



The Effect of Talk, Touch, and Combination of both Talk and Touch Stimulation on Movement and Fetal Heart Rate among Mother with High-Risk Pregnancy

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Abstract. High rates of high-risk pregnancies, neonatal deaths, and developmental disorders are health problems. Unique stimulation and touch fetal stimulation were an effective strategy to prevent delay development fetally and to avoid destruction during the maternal period. The study aimed to compare three approaches, including speech stimulation, touch stimulation, and combination on increasing heart rate and movement among fetal. A quasi-experimental study, pre-test, and post-test with three different intervention groups were applied in this study. The findings showed that there were three different of the mean of the score after receiving the intervention as follows: 1) talking stimulation increased 1.3 of the rating of fetal movement (p-value=0.006); 2) touch stimulation increased 1.9 scores of fetal movement (p-value=0.001), and 3) combination of talking stimulation and touch stimulation increased 2.2 ratings of fetal movement (p-value=0.000). The fetal heart rate showed that the heart rate of fetal also increased after receiving the intervention than before receiving the intervention.

Keyword: Fall prevention, the technology used



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INTRODUCTION

A high-risk pregnancy is a crucial maternal health problem worldwide. It impacts not only for mother but also their fetus health, such as IUGR and developmental disorders. In Indonesia, the neonatal mortality rate (NMR) in 2012 reported 19 fetuses were death per 1000 live births (1). While the Infant Mortality Rate (IMR) in Jakarta in 2016 showed four deaths per 1000 live births. IMR in Central Jakarta 32 per 13,070 live births and NMR smaller (2).

The preliminary study at the Hospital Islam Cempaka Putih (RSIJ Cempaka Putih) showed the NMR with six babies of death per 627 live births. This number tended to increase in 2017 with 20 babies' death per 819 live births (3). This condition affected child development disorders, approximately 11.9% of the total life birth (4). Whereas, worldwide, the incidence of child development disorders was relatively high and tended to increase, such as 24% of occurrence in Thailand at 24%, and following by Argentina 22%. The rate of developmental disorders in the United States was 12-16%, while 13-18% occurred in Indonesia (5).

The increasing number of neonatal mortality and child development required effective interventions to reduce the mortality rate. Fetal stimulation is an effective strategy and has positive effects on well-being, fetal movement, and heart rate and ensure fetal hearing (6,7). Pregnant women who need fetal stimulation pay attention to fetal movements (6). Attention to abnormal fetal movements will encourage alertness and seek help to avoid fetal death (8). Therefore, speech stimulation was considered to improve well-being, mainly on the adequacy of risk, disability, and high mortality.

Some studies found that fetal stimulation could affect the peaceful heart and stimulate fetal movement and increase heart rate (9,10). Pregnant women commonly implemented speech and touch stimulation. It could sense of hearing and touch through delivery to the brain and fetal heart rate and movement. The reason for comparing three different interventions was to determine the most effective of those interventions.

The goal of fetal stimulation to deal with fetal cognitive and psychosocial development, especially in high-risk pregnancies. The significance of this study to support the role of maternity nurses in pregnant women to perform stimulation as an intervention option to improve fetal well-being and development.

OBJECTIVE

The study aimed to compare three strategies, including speech stimulation, touch stimulation, and combination on increasing heart rate and movement among fetal.

METHOD

A quasi-experimental study, pre-test, and post-test with three different intervention groups were applied in this study. The study was conducted at the antenatal clinic and inpatients room at Cempaka Putih Hospital Jakarta. We involved thirty samples that were selected and allocated into three groups. It comprised of 10 samples per group. The samples were pregnancy with a high risk who were selected based on the criteria inclusion.

A fetal Doppler was used to check the frequency of the fetal heart rate, while the incidence of fetal movements was examined by using the examiner's hand. This fetal Doppler is a standard tool and commonly used in outpatient and inpatient care at Cempaka Putih Hospital.

Samples were divided into three groups, such as 1) group A received speech stimulation education, 2) group B received touch stimulation education, and 3) group C was received the combination between speech stimulation education and touch stimulation education. The program consisted of an education group stimulating for 3-5 minutes. The intervention procedure speech stimulation as follows: 1) before starting, the mother was required to arrange the position to be semi-fowler or sitting relaxed, 2) talking with normal voice by using megaphones (around 80 decibels) directed at their stomach, 3) mother is required to introduce themselves and greet greetings with the fetus and tell stories for 3 minutes.

The intervention of touch Stimulation started by arranging the Mother's position to be semi-fowler or sitting relaxed. The touch movements on their stomach with a period of each 10-second action such as caressing, rubbing, patting, pressing, shaking, and knocking were required among mother. Procedure touch and talk stimulation: Pregnant women do both stimuli simultaneously, namely stimulation of speech while doing touch movements on their stomach according to the procedure for 3 minutes. The frequency of fetal heart rate and fetal movements were examined before and after program implementation. The researcher also explained the study aims to all patients, and permission was sought by informed consent. Furthermore, anonymity, confidentiality, *beneficence*, and *non-maleficence* was assured. Participants had the right to withdraw from the study at any time.

The data were analyzed by using the chi-square test to compare the mean difference of personal data. T-test was applied to examine and compare the mean between Fetal Movement and Fetal Heart Rate before and after receiving the intervention. The significant level was $p < 0.05$. Normality testing was also tested to ensure the normal distribution of the data.

RESULTS

Characteristic of respondents based on aged and parity period

Table 1 showed that 53% of participants aged less than 20 years old, and 46.7% of participants were 20 to 35 years old. Regarding the parity status, 33.3% of participants were first birth. 50% of them were multigravida, while only 16.7% of participants had been Grande multigravida.

Table 1. Characteristic of respondents based on aged and parity period

Characteristics	Talk stimulation group		Touch stimulation group		Talk and touch stimulation group		Total	
	n	%	n	%	n	%	n	%
Age								
<20 years	5	50	5	50	6	60	16	53.3
20-35 years	5	50	5	50	4	40	14	46.7
Parity								
Primigravida	4	40	4	40	2	20	10	33.3
Multigravida	5	50	5	50	5	50	15	50
Grande multigravida	1	10	1	10	3	30	5	16.7

Comparison of fetal movement and fetal heart rate before and after receiving the intervention

Table 2 showed there are significantly different on Fetal Movement and Fetal Heart Rate from three different groups before and after receiving the intervention. The fetal movement average increased after receiving the intervention than before receiving the intervention as follows: 1) talking stimulation increased 1.3 of fetal movement (p -value=0.006); 2) touch stimulation increased 1.9 of fetal movement (p -value=0.001), and 3) combination of talking stimulation and touch stimulation increased 2.2 of fetal movement (p -value=0.000).

Regarding the fetal heart rate, the findings showed that fetal heart rate scores increased after receiving intervention than before receiving the intervention. The counts as follows: 1) talking stimulation increased 1.2 of heart rate; 2) touch stimulation increased 1.6 of heart rate, and 3) combination of talking stimulation and touch stimulation increased 1.7 of heart rate.

Table 2. Comparison of fetal movement and fetal heart rate before and after receiving the intervention

Stimulation	Fetal Movement					Fetal Heart Rate				
	Mean of Pre-test	Mean of Post-test	Mean different	SD	P-value	Mean of Pre-test	Mean of Post-test	Mean different	SD	P-value
Talk	0.2	1.5	1.3	1.15	0.006	146.7	147.9	1.2	1.03	0.005
Touch	0.3	1.9	1.6	0.96	0.001	147.3	148.9	1.6	1.17	0.002
Combination of talk and touch	0.1	2.3	2.2	1.03	0.000	149.8	151.5	1.7	0.94	0.000

DISCUSSION

Effectiveness of speech stimulation, touch, and combination against fetal movement among high-risk pregnancy

An expression of caring among mothers provided peace of mind to the fetus. In physiology, a concept explained that a hypothalamus would send a message to the pituitary gland to secrete endorphins. Releasing endorphins could inhibit stress hormones such as ACTH, adrenaline, and nor-adrenaline, which cause vasoconstriction (11). This condition increased blood circulation among mothers and fetuses. It was indicated to improve the fetus's movement due to increased energy. At the same time, the brain sends message the muscle effector to run fetal organs. The fetal movement was more active due to stimuli from effector and adequate fetal circulation.

Mothers' touch provided comfort and more appropriate to deliver emotions such as caring, happy, love, gratitude, and empathy. It was consistent with opinion from Gerhardt (12), and Voegtline (13) mentioned that mother touch was a positive effect on the fetus after 28 weeks since they were quickly recognizing and likes the touch pattern of the mothers' fingers.

The concept of delivery confirmed that touch stimulus through the mothers' hand pressure in the skin stomach could transmit a message to peripheral nerves (nerves outside the brain and spinal cord) (14). The stimulus then enters the central nervous system in the spinal cord. The stimulus is delivered in the thalamus and directly to the sensory center of the cerebral cortex.

The gentle touch from the mother was a positive effect on perceived pleasure. It also contributed to the hypothalamus activation of delivering a message to the pituitary gland. This process impacts on releasing endorphins and suppress stress hormones such as ACTH, adrenaline, and nor-adrenaline, which cause vasoconstriction (11). This causes smooth circulation and enough energy for the fetus to move more actively. In addition, the stimulation of the touch to the muscle effector and the arising of motion commands. The results showed that there were differences in the average fetal movements after speech stimulation 1.3, after stimulation of touch 1.6 and after stimulation of combination 2.2 with a p-value of 0.541.

It was indicated that no significant differences between three interventions, such as fetal stimulation, speech stimulation, touch, and combination in increased fetal movements. In other words, speech, touch, and combination stimulation have the same effectiveness in improving fetal movements.

However, from the slight mean difference above, it appears that touch stimulation increases fetal movement rather than speech stimulation. Combined stimulation increases fetal movements more than a single stimulus of speech or touch.

Touch stimulation increases fetal movement more than speech stimulation. This statement is supported by the results of Marx's research (9), that the mother's touch is a potent stimulus, producing responses to various fetal behaviors. The fetus displays more movement of the arms, head, and mouth when the mother touches her stomach compared to the stimulus of the mother's voice. As with talking to a fetus, most mothers and even fathers caress the mother's abdomen in response to kicking or fetal movements, although the mood of pregnant women is influenced by caressing the stomach, thereby reducing anxiety or depression (15).

The nature of touch stimulation in this study is a slight variation of touch movements and repetition. This repetition accelerates the memorization and response of the fetus. While the stimulation of speech by telling stories uses more and different words so that the fetus is relatively less known, even though the fetus is familiar with the characteristics of the mother's voice, the result is that the fetus takes longer and responds less.

Stimulation of the combination of speech and touch further increases the fetal movement synergistically. This is by the opinion of Varney (8) and Jakobovits (16), various types of stimulation influence that fetal movement. Combined stimulation provides more stimulus than a single stimulus, thereby stimulating endorphin release and increasing fetal circulation, which in turn results in more fetal movement.

The conclusion of this study is the stimulation of speech, touch, and combination can be done individually or in combination as a natural way for pregnant women to find out whether the fetus is moving or not. Pregnant women have the perception that active fetal movements signify a healthy embryo and proper hearing function.

Differences in the Effectiveness of Speech Stimulation, Touch and Combination Against Fetal Heart Rate in High-Risk Pregnancy

Following the concept of delivery, the mother's voice travels through the amniotic fluid to the bone conduction pathway rather than through the outer and middle ear system. Sound propagation to auditory bone delivered to the oval level and vibrated the liquid in the cochlea and the round level of the brain. Furthermore, the fetal brain processes these vibrations so that the perception of sound that affects the pacemaker of the heart arises.

The fetal heart rates were influenced by the sympathetic nervous system, parasympathetic, baroreceptors, chemoreceptors, central nervous system, and hormonal systems (17,18). The fetal heart rate changed when increasing of sound stimulation. The mothers' voice has positive effects on the sympathetic nervous system to stimulate adequate adrenaline and noradrenaline. Moreover, the sympathetic nervous system also impacts on fetus movement extremities and increasing heart rates within the normal range. Therefore, it was indicated a healthy fetus in the womb. Acceleration showed there is a relationship of all components that hold a pacemaker is balanced. Acceleration occurs because the need for O₂ consumption increases, for example, in fetal externality. The increasing sound was associated with the balance of cardio acceleration. Following the concept of delivery, the mothers' voice through the amniotic fluid to bone conduction pathway rather than the outer and middle ear system. Delivering of Sound propagation to the auditory bone was applied in the oval level and vibrated of fluid on cochlea and part of the brain. Furthermore, the fetal brain processes these vibrations so that the perception of sound that affects the pacemaker of the heart arises.

The influence of mothers' soft voice was positive effects on fetal movements and thinking activities in the form of increased fetal heart rate variability. Sound stimulation of the hypothalamus and central nervous system also makes coordination of autonomic activity and mediation of cardiac reflexes and vasomotor centers by regulating the action of the heart and the diameter of blood vessels.

The mean difference comparison of fetal heart rate after receiving speech stimulation was $\Delta=1.2$. After receiving touch, stimulation was $\Delta=1.6$ and the

combination of speech and touch stimulation ($\Delta=1.7$) with a p-value of 0.583. It was indicated that there is no significant difference between three different types of those interventions on fetal heart rate.

Comparing with speech stimulation, it appears touch stimulation was more rather than speech stimulation. The nature of touch stimulation was slightly varied in touch movements. Thus mothers often conducted naturally than speech stimulation by storytelling. This strategy improved the memorization and response of the fetus. It was consistent with the law of repetition confirmed that individual with regular stimulation has a positive effect on a healthy body. While stimulation of speech provided different words, therefore fetus is relatively less known, even though the fetus is familiar with characteristics of mothers' voice. The result confirmed that the fetus was longer and less responsive to stimulation.

Synergistic combination stimulation increases fetal heart rate more than single speech or tactile stimulation. This is following the opinion of Varney (8) and Jakobovits (16), various types of stimulation influence that fetal heart rate. Combination stimulation provides more stimulus than a single stimulus, thereby stimulating endorphin release and increasing fetal circulation and heart rate.

The results concluded speech stimulation, touch, and the combination of both speech and touch stimulation improved movement and fetal heart rate among fetuses. This is following Mercer's theory of maternal role achievement that a strong emotional bond between mother and fetus increasingly gives satisfaction and appreciation for the mother's role (19). Self-appreciation for the mother's role has a positive influence on the achievement of the mother's part. The role and instinct of the mother are significant in sensing fetal movements or kicks. Fetal movement is something special that is missed and sought by the mother. Likewise, the voice and touch of the mother is something special and is coveted by the fetus. Furthermore, the average fetal heart rate is also information that the mother and family want to hear.

Mothers play a critical role in creating a healthy pregnancy because the fetus is actually under the influence and monitoring of the mother. Thus the role of mother, father, and sister in the microsystem environment doing speech and touch stimulation is ideally a usual way to detect fetal well-being and prevent fetal well-being disorders. If this is achieved, then the achievement of the maternal role at the anticipation stage will be optimal. This will be the basis of maternal competence in the next step of achieving functions, namely at the formal, informal, and personal stages. A study conducted by Mercer (19) mentioned that all of these stages have an impact on the well-being of the fetus or baby later.

CONCLUSION

This study described the effectiveness of three different strategies on increasing heart rate and movement among fetal. There was no adequate difference between fetal movement and fetal heart rate before and after the intervention of stimulation of speech, touch, and combination with p values of 0.541 and 0.583

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