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The Effects of Prenatal Tactile and Vestibular Enrichment on Human Development

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Abstract: To investigate the influence of prenatal tactile and vestibular intervention on infant's social, emotional and motor development and to evalulate the maternal-child attachment after participated the prenatal activity. The 120 pregnant women were trained to stroke their abdomen, pat rhythmically on fetus' bottom and rock themself on the rocking chair 10–15 minute each everyday throughout pregnancy.

The infant's developmental outcome were evaluated by Danver developmental test in term of social, emotional and motor development. For an assessment of the mother-child attachment and the calming effect on infant were evaluated by evaluation sheet. The infant's response to stimuli were also analysed.

The participated infants stopped crying and showed calming effect when rhythmic patting and rocking were applied after birth, they also have a capacity of conditional learning by kicking back in response. The enriched infants showed smile, head up, sit and stand earlier than the control group. They also showed good emotion and better performance in mother-child attachment. These findings in this study suggest that the infants have an ability of learning in utero, and the prenatal tactile / vestibular enrichment may be an effective way to promote infant's social, emotional and motor development.

Zusammenfassung: *Die Auswirkungen von pränataler, taktiler und vestibulärer Förderung auf die menschliche Entwicklung.* Ziel der Untersuchung ist es, den Einfluß von taktilen und vestibulären Interventionen auf die soziale, emotionale und motorische Entwicklung des Kindes zu erfassen und ebenso die Mutter-Kind-Bindung hiernach zu bewerten. 120 Frauen folgten folgender Instruktion: Jeden Tag während der Schwangerschaft, jeweils 15 Minuten den Bauch im Bereich der Rückseite des Kindes zu streicheln und auf einem Schaukelstuhl zu schaukeln.

Die Auswirkungen auf die Entwicklung des Kindes wurden mit dem Danver-Entwicklungstest für soziale, emotionale und motorische Entwicklung eingeschätzt. Die Einschätzung der Mutter-Kind-Bindung und der Beruhigungseffekt auf das Kind wurden an-

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hand von Einschätzungsbögen vorgenommen. Auch die Reaktionen des Kindes auf die Interventionen wurden analysiert.

Die teilnehmenden Kinder hörte mit Schreien auf und wurden ruhig, wenn nach der Geburt das rhythmische Streicheln und Schaukeln erfolgte. Sie zeigten auch ein konditioniertes Lernen in ihren Reaktionen auf die Interventionen. Die in dieser Weise geförderten Kinder zeigten Lächeln, Aufrechthalten des Kopfes, Sitzen und Stehen früher als die Kontrollgruppe. Sie zeigten auch ein deutlicheres Bindungsverhalten. Die Ergebnisse dieser Untersuchung legen nahe, daß Kinder während der Schwangerschaft lernen, und daß die pränatale taktile und vestibuläre Förderung ein wirksamer Weg sein könnte, die soziale, emotionale und motorische Entwicklung des Kindes zu unterstützen und zu fördern.

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Introduction

It has been known that the sense of touch begins at least by the 8th week of pregnancy and the organ of the sense of balance and orientation in space, the vestibule of the ear, is found by the 17th week. Therefore, both senses are developed and stimulated to function during in utero. Fetus can percept and respond to both tactile and vestibular stimuli.

Many forms of tactile stimulation have been provided for preterm neonates. The stimulated neonates show more weight gain, more active and alert, more nature habituation and orientation and also give a greater developmental progress.

The vestibular stimulation also influences on motor development in preterm neonates. It effects a significant improvement in gross motor skill. Freedman and Boverman demonstrated the calming effect of rocking stimuli on preterm infants. Pederson and Ter Vragt reported that vestibular stimulation has a powerful effect on inhibiting crying and enhancing visual alertness.

Although fetus can percept and learn sense of touch and movement even in utero, but there are few studies which envestigated the effects of prenatal tactile and vestibular stimulation on postnatal life. As the tactile / kinesthetic stimulation can positively effect preterm baby, so, our purpose of this study is to provide the tactile and vestibular intervention to fetus during in utero and investigate the influence of prenatal intervention on infant's, emotional and motor development, and also evaluate the maternal-child attachment after applied the prenatal activity.

Method

Sample

The sample comprised 120 pregnant women who participated the prenatal tactile and vestibular activity during pregnancy. The other 25 control pregnant women did not participate. Both groups were selected from the same general population. The maternal charactristies and obstetrics factor are shown in Table 1.

Procedure

Each pregnant women in the experimental group received the tactile activity using massage circularly around abdomen by her husband, follow with rhythmic patting

Table 1. Maternal character and obstetric factors in both group.

	Experimental group (N = 120) MEAN + S.D.	Control group (N = 25) MEAN + S.D.	T	P
Maternal age	30 + 4.4	31.5 + 6	–1.3	1.8
Gravid	1.3 + 0.6	1.4 + 0.6	–0.3	1.2
Educability *	1.3 + 0.5	1.2 + 0.4	0.8	0.42
Economic status **	1.6 + 0.5	1.5 + 0.5	0.9	0.37
Type of delivery ***	1.2 + 0.4	1.2 + 0.4	–0.29	1.23
Amniotic fluid ****	1.08 + 0.27	1.07 + 0.27	0.07	0.95
Term/Preterm *****	1.1 + 0.3	1.1 + 0.3	0.04	1.03

* 1 = Graduate, 2 = Undergraduate
** 1 = > 30,000 Bath, 2 = < 30,000 Bath
*** 1 = Normal Labour, 2 = Cesarean Section
**** 1 = Clear, 2 = Meconium Stain
***** 1 = Term, 2 = Preterm

on fetus' bottom, practise 10 minute each in a day begin at 20 week gestational age. Another activity is patting abdomen when fetus move, practise from 28 week till birth. The vestibular activity by rocking herself on rocking chair was given 15 minutes a day in the evening started from 20 week gestational age till birth.

Table 2. The frequency of practice.

Frequency	Type of prenatal activity	
	tactile	vestibular
Everyday	27.27%	22.72%
5–6 / week	36.36%	12.12%
3–4 / week	27.27%	27.27%
1–2 / week	9.09%	21.27%
No Practice	–	16.66%
> 3–4 / week	90.9%	62.11%

Measure

Clinical data was recorded from evaluation sheet included maternal age, gravid educability, economic status, Type of delivery, colour of amniotic fluid, and term / preterm status. The frequency of practice was also recorded. The infant's developmental outcome were evaluated by Danver developmental test in term of social, emotional and motor development.

For an assessment of the mother-child attachment and the calming effect on infant were evaluated by questionare. The infant's response to stimuli were also analysed. We apply rhythmic patting and rocking pattern while baby is crying and test whether each activity will calm down the baby or not. We also pat back to abdomen to see whether fetus will move in response or not.

Results

The data were analysed to determine how the stimulation affected the experimental infants. In Fig. 1, when the experimental infants are crying, the rhythmic patting pattern will be performed and we found that infants stopped crying 2.1 minutes in average, while the control infants stopped crying with the same patting pattern in 4.6 minutes. Figure 2, 32.5% of experimental infants always calm down after giving the previous rocking pattern. 29.1% response frequently. The finding in Fig. 3 suggested that the experimental infants have a capacity of conditional learning. 16.6% of them always kick back in response and 48.3% kick back frequently.

Fig. 1. Time response to rhythmic patting.

Fig. 2. Calming effect on rocking chair. Number and percentage of response.

The data in Table 3 showed that 49.1% of infants have an excellent emotional response and 35.8% indicated good emotion. Babies who have excellent or good emotion are also easy to take care after birth. From Table 2, participated mother practised tactile activity more than vestibular activity in the percentage of 90.9 to 62.1% (more than 3–4 time / week).

Table 3. The experimental infant's emotional response.

Emotional response									
Excellent		Good		Fair		Bad		Unknown	
No.	%	No.	%	No.	%	No.	%	No.	%
59	49.1	43	35.8	16	13.3	2	1.5	3	2.5

Fig. 3. Kick back response (Conditional learning).

As shown in Fig. 4 in the section of social development, the experimental infants showed a better emotional development, they can smile spontaneously at 1 month of age in average while the control children smile at 1.8 month of age. But there is no significant difference were noted in item of laugh.

However, in the section of motor development. The experimental infants can head up 90 at 1.1 month, rolls over at 3.3 month, sit without support at 5.5 month and pulls self to stand at 7.1 month in average while the control children can head up 90, rolls over, sit without support and pulls self to stand at 2.3 month, 3.3 month, 6.5 month, 9 month in average. These suggest that experimental infants have a significant development in gross motor skills than control children. Except the item of rolls over which showed no difference.

The study in Table 4 demonstracted that maternal relationship to her children and husband were increased significantly after participated the activity.

Table 4. The relationship to their children and husband after participated the prenatal activity.

	Relationship to children		Relationship to husband	
	No.	%	No.	%
Better relation	108	90	95	79
Unchange	10	8.3	23	19.1
Worse	–	–	–	–
Unknown	2	1.6	2	1.6

Discussion

The data review in Figs. 1 and 2 suggest that fetus can learn both tactile and vestibular stimuli even in utero and the previous experiences they recieved can influence their perception and learning after birth. This effect could be due to the fetus feel accustomed to those stimuli during in the womb, so they feel sleepy and calm down as soon as the previous stimuli was applied again.

Our group comparison in Fig. 4 and Table 3 indicate that the experimental infants have a good emotion, easy to take care and present smile earlier than general

Fig. 4. The developmental measurement of personal-social and motor of experimental infants (E = enriched group, C = control group).

population. This could possibly be a result of touch and movement pattern which reinforce a positive emotional growth and produce calming effect to them. There findings are also supported by other tactile and vestibular stimulation on preterm baby which reported more quiet sleep, longer duration of quiet sleep, less awake and less crying.

Another consideration need to be stressed here is to use the rocking and tactile technique during pregnancy as a tool to give calming effect for babies after birth. This will be the important point that can be practised in routine prenatal care so that every newborn will have a positive emotional growth, cryless and more quiet sleep.

In addition, in Fig. 4 the experimental infants also showed better motor development on Danver developmental scale. They can head up, sit, and stand earlier than control children. This could be due to the effect of rocking activity that paticipated mother practised throughout pregnancy. However, there is no defference between two group in section of roll over. This may be due to the less practice in vestibular activity when compare to tactile activity as shown in Table 2. We believe that the more they practise, the more good outcome will be found.

Many studies suggest that the communication with unborn child during pregnancy may improve mother-child attachment and bonding. As shown in Table 4, the data showed better performance in relation between mother and child after participated the prenatal activity. The better relationship to her husbands also showed in Table 4.

In concluding, study on prenatal tactile and vestibular stimulation to fetus shows benefits for postnatal life. Stimulated infant show better performance in social, emotional and motor development. The stimulation activity also promote better mother-child attachment. Finally, from the finding of this study, we would like to emphasize that the prenatal rocking and tactile pattern here may be routinely introduced to every pregnant women in order to enhance a good emotion and development to all new generation.

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