The Effect of Exposure Qari and Qariah Recitation During Pregnancy to the Number of Astrocyte Glia Cells in the *Cerebrum* Newborn *Rattus Norvegicus*

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Abstract

The quality of human resources should be prepared since in early stage. Pregnancy is one of a significant period which can take advantage to by providing proper nutrition and adequate stimulation. For instance, sound and music, the most harmonious combination and easily accepted by the fetus(1). Experimental analytic type with post-test only control group design was employed on 30 pregnant *Rattus norvegicus* which were divided randomly into 3 groups, namely the control group, qari group, and qariah group. Each of the groups had stimulation starting 6th to 17th days of pregnancy for 60 minutes. At 18 days of pregnancy, the mother of *Rattus Norvegicus* was sacrificed and bring forth with *Sectio Caesarea* (SC). As a result, the number of astrocyte glia cells in the *cerebrum* was higher in the qaria recitation stimulation group (22.62 ± 3.75), compared with the group that was listened to qari recitation stimulation group (19.84 ± 2.48), while the control group (16.54 ± 2.78). A significant difference found in the number of astrocyte glia cells in the *Cerebrum Rattus norvegiccus* newborn that were listened to the qari and qariah recitation stimulation group and the control group. The highest number of Glia cells is obtained from the stimulation of qariah recitation.

Keywords: *Stimulation, Pregnancy, Recitation, Astrocyte glia cells, Cerebrum, Rattus norvegicus*

Introduction

The quality of human resources should be prepared since the early stage. The important process to generate qualified human resources is by ensuring that every baby is born from a physically, mentally, and socially healthy mother. Providing proper nutrition and adequate stimulation during pregnancy is one of the ways to generate qualified human resources. For instance, stimulating by sound and music is proven to change the structure and function of the fetal brain in the uterus(1).

Glia is the most plenty of cells in the human brain which always increase following the development of the human brain. Glial cells provide lactate for energy sources in neurons and support energy for axons(2). Astrocytes have functions in the physical arrangement of the brain, correlate with neuron synapses, and the assistance of electrical impulses in the brain(16). Damaged or missing astrocytes can be used to function and structure the brain(15). Here, the process to ensure the quality of the fetus is by increasing glial cells with reducing apoptosis and increasing the glial cell ratio(1,3).

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The ear starts growing at 18 weeks of age. Then, at 22 to 24 weeks, the fetus will begin to hear low-frequency sounds from outside the uterus[4]. The stimulation of the Mozart instrument influenced the number of neuron cells more than to dangdut and gamelan songs[1]. Mozart's instrument played with a frequency of 75-10.000 Hz and an intensity of 70-130 dB which provides a lower apoptotic index than other music[5]. A good response came up after playing music for the fetus in the uterus which showed that the heartbeat may often increase, causing it to move faster[17]. Even though the fetus is inside the uterus, it has an environment with sound, vibration, and movement[18]. The heart of the fetus can be seen from the changes in fetal heartbeat and its movements after giving sound stimulation. The escalation response from the fetal heartbeat occurs in ± 20 weeks pregnancy and mostly occurs in ± 26 weeks pregnancy[19].

The human voice is divided into two major groups, namely the type of voice in men and women. The voice type in men is divided into tenor, baritone, and bass, while in women is a soprano, mezzo-soprano, and alto[6]. The fundamental frequency (f0) difference between men and women is clear, the fundamental frequency of human voices for men and women is two normal distributed curves with a little overlapping[9]. Qari is a person who recites the Qur'an by restricting to the correct rules. A qari is usually used for a male who recites the Qur'an, and qariah is used for a female who recites the Qur'an[20].

Material and Methods

This study conducted analytical experimental research with a post-test-only control group design by using the *Rattus norvegicus* as a model by giving stimulation as the pregnant mother. The research was carried out in January-March 2021 at the Pathology Laboratory and Experimental Animal Cages of the Faculty of Veterinary Medicine, Campus C Universitas Airlangga, Surabaya, Indonesia.

The population of this study was 2-3 months old white mice Wistar strain (*Rattus norvegicus*) with an initial weight of 120-160 grams, with 30 *Rattus norvegicus* according to the inclusion and drop-out criteria as the sample. They were divided into 3 groups random, namely, the control group, the qari group, and the qariah group. Each of the groups will be listened to recitation for 60 minutes, with an intensity of 65 dB. Here, the mice were inside a soundproof cage so that it is adjusted and arranged to focus on the recitation which will be played through the speakers that had been installed.

In the initial process of fertilization of *Rattus norvegicus* was injected with *Pregnant Mare Serum Gonadotrophin* (PMSG) 10 IU and 10 IU hCG injection. Then, the mating process was done 48 hours later, with 1 male mouse and 1 female mouse, Manomatting. After 17 hours, a copulatory plug will be evaluated as a marker of pregnancy day 0. The treatment was started on day 6th -17th of pregnancy. At the age of 18th days of pregnancy, the mother of *Rattus norvegicus* was sacrificed and the neonatal *Rattus norvegicus* was brought forth by *Sectio Caesarea.* Here, the researcher selected 2 each, starting from the heaviest and the lowest weights.

CUBASE 5 software was utilized to analyze the highest and lowest frequency of qari and qariah recitation to determine the sound intensity using a sound analyzer application and a sound meter application.

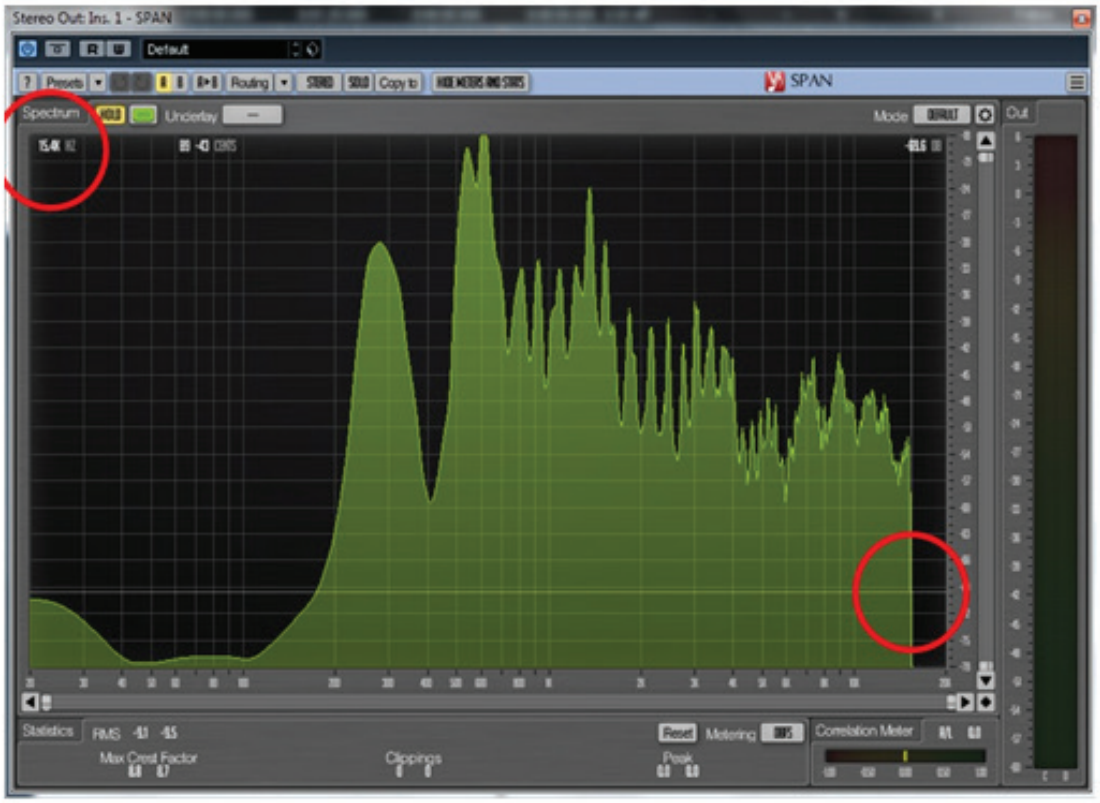

Figure 1. Analysis of qari recitation frequency with the farthest frequency, around 15.400 Hz

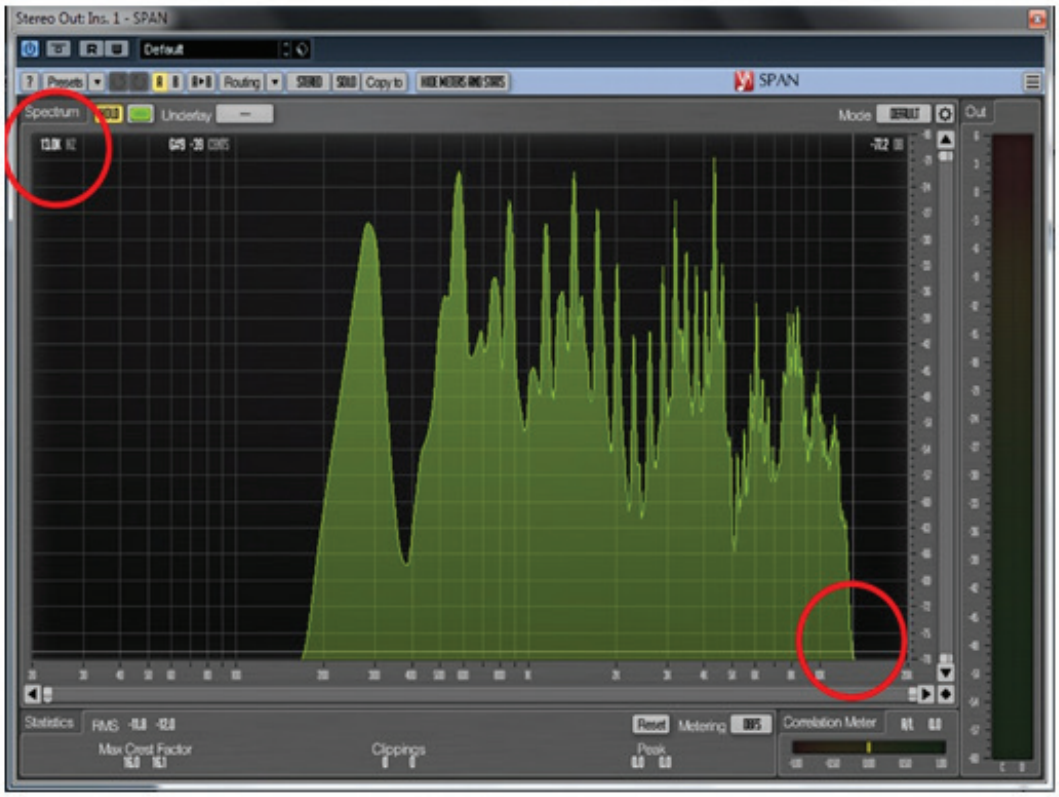

Figure 2. Analysis of qariah recitation frequency with the farthest frequency, around 13.000 Hz

To measure the number of Glia Astrocyte cells in the *cerebrum* newborn's *Rattus norvegicus* between the treatment group and the control group, employed normality test used the Saphiro-Wilk test, followed by the homogeneity test using the Levene variety. The test to differ each group was by employing the Analysis of Variance (ANOVA) with the Least Significant Difference (LSD) further test. If the p-value <0.05 means that there is a significant difference. Then, computer software SPSS 21.0 was used as a tool to simplify the data processing. At last, the study ethics are considered during the research process to include a replacement, reduction, and refinement.

Results

The number of Astrocyte Glia Cells in the *cerebrum* was determined and calculated by *Hematoxylin-Eosin* staining technique with a magnification of 5 fields of view, at 400x magnification.

Table 1. Mean and Standard Deviation the Number of Astrocyte Glia Cells in the cerebrum and cerebellum of Rattus norvegicus offsping from mothers was listened to the recitation of surah Ar-Rahman by qari, qariah, and the control group.

Group	n	Astrocyte Glia Cell Count at Cerebrum
		Mean ± SD
K1	10	16.54 ± 2.78
K2	10	19.84 ± 2.48
K3	10	22.62 ± 3.75

Information :

K1: Control group

K2: Stimulation qari recitation

K3: Stimulation qariah recitation

Based on table 1, it was known that the highest average value of the number of Glia Astrocytes cells in the *Cerebrum Rattus norvegicus* newborn was in the group that listened to the recitation of surah Ar-Rahman by qariah with Astrosit (22.62 ± 3.75).

Table 2. The results of the data normality test used the Shapiro-Wilk test, the Levene Variety homogeneity test, and the data on the number of astrocyte cells

Group	Statistic	p-value	Explanation
K1	0.947	0.637	Normal data
K2	0.913	0.304	Normal data
K3	0.907	0.259	Normal data
Levene test	0.985	0.386	Homogeneous between groups

Information :

K1: Control group

K2: Stimulation qari recitation

K3: Stimulation qariah recitation

The results of the normality test using the Shapiro-Wilk test on the number of glia astrocyte cells in the *Cerebrum Rattus norvegicus* newborn were all normally distributed, with the Astrocyte values each group was normal. It continued with the homogeneity test in the *cerebrum* of 0.386 which indicated that the variance between groups was homogeneous.

Table 3. ANOVA test results for the number of Astrocyte cells in the *cerebrum* of *Rattus norvegicus* newborn

Variabel	Statistic	p-value	Explanation
Astrocyte cells in Cerebrum	9.947	0.001	Significant

*p < 0,05 = there are significant differences

Based on table 3, there was difference number of astrocyte cells in the *Cerebrum Rattus norvegicus* newborn with a calculated F value of 6.504 and significance value of 0.005, it indicated that there was a significant difference between treatment groups on the number of astrocyte cells in the cerebrum of Rattus norvegicus.

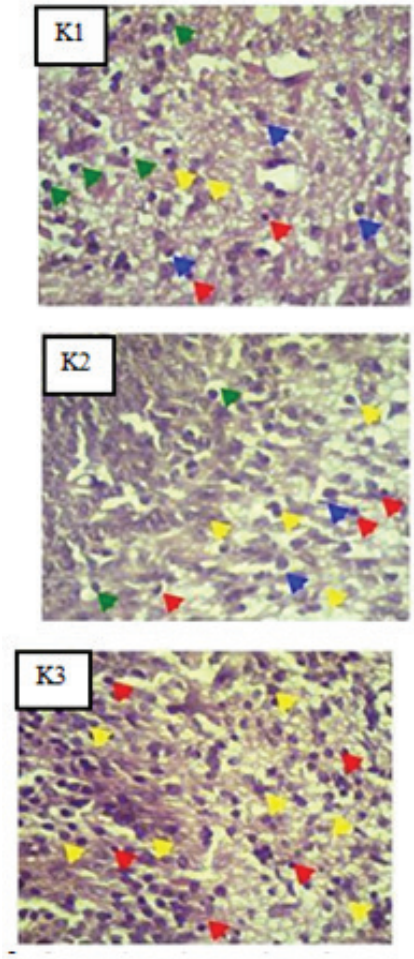

Figure 3. Comparison number of Astrocyte glial cells (yellow arrows) in each group using hematoxilin eosin staining technique 400x magnification in *Cerebrum Rattus norvegicus* newborn

Based on Figure 3, yellow arrow showed the difference number of Glia cells at C*erebrum Rattus norvegicus* newborn in the control group (K1), Qari grup (K2) and Qariah grup (K3).

Discussions

In this study, the elements of dB intensity and frequency range are analyzed by utilizing the Sound Analyzer application so that the two groups get almost the same dB value, with qariah recitation with 65.2 dB and qari recitation with 65.3 dB. The sound frequency is processed by employing CUBASE 5 software with resulted in the qariah recitation obtained the highest frequency, around 13.000 Hz, and the lowest frequency of 167 Hz. For qari, the highest frequency is around 15.400 Hz and the lowest frequency is 20 Hz. The difference in frequency generated from the two sounds of qari and qariah can cause a difference in the signal that is picked up by the stereocilia inner hair cell in the cochlea and causes an influx of Ca2 + and stimulates the release of neurotransmitters in the ear nerves. Here, the neurotransmitters will release a potential action and transmitted by the vestibulocochlear nerve then reach the *Cerebrum*, so that the message captured by the brain is different.

There are many different types of sound based on various classification systems. In music theory, humans have different types of voices, both male and female. Types of voice in men are divided into tenor, baritone, and bass. Whereas women are divided into soprano, mezzo-soprano, and alto[6]. Furthermore, men's and women's voices have a different frequency, it was found that there was a difference in fundamental frequency (f0) between men and women. The value of f0 women is higher than men. Because of that, the human voice f0 for men and women is two normally distributed curves with slight overlapping. Here, the average female voice is above 200 Hz, while the male voice is below 170 Hz[9].

Producing human voices require three elements, namely, resources, sound sources, and sound modifiers. The power source of the normal sound signal resulted from the compression motion of the lung muscles. A sound modifier is an articulator that changes the shape of the vocal tract so that the frequency characteristics of the acoustic cavity pass through what the sound passes so that the resulting frequency will be different[6]. The accuracy results for the testing process on female voices obtained 100% accuracy results, while men obtained 95.47% accuracy results. The system's ability to detect the female gender was better than male [8]. From each group, there was a difference in the pitch value of each individual. This is influenced by the shape of the vocal cords, mostly, women's voices have a higher pitch value than men's[10].

Due to the mass and tension of the vocal cords, men have longer and heavier vocal cords than women. Men have a baseline frequency prevalent at 125 Hz, while women have an octave (twice) higher baseline frequency than men at around 250 Hz. The lowest frequency that can be achieved by a bass singer is around 64 Hz[11]. The basic tone of men is lower than that of women, where the average basic tone of men and women is, 129Hz to 167Hz with a peak of 152Hz for men and 207Hz to 269 Hz, and a peak of 239Hz for women[11].

As a result, there was a significant difference in the average number of glial cells in the *cerebrum* of *Rattus norvegicus* newborn, between the control group and the group of exposure to the surah Ar-Rahman recitation by qariah. The highest mean number of glia astrocyte cells is in the group listened to the surah Ar-Rahman recitation by qariah. Here, it can be seen that there are differences in the mean number of astrocyte glial cells in the group listened to surah Ar-Rahman recitation by qari, qariah, and the control group. It occurs due to the difference in dB intensity and the range of the highest and lowest frequencies generated from the voices of reciter and qariah, where the voice of qariah produced the highest average number of glial cells compared to qari and control groups.

Conclusion

The number of glial astrocyte cells in the *Cerebrum Rattus norvegiccus* newborn in qariah recitation group had the highest value compared to the qari and control groups. Moreover, there was a significant difference in the number of glial astrocyte cells.

Conflict of Interest: The author states that they didn't find any conflict of interest in completing this study.

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Ethical Approval: This study has obtained ethical eligibility permission based on the Research Ethics Committee of the Faculty of Veterinary Medicine, Airlangga University Number: 2.KE.006.01.2021

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