Effect of Murotal Sound Stimulation during Pregnancy on the Number of Neuron Cells of Cerebrum and Cerebellum of the Newborn *Rattus norvegicus*

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Abstract

Background: The human development index (HDI) illustrates how superior human resources are. The stimulation of Murotal during growth and development has been shown to increase cell growth in plants. The aim of the study was to analyze the effect of the differences againts the number of neuron cell's in the cerebrum and cerebellum *Rattus norvegicus* offspring between those who received Al-quran Murottal surah Ar-Rahman stimulation, Qori and Qoriah sounds voice in pregnancy day of 6th. **Methods:** An Experimental study using 30 pregnant (*Rattus norvegicus*). Subjects were randomized into three groups, control group (Q1), voice of Qori group (Q2), and voice of Qoriah group (Q3). sound stimulation was given on 6th-17th days of pregnancy. From each mother, two Newborn of *Rattus norvegicus* were taken to make preparations from brain tissue. Eosin Hematocycline was performed to assess number of neuron cells. **Results :** The study shows that the mean and standard deviation of the number neuron cells cerebrum and cerebellum in the control group is 9.88 ± 1.71 and 21.10 ± 2.11, the voice qori group is 10.16 ± 1.01 and 22.46 ± 1.71, and the voice qoriah group 11.12 ± 1.52 and 22.50 ± 1.76. ANOVAs statistical test results show there is no significant differences among groups with a value of p = 0.152 in the cerebrum and p=0.183 in the cerebellum. **Conclusion :** Murotal sound stimulation during pregnancy increased the number of neuron cells in the cerebrum and cerebellum of newborn rats.

Keywords: *neurons; cerebrum; cerebellum; murotal; sound*

Introduction

Global challenge in all countries is competition for human resource development, not only related to material functions, but directly related to the intelligence function of the brain intelligence to intelligence competitive, brain to brain competition. preparing the next generation needs to be done, especially creating quality human resources, has adequate intelengensi prepare for life in an increasingly competitive[1].

Integrated management of brain intelligence will produce human resources who are intelligent, have high competence, ability, skills, and competitiveness. Intelligence is related to the efficiency of the information transfer process in the brain that can be attempted since the prenatal period, Indonesian Child Doctors Association, the first day of life is called the golden age, the period from early pregnancy until the child is born and 2 years of age is an important period, determining the quality of health in life next. At that time the brain development has reached 80% of the brain[2].

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The development and growth of the brain as well as the maintenance of intellectual health in the fetus affect cognitive, social and emotional abilities for the foundation of development and development of future generations. The cerebral cortex is a part of the brain that has cognitive function, but recent research has shown that the cerebrum (cerebrum) and cerebellum (cerebellum) contain more neuron cells than the cerebral cortex which allows them to be involved in cognitive function[3]. Demonstrated that the cerebrum and cerebellum are interconnected via polysynaptics, forming a system associated with cognitive function and neuropsychiatric disorders. So it can be ascertained that the cerebrum and cerebellum play an important role in motor, cognitive, emotional and behavioral development[4,5]. Therefore, stimulus and nutrition provided during pregnancy play an important role in fetal brain function. The fetal brain at that time undergoes proliferation, migration, differentiation, myelination, synaptogenesis, and apoptosis which are influenced by environmental and genetic factors. environment such as nutrition and stimulation[6,7].

Efforts that can be made during pregnancy are to provide adequate nutrition and stimulation. Stimulation that is easily accepted by the fetus is stimulation in the form of sound. Experts claim that sound stimulation in the prenatal period is an environmental factor that can affect the growth of the fetus in the womb and that there are certain parts of the brain that are affected by familiar music rather than music unknown to listeners[3,4,8,9]. In Indonesia, the majority of people are Muslim so that the murotal voice is often heard. Listening to murotal has a calming and relaxing effect on a person, so that it will also contribute to lowering blood pressure[10,11]. Murotal both sung by men and women can be distinguished by type frequency and sound intensity. The accuracy of the voice in women reaches 100% while in men 95.47% this happens because the male voice is detected to be similar to the female voice so that the accuracy of the male voice is reduced[12–14].

This study identifies differences the effect number neuron cells of stimulating the murotal quran in the cerebrum and cerebellum of newborn mice (*Rattus norvegicus*) whose mothers to murotal qori voice stimulation and murotal qoriah voice stimulation during pregnancy.

Materials and Methods

This research is an experimental study on mice (*Rattus norvegicus*) which was conducted from february to april 2021 at the Laboratory of the Faculty of Veterinary Medicine, UNAIR, Surabaya. This study used 30 adult female mice (*Rattus norvegicus*) aged 2-3months of pregnancy which were exposed to stress during pregnancy on the 6th until 17th days of pregnancy. The research subjects were divided into 3 groups which were randomly selected (Q1, Q2, and Q3) with 10 mice in each group.

The first group: the group was not given any treatment, the rats were only pregnant and were allowed to eat and drink like pregnant rats in general.

Second group: qori sound stimulation group, pregnant rats on days 6-17 in a soundproof room for 1 hour playing ar rahman letters with sound intensity close to 65 dB at night.

The third group: the qoriah sound stimulation group, pregnant rats on days 6-17 in a soundproof room for 1 hour playing ar rahman letters with a qoriah sound with a sound intensity close to 65 dB at night Fourth group: Control group with standard treatment without stress exposure.

Sampling Inspection

Rattus norvegicus mothers were anesthetized then the pups were born by sectio caesarea (SC) on the 17th day of pregnancy. The pups of *Rattus norvegicus* which were to be sacrificed were anesthetized first, and then the cranium was cut in the sagittal direction from caudal (occipital) to rostral (frontal), right between the two hamisters of their brain. Furthermore, the brain was released. The separated brain was weighed, and then put in a 10% formalin solution for organ preservation; the cerebrum and cerebellum were taken. Furthermore,

Hematoxylin-Eosin (HE) staining were made.

Data Analysis

To see the normality of the data, the Shapiro-Wilk test was used. If the data obtained are normally distributed, then the ANOVA test is used followed by LSD (Least Significant Difference) to see the differences in all groups. If the data obtained are not normally distributed, the Kruskall Wallis test and the Mann Whitney test are used. This study uses a significance level of P<0.05. To simplify statistical calculations, researchers used the SPPS tool version 21.

Results and Discussion

Results

The results showed the highest number of neurons in the cerebrum and cerebellum on murotal sound stimulation compared to the control group, the qori sound murotal stimulation group, and the qoriah sound murotal stimulation group (Table-1).

The results of the normality test using the Shapiro-Wilk test in the treatment group obtained a significance value (p-value)> 0.05, which means that the data distribution was normally distributed, so the Analysis of Variance (ANOVA) test was used. tested whether there were differences in the treatment group in the number of neuron cells in the cerebrum and cerebellum.

Based on the results of the ANOVA test in table-2, it is known that there is no significant difference between groups in the number of neurons in the cerebellum and cerebellum in the newborn *Rattus norvegicus*.

Table 1: Mean and standard deviation of neuron cell counts in the cerebellum and cerebellum of *Rattus norvegicus* newborns.

Group of Treatment	Mean ± Standard Deviation	
	Cerebrum	Cerebellum
Q.1	9.88 ± 1.71	21.10± 2.11
Q.2	10.16± 1.01	22.46± 1.71
Q.3	11.12± 1.52	22.50± 1.76

Table 2: Anova test results on neuron cell counts in Cerebrum and Cerebellum of newborn *Rattus norvegicus*.

Variable	p-value
Number of neuron Cells in Cerebrum	0.152
Number of neuron Cells in Cerebellum	0.183

* Significantly different <0.05

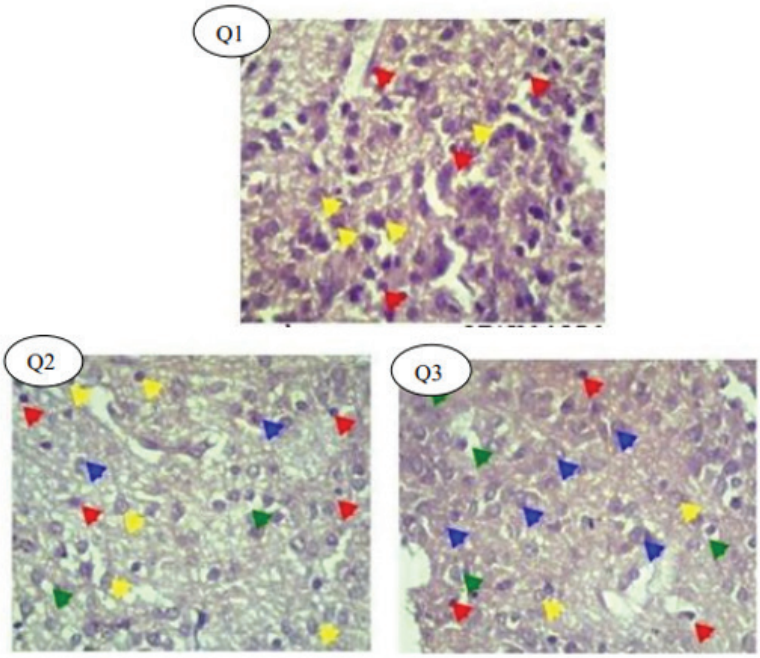

Figure 1: The difference in the description of the number of neuron cells in the cerebrum tissue of newborn rats. The blue arrow indicates the presence of neuron cells which is indicated by the presence of blackish gray chromogen. The combination of the murotal sound qoriah stimulation group (Q3) occurred most often between the murotal sound qori stimulation group (Q2), and the control group (Q1), the control group the least. hematocycline-eosin with a magnification of 5 fields of view as much as 400 times.

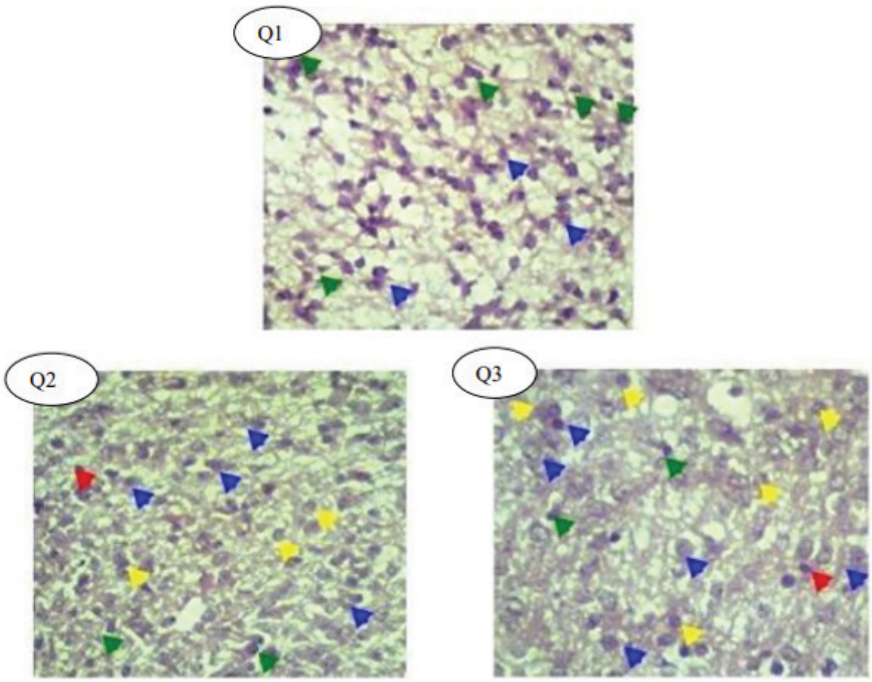

Figure 2: The difference in the description of the number of neuron cells in the cerebellum tissue of newborn rats. The blue arrow indicates the presence of neuron cells which is indicated by the presence of blackish gray chromogen. The combination of the murotal sound qoriah stimulation group (Q3) occurred most often between the murotal sound qori stimulation group (Q2), and the control group (Q1), the control group the least. hematocycline-eosin with a magnification of 5 fields of view as much as 400 times.

Discussion

The highest mean number of neuron cells cerebrum and cerebellum was in the qoriah sound stimulation group followed by qori sound stimulation and the control group. female voices tend to have better frequency intensity and are familiar to fetal ears so they are most easily captured by the fetal brain. however, there was no significant difference between the treatment group and the control group on the number of neuron cells in the Cerebrum and Cerebellum *Rattus norvegicus* offspring then continued in the test. *post-Hoc* LSD which showed that there was no significant difference in the number of Cerebrum and Cerebellum neuron cells between the treatment group and the control group.

Sound can resonate with cell organelles, one of the cells is brain nerve cells, where the brain tissue has main cells, namely neurons that function to convey signals from one cell to another[15,16]. Sound containing the tone - the tone harmonious and orderly able to generate rhythmic stimulation to the central nervous system because the performance of the brain that can coordinate and control all activities of the body into homeostasis[14]. In contrast to murottal, music will sound beautiful as created by the tool or the human voice sounds carefully structuring can form a specific pattern[17].

In pregnancy nuclei in the brain stem have formed at the beginning of the second trimester. At 20-22 weeks of gestation, some neurons in the hearing center have formed dendrites and axons, with the physiological and behavioral responses of the fetus to sound, including brainstem reflex activity, indicating that the auditory stimulus has reached the center of the auditory system in the brain[9,18,19]. The growth of children has been started since I was in the womb it is not surprising that Islam says education has started since the baby still in the womb. The fetus begins to hear clearly at the age of 6 months in the womb so that the fetus can move its body according to the rhythm of the mother's tone of voice[20]. Factors the environment in the form of sound on fetal brain development in the form of sound affects the growth of neural connections and causes the process of neurons to adapt to the stimulation given.[21].

There was a difference in the results of the study, but it was not significant because of the fetus being able to hear sounds from outside apart from treatment, sounds from outside and from within. Sounds from the inside are hidden and can be heard more in low frequencies such as the mother's heart sound, the sound of the mother's intestinal peristaltic movements and the sounds around the mother, and the similarity of the voice of women/ qoriah to the voice owned by the mother.

Stimulation for fetal hearing is the easiest form to do because it is automaticmore often hear sounds in the mother's body such as the sound of the heartbeat, body fluids and digestion. a report found similarities in the accuracy of women's voices and men's voices tested with a sound frequency detection system with a backpropagation neural network, for the type of voice it was known that the accuracy of women's voices reached a value of 100% while in men 95, 47% of this happens because male voices are detected to be similar to women's voices so that the accuracy of men's voices is reduced[12]. The research conducted which compared the mother's voice with the recorded voice of the father and played in the fetus showed no significant difference in fetal heart rate, number and duration of fetal movement[22].

Sounds from the outside and the inner environment that the fetus can hear can activate neurotransmitters in neuron cells that have ionic ions such as glutamate and Ca2 + influx which will bind to CAMK then phosphorylate with CREB which will then stimulate BDNF mRNA to become BDNF, then BDNF will bind to its receptors, namely TrKB which will affect the process of proliferation, differentiation, migration, synaptogenesis, apoptosis and myelination which will increase the number of neuron cells.

Conclusion

In conclusion, our data show that there is a difference in the mean number of neuron cells in the cerebrum and cerebellum. However the it is not significant. The highest

mean number of neuron cells was in the qoriah voice stimulation group followed by qori voice stimulation and the control group. female voices tend to have better frequency intensity and are familiar to fetal ears so they are most easily captured by the fetal brain

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Ethical Approval : This study has obtained ethical eligibility permit based on the Research Ethics Committee of the Faculty of Veterinary Medicine, Airlangga University No: 2.KE.004.01.2020

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