



# Murottal Sura Al-Fatiha during Pregnancy Increased the Number of Neuron Cells in the Cerebrum and Cerebellum of the Newborn Rattus Norvegicus



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## Keywords

*cerebellum;*  
*cerebrum;*  
*human and health;*  
*neurons;*  
*Sura Al-Fatiha;*

## Abstract

Al-Qur'an verses that are read with correct recitation and tar til have frequencies and wavelengths that can affect the brain to analyze differences in the number of neurons in the cerebrum and cerebellum of Rattus norvegicus newborns between exposure to Surah Al-Fatiha and the control group. The experimental study used a pure experimental design (Posttest Only Control Group Design), the treatment was carried out in a soundproof box for 1 hour at night on the 9th day of pregnancy with an intensity of 65 dB. The cerebrum and cerebellum were prepared, stained by HE, calculated by 400x magnification, and then analyzed using appropriate statistics. The number of neurons averages in the cerebrum was 167.75 and for the control group was 126.62. In cerebellum was 80.50 and 63.00 in the control group. There were a statistically higher number of neurons in the Al Fatiha group, with  $p=0.046$  in the cerebrum and  $p=0.030$  in the cerebellum. Conclusion: Sura Al Fatiha, during pregnancy, gave a higher number of newborn brain neurons compared with the control group.

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## Contents

Abstract .....	1383
1 Introduction .....	1384
2 Materials and Methods .....	1384
3 Results and Discussions .....	1385
3.1 Results .....	1385
3.2 Discussions .....	1386
4 Conclusion .....	1387

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Acknowledgments.....	1387
References .....	1388
Biography of Authors .....	1390

## 1 Introduction

Al-Qur'an is the holy book of Islam that is used as a way of life. Asy Syifa, also known as the Qur'an, means medicine for all diseases. One of the therapies in sound healing in treating mental and physical conditions is murottal Al-Qur'an therapy (Tumiran et al., 2013). Murottal therapy or religious therapy is carried out by a qori' where verses of the Qur'an are read for several hours or minutes that positively impact someone who hears it (Silvia, 2017). Listening to the voice of the Qur'an can divert the mind from anxiety and pain and eliminate negative thoughts to become calm and can affect healing (Susanti et al., 2019).

Listening to the Qur'an impacts the soul, including eliminating, repairing, and curing disease (El-saleh et al., 2021). The verses of the Qur'an that are read with correct recitation and tartil have frequencies and wavelengths that can affect the brain and restore balance to the body (Wahyuni et al., 2021). Listening to murottal Al-Qur'an can be used as sound healing which can be used in treating mental and physical conditions. The sound component represents the human auditory system from the cochlea, the cochlear nucleus, and the central auditory part to the temporal lobe (Hechehouche et al., 2020). Sound can resonate with cell organelles, one of which is brain nerve cells, where brain tissue has the main cell, namely neurons whose function is to convey signals from one cell to another (Djuwita et al., 2012). Sound stimulation can produce alpha brain waves at a frequency of 8 to 13 Hz which can study neural oscillations evoked by sound from synchronizing events that can increase behavioral cortical excitability (Samhani & Mohamed Faruque, 2017).

Brain wave synchronization may be preceded by synaptic plasticity based on the learning and development of long-term memory (Widjaja, 2021). The synapses change and the neurons are connected where they generate their electrical signals and brain oscillations are stimulated from the stimulation of brain waves while listening to the Qur'an (Samhani et al., 2019). During the prenatal period, the brain is most susceptible to external factors, where any stimulation given at a specific time can affect the morphology of development in the brain area (Sanyal et al., 2013). Giving stimulation at the right time impacts maternal relaxation, where the administration is carried out for 1 hour. This is due to the fetal sleep watch cycle, where most of the time is for sleep (due to metabolism that grows and develops absorbing energy from outside), and fetal brain wave changes occur (Joewono, 2013). Music can affect the central nervous system through the uterine wall, shape brain development, and increase neurogenesis and neuroplasticity (Russo et al., 2021). Brain plasticity means that the brain can be modified, which can shape brain structure and function that is influenced by the environment (Zhang, 2020), with this explanation, researchers are interested in seeing the effect of the number of neuron cells exposed to murottal Al-Qur'an Sura Al-Fatiha as a prenatal stimulus and responded positively to cells. The results of this study can be used as scientific information about cellular changes in the brain after exposure to murottal during pregnancy that can be developed as brain stimulation (Jernigan et al., 2001; Buffa et al., 2020).

## 2 Materials and Methods

The experimental design was an actual experiment (post-test only control group). The research was carried out in experimental animal cages and laboratories of the Faculty of Veterinary Medicine, Universitas Airlangga, after obtaining ethical compliance. The experimental animals used were female *Rattus norvegicus*, with a total of 16 animals divided into two groups with eight broods in each group, while the group consisted of the control group and the exposure to Sura Al-Fatiha.

Female rats were given pregnant mare's serum gonadotropins (PMSG) 10 IU for 48 hours, then continued with 10 IU hCG for 17 hours, then female rats were mated with male rats animatingly. On the eighth day, the rats were subjected to ultrasound to confirm that the rats were pregnant. Exposure to the Sura Al-Fatiha was carried out at night for 1 hour in a soundproof box with an intensity of 65 dB, measured using a Sound Level

Meter. Exposure was carried out for ten days at the age of 9-19 days of pregnancy, and on the 20th day, female rats were sacrificed to take newborns with heavy, medium, and light weight for making brain preparations using Hematoxylin-Eosin (Tzoulas et al., 2007; McMichael et al., 2006). The number of neuron cells was counted in the cerebral cortex and cerebellum layers observed in 5 fields of view using a Nikon E100 light microscope with 400x magnification. Before being analyzed, the normality and difference tests were carried out, which were then continued using the Mann-Whitney test and T-Test.

### 3 Results and Discussions

#### 3.1 Result

Table 1 showed that the average number of neurons in the Al-Fatiha group in the cerebrum and cerebellum was higher than in the control group. The results of data analysis using the Mann-Whitney test and T-Test were  $p < 0.05$ , which means a significant difference between the control group and the Al-Fatiha letter.

Table 1  
Average of Cerebrum and Cerebellum Neuron Cells in Newborn *Rattus norvegicus*

Groups	$\Sigma$	Mean $\pm$ SD		p-value	
		Cerebrum	Cerebellum	Cerebrum	Cerebellum
Control	8	126.62 $\pm$ 32.14	63.00 $\pm$ 16.93	0.046 <sup>a</sup>	0.030 <sup>b</sup>
Sura Al-Fatiha	8	167.75 $\pm$ 44.26	80.50 $\pm$ 11.61		

<sup>a</sup>Mann-Whitney

<sup>b</sup>T-Test

Figures 1 and 2 showed the number of cerebrum and cerebellum neurons in the Sura Al-Fatiha group where staining using preparations Hematoxylin-Eosin with arrows showed the presence of triangular-shaped cells observed from a 5x field of view with 400x magnification.

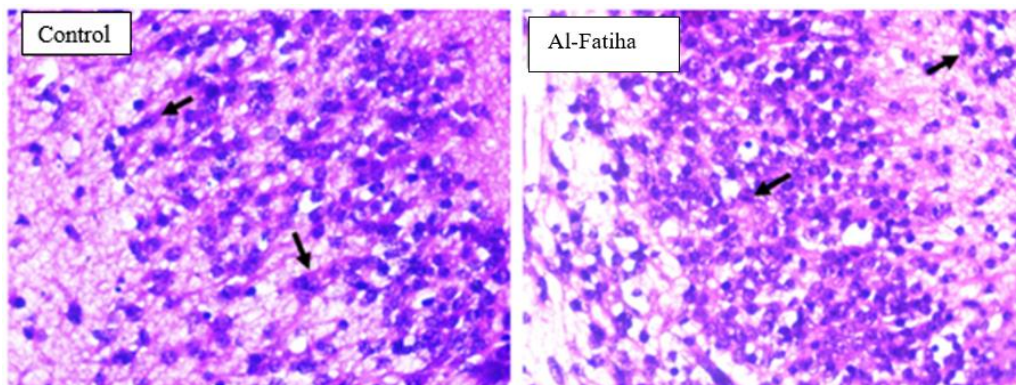


Figure 1. The Number of Neuron Cells in Cerebrum

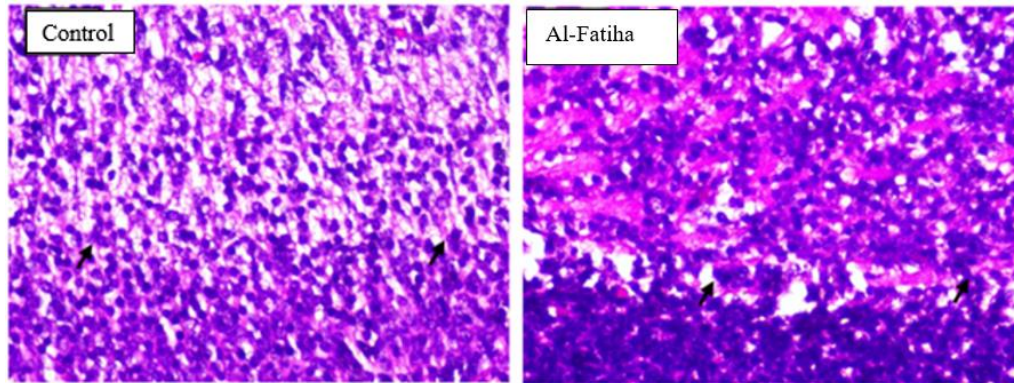


Figure 2. The Number of Neuron Cells in Cerebellum

### 3.2 Discussions

Language and music are two basic abilities that are very important for human life and are in different brain parts. Previous studies in animals have found that neurons in the auditory cortex respond to certain combinations of spectral and temporal energy and sounds relevant to the animal's natural environment, such as the sound of communication (Hanson, 2020). Music can stimulate areas of motor, language, and cognitive function simultaneously. Music can also improve brain development in mice and increase neural plasticity. Research studies on white rats showed an increase in the proportion of cortex throughout the brain and each nerve cell increased by 15%; when adult mice respond to a complex environment, the brain will also form new synapses (Zhang, 2020).

Research on the effect of Sura Al-Fatiha during pregnancy and its effect on the number of neuron cells is still very little in the literature. The sound of the Qur'an is a series of meaningful words that cannot be analyzed, so the discussion is taken from research on the effect of music during pregnancy on the number of neurons in children (Herculano-Houzel, 2017; Schultz, 1997; Chinta & Andersen, 2005). The relationship between music and language in the developing brain emphasizes the importance of stimulating children to strengthen auditory processing skills (Jagoo, 2021). This study showed that the number of neurons in the cerebrum and cerebellum of *Rattus norvegicus* children exposed to murottal Al-Qur'an Sura Al-Fatiha was higher than in it found that there was a significant difference in the cerebrum and cerebellum between the Sura Al-Fatiha group with the control group (Witter & De Zeeuw, 2015; Bastian, 2006). Stimulation of sound from murottal Al-Qur'an, which is heard, can affect brain growth which activates Ca<sup>2+</sup> Influx, which binds to CaMK, CaBP, CREB, BDNF, and Synapsin, which in turn affect synaptogenesis and apoptosis, which can increase the number of neuron cells.

The effect of environmental enrichment during pregnancy can provide a better brain capacity in processing information and creating new things that can be seen from the number of neurons, glia/neuron ratio, and synapsin (Joewono, 2020). This study limits Mozart's musical stimulation because there is very little literature on murottal Al-Qur'an. Mozart music stimulation during pregnancy can increase the expression of BDNF and synapsin 1. Mozart music has been shown to increase Calcium Binding Protein (CaBP) which stimulates BDNF and TrkB receptors (Permatasari et al., 2018). Research studies were conducted on the correlation of classical music and the Qur'an to the left and right brain waves; listening to the Qur'an provides a balance of more alpha waves than classical music (Yani et al., 2021). Alpha waves with a frequency of 8-12 Hz in the parietal and occipital lobe locations with proper rhythm gave a positive correlation to memory (Rahman et al., 2021).

The effects of murottal Al-Qur'an therapy give a positive response to the body and have been studied extensively by scientists (Susanti et al., 2019). The organ most susceptible to stimuli is the brain, where stimuli from the environment can affect its nerves. Sound stimulation was given at the right time, and optimally can act as a stimulus that can affect brain development (Sholichah et al., 2020). The theory about the number of neurons is that the more stimulus was given from the outside, the more synapses would be formed, and the greater the number of neuron cells that will survive cell death (Rees & Walker, 2001). Sound has been



shown to have a physiological effect on respiration, blood pressure, and heart rate. Music that is played can facilitate hippocampal neurogenesis (Chaudhury et al., 2013).

An environment rich in stimuli will affect the growth and development of the brain, which has a thicker cortex, a more significant number of glial cells, and a more significant number of nuclear neurons. Growing neurons have more dendritic sites that can form synapses (Pratiwi et al., 2022). The number of cells undergoing apoptosis depends on the synapses; the more synapses formed, the less apoptosis will occur (Octariyandra et al., 2019). In contrast, adverse environmental conditions can affect the embryo and fetal brain during pregnancy. Some environmental conditions include infectious infections, drugs, maternal hereditary diseases such as diabetes and stress, and living nearby noisy areas such as train stations or airports (Suryasa et al., 2021). The adverse effects of the environment during pregnancy, especially on the fetal brain, are cell death, defects in neuronal stem cell proliferation, and defects in neuronal stem cell differentiation (Sarieva & Mayer, 2021).

Sounds that the fetus can receive, such as music with a harmonious combination of sounds, will provide brain growth and development with good environmental and genetic potential; continuous external stimulation will maintain the number of neuron cells so that the fewer the number of apoptosis that occurs. Exposure to murottal Al- The Qur'an is in line with research on sound rhythms providing the formation of brain waves with increased rhythm during listening to Sura Al-Fatiha (Samhani et al., 2019). Sound stimulation causes neurons to be separated and integrated with brain circuits (Kucikiene & Praninskiene, 2018). Sound can affect the growth of neural connections that cause the neuron process to adapt to the given stimulus (Yani et al., 2021), where the selected group of neurons can synchronize intelligence and emotional processes (Samhani et al., 2019). Sounds that are heard can also affect the activation of the frontal and frontal lobes, lowering cortisol and ACTH to normal limits (Laska et al., 2018). Listening to the Qur'an's voice distracts from pain and anxiety, eliminates negative thoughts to become calm, and can influence healing (Susanti et al., 2019).

This research is the first experiment of giving murottal stimulation of Al-Qur'an Sura Al-Fatiha using the sound type of humans in animal experiments. On the other hand, with the limited number of subjects on the effect of murottal Al-Qur'an on the number of neuron cells, similar research is needed in other parts of the brain that need to be developed. The strength of this study is the experimental animal treatment stages using vaginal swabs (diestrus phase) and ultrasound to determine pregnant rats. This study initially faced obstacles, so it was necessary to carry out several pregnancy procedures and additional examinations.

#### 4 Conclusion

The results showed that the number of cerebral and cerebellar neurons of *Rattus norvegicus* newborns exposed to murottal Al-Qur'an Sura Al-Fatiha during pregnancy was higher than those not exposed to murottal Al-Qur'an.

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