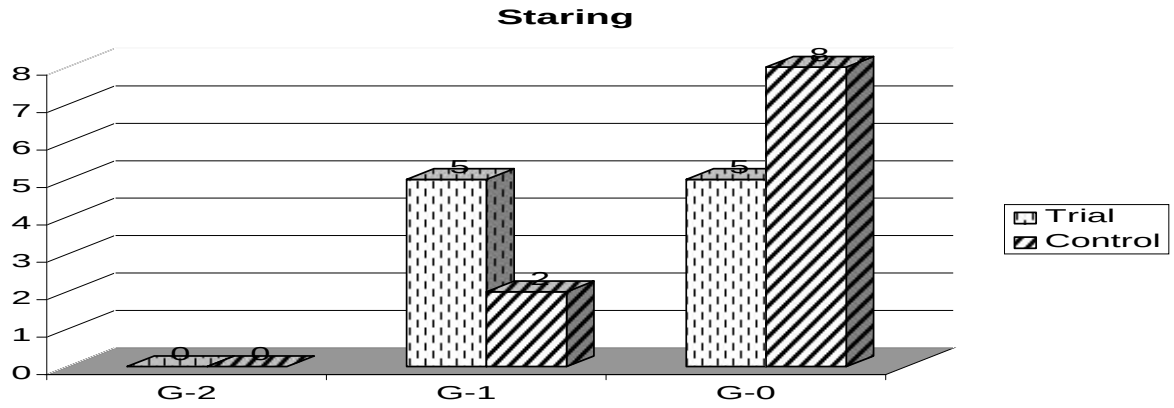
Group	Mean	Mean difference	SD	T	P
Trial	2.000	0.100	0.000	1.000	0.331
Control	1.900		0.316		

- The difference in the mean values of the two groups is not great enough to reject the possibility that the difference is due to random sampling variability. There is not a statistically significant difference between the input groups (P = 0.331).
- **Table 4: Showing grading of Staring in trial & control group**

Grade	No. of pts in trial group	%	No. of pts in control group	%
2	**0**	**0%**	**0**	**0%**

1	**5**	**50%**	**2**	**20%**
0	**5**	**50%**	**8**	**80%**

Graph 4:



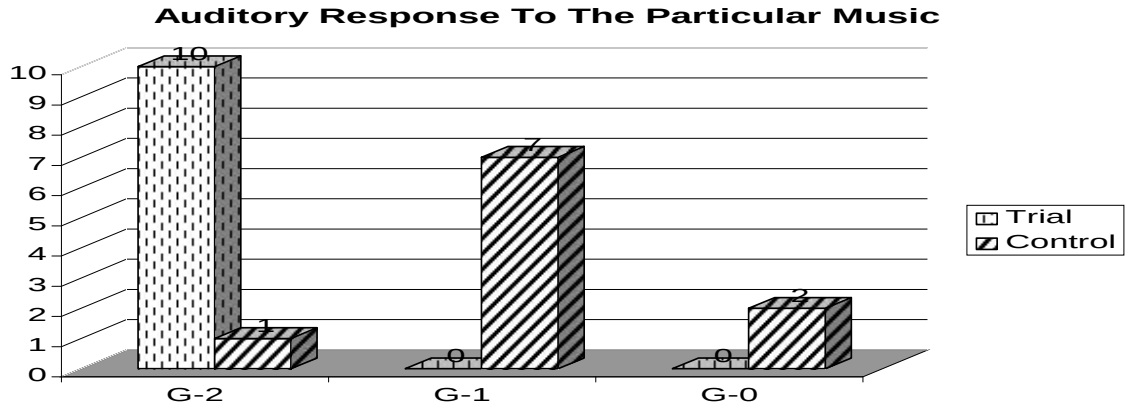
- This study show that half of the pts in trial group fall in the category of Grade 1 (50%) & half in Grade 0 (50%) where as only 20% pts in control group fall in the category of Grade 1 & rest in Grade 0.

Group	Mean	Mean difference	SD	T	P
Trial	0.500	0.300	0.527	1.406	0.177
Control	0.200		0.422		

- The difference in the mean values of the two groups is not great enough to reject the possibility that the difference is due to random sampling variability. There is not a statistically significant difference between the input groups (P = 0.177).
- **Table 5: Showing grading of Auditory response to the particular music in trial & control group**

Grade	*No. of pts in trial group*	*%*	*No. of pts in control group*	*%*
2	**10**	**100%**	**1**	**10%**
1	**0**	**0%**	**zz7**	**70%**
0	**0**	**0%**	**2**	**20%**

Graph 5:



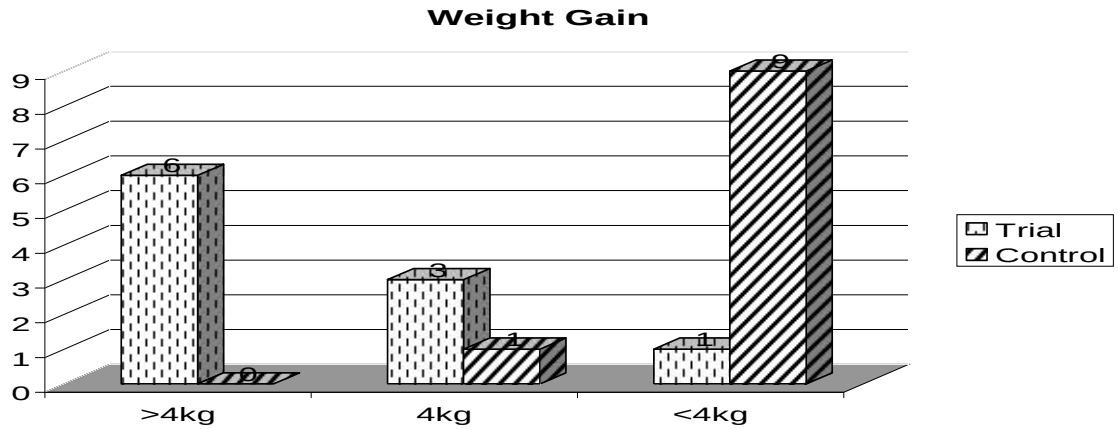
- This study show that all the pts in trial group fall in the category of Grade 2 (100%), where as only 10% of pts in control group fall in the category of Grade 2 , 70% & 20% in Grade 1 & Grade 0 respectively.

Group	Mean	Mean difference	SD	T	P
Trial	2.000	1.100	0.000	6.128	<0.001
Control	0.900		0.568		

- The difference in the mean values of the two groups is greater than would be expected by chance; there is a statistically significant difference between the input groups (P = <0.001).
- **Table 6: Showing wt gain in trial & control groups from 5th month till delivery**

Wt. Gain	*No. of pts in Trial group*	*%*	*No. of pts in Control group*	*%*
>4 kg	**6**	**60%**	**0**	**0%**
4 kg	**3**	**30%**	**1**	**1%**
<4 kg	**1**	**10%**	**9**	**90%**

Graph 6:



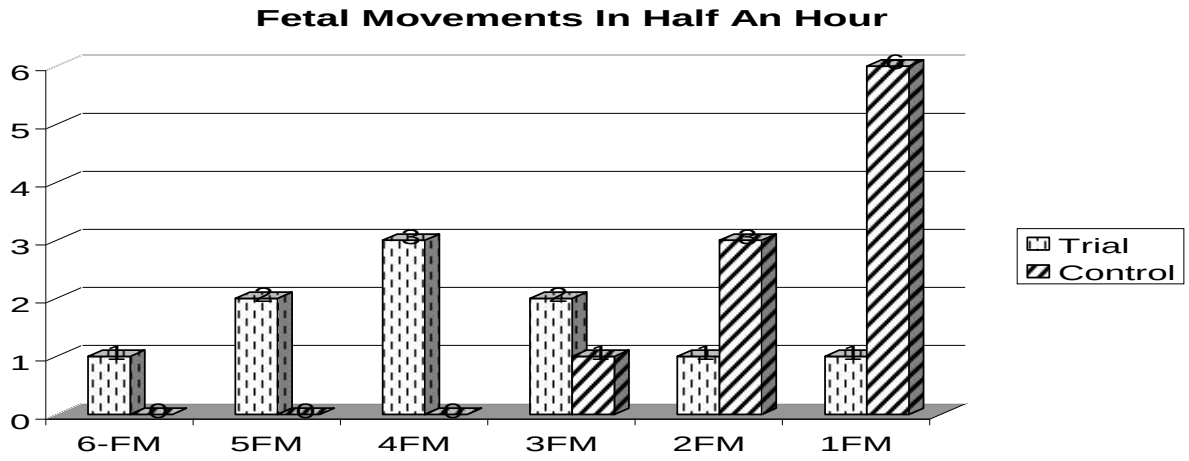
- This study show that there was increase in wt gain more than 4 kg in 60% of pts of trial group where as 90% of pts in control group had wt gain less than 4 kg.

Group	Mean	Mean difference	SD	T	P
Trial	4.320	1.100	0.473	5.171	<0.001
Control	3.220		0.478		

- The difference in the mean values of the two groups is greater than would be expected by chance; there is a statistically significant difference between the input groups (P = <0.001).
- **Table 7: Showing fetal movements in ½ hr in trial & control groups**

Fetal movements	No. of pts in Trial group	%	No. of pts in Con-trol group	%
6	**1**	**10%**	**0**	0%
5	**2**	**20%**	**0**	0%
4	**3**	**30%**	**0**	0%
3	**2**	**20%**	**1**	10%
2	**1**	**10%**	**3**	30%
1	1	10%	6	60%

Graph 7:



❖ This study show that maximum no. of movements i.e. 6 in ½ an hr were observed in trial group where as maximum 3 movements were observed in control group pts.

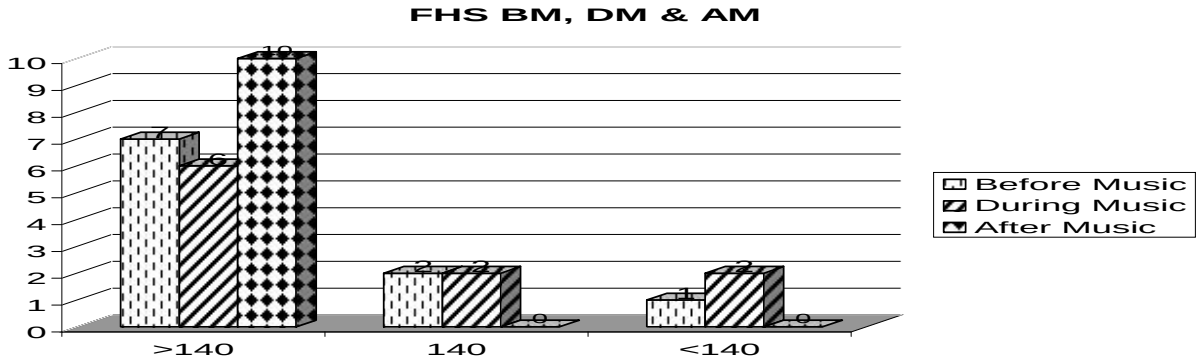
Group	Mean	Mean difference	SD	T	P
Trial	3.700	2.200	1.494	4.208	<0.001
Control	1.500		0.707		

❖ The difference in the mean values of the two groups is greater than would be expected by chance; there is a statistically significant difference between the input groups (P = <0.001).

❖ **Table 8: Special observations in trial group i.e. FHS BM, DM, AM**

FHS	*BM*	*%*	*DM*	*%*	*AM*	*%*
>140	**7**	**70%**	**6**	**60%**	**10**	**100%**
140	**2**	**20%**	**2**	**20%**	**0**	**0%**
<140	**1**	**10%**	**2**	**20%**	**0**	**0%**

Graph 8:



❖ This study show that in all the pts (100%), FHS decreased after listening to music.

DISCUSSION

Effect of music on auditory response to the particular music:

Statistical analysis revealed that the mean score of this reflex was 0.900 in control group which was 2.000 in trial group. This change that occurred with the music is statistically significant (p<0.001).From this study we are able to conclude that the baby was habituated to particular music which his mother was listening during his fetal life.

The study does indicate that the fetus is able to learn and remember familiar auditory stimuli in the womb, retain this information over the birth period and that this learning is specific to the familiar stimulus. Fetal memory may serve a number of specific functions, dependent upon the learning of particular stimuli prenatally.

Effect of music on weight gain:

Statistical analysis revealed that the mean score of this reflex was 3.220 in control group which was 4.320 in trial group. This change that occurred with the music is statistically significant ($p<0.001$).

Pregnant woman is under more stress about baby's well being. An exaggerated stress response has negative effects during pregnancy and childbirth, as it can cause fatigue, anxiety, poor appetite, sleeplessness, etc. So to cope up with stress, she should involve herself in some positive constructive activities. Music is one among the stress reliever. As her stressful life is relieved she can have good appetite, proper sleep, ultimately which may lead to weight gain.

Effect of music on fetal movements observed in half an hour:

Statistical analysis revealed that the mean score of this reflex was 1.500 in control group which was 3.700 in trial group. This change that occurred with the music is statistically significant ($p<0$).

Sound enters the uterus; passes through the liquid medium & reaches the fetus. This sound is recognized by the fetus so it responds to that. Hence, fetal movements were increased in the trial group. At the same time, the movements have been decreased after 15 min, as the fetus is "habituated" to the stimulus that is given.

SPECIAL OBSERVATION:

Some specific test has been conducted for the trial group i.e. fetal heart monitoring before music, during music exposure & after music exposure. In control group FHS was uniform for 40 min of observation period under normal environmental conditions where as in trial group there was deceleration in FHS which probably shows relief of stress on fetus & soothing effect of the music.

EFFECT ON OTHER REFLEXES:

Statistical analysis revealed that there was only one reflex i.e. sucking reflex in which change occurred was statistically significant , where as in other reflexes there was no significant change seen, when trial group was compared to control group. From this data we can conclude that music has no positive effect on the nervous system.

A memory in uteri may be important for the establishment of breast feeding. The mother's diet flavors both the amniotic fluid and her breast milk. The fetus may learn about the flavor of the amniotic fluid via its swallowing of this fluid which begins at 12 weeks of gestation. When presented to the breast for the first time, the newborn recognizes the colostrums as familiar due to the presence of the same tastes that have been present in the amniotic fluid. This may enhance the baby's willingness to suck.

CONCLUSION

On the bases of above it is concluded that Music is beneficial for the cognitive development of the fetus.

1. Statistical analysis revealed that, except in sucking reflex, there was no significant result in other neurological reflexes of the newborn.
2. The study indicates that the fetus is able to learn and remember familiar auditory stimuli in the womb & the baby is habi-

tuated to the particular music which his mother was listening during his fetal life.

3. Music gives peace & emotional stability, thus an instrument to relieve stress. By relieving stress, it keeps the mother happy which was elicited probably by the increase in the weight gain of the mother in the trial group.
4. Fetus listens the music. It reacts to the music & is habituated to the stimuli. This may be the probable cause of increase in the fetal movements in the trial group which were observed in half an hour exposure to the music.

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