The Effects Of Adecuate Brisk Walking Exercise Toward Amount Of Pyramid Cells In The Cerebral Cortex Of Congenital Hypotyroid Pups

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Abstract

Hypothyroidism is a thyroid hormone deficiency disease that causes developmental abnormalities or disorders of nerve cells, especially pyramids cells in cerebral cortex, so that it can interfere daily activities and resulting low value of intelligence quotient (IQ). Pharmacological therapy is still lacking to help sufferers of hypothyroidism.Determine the effects of brisk walking exercise against the number of pyramid cells that are in the cerebral cortex of congenital hypothyroid rats.Postes to analyze changes in the number of pyramid cells in the cerebral cortex of congenital hypothyroid rats. Pups that born from each parents taken 5 pups, so we get 6 groups: normal without exercise, normal with exercise, hypothyroidism without exercise, hypothyroidism with exercise, hypothyroidism When it reaches the age of 8 weeks, pups brain tissue taken and made preparations so it can be compared the number of pyramid cells.First, the data is normality teted with *kolmogorov-smirnov* method.analyzed by *one way anova*. And *post hoc multiple comparison test*.The number of pyramid cells of normal group (66), normal training (88), hypothyroidism (47), hypothyroid exercise (59), hypothyroidism with thyroxine (85) and hypothyroidism with thyroxine and exercise (97). *One way anova* test result shows the result of p = 0.000 (p <0.05) so can be said there are differences in the average number of pyramid cells are significantly among the six groups and adequate exercise brisk walking can increase the number of pyramid cells.

Keywords : hypothyroidism, thyroxine, brisk walking, pyramidal cells

1. Introduction

Hypothyroidism is a thyroid hormone deficiency disease that causes the disorder or developmental disorder, especially nerve cells in the cerebral cortex pyramid cells, which can interfere with daily activities and lead to low grades Intelligence Quotient (IQ). Throughout the world the prevalence of hypothyroidism close to 1: 3000. While in Indonesia newborn screening results in some province found babies with congenital hypothyroidism about 1 in 305 live births. Cretin is a further consequence of iodine deficiency in the womb. Each patient cretin had
a deficit of 50 IQ points. If found 1-10% of patients cretin populated, it is predicted that there 5-30% of children who suffered damage to part of his brain that it can not function optimally, and 30-70% of the population in the area is weak and unproductive because hipotiroid. (Samsudin, 2014).

Hipotiroid generally based etiology can occur because of primary failure of the thyroid gland itself, secondary to deficiency of TRH, TSH or both, and could also be due to lack of iodine intake and food. While the definition of congenital hypothyroidism is a

thyroid hormone deficiency disease inborn. One result of this condition is retarded mental. Growth brain cells and mental health requires thyroid hormone in sufficient quantities. When the body is deprived of thyroid hormones in the womb of his mother, a child will have mental retardation but mental retardation can be prevented if treatment is given promptly recovered, but can not be recovered when it has been established for several months after a person is born although then given hormones tiroid.(Sherwood,L.2011). .

The brain can be likened to a special computer. human behavior depending on the programs that are inside. While the chip is the brain-nerve cells neuron.Salah the cells that are in the cerebral cortex is the pyramid cells. Selpiramida is a type of neuron "major excitatory" which use glutamate as ineurotransmitter. (Markam,2005). Hipotiroid alone can reduce the number of cells of the pyramid and the pyramid can stop cell growth at the age of 30 days in mice. (Ruiz-Marcos, et al 2003). Fast walk is very simple activity and is one type of exercise is aerobic and can improve the physical condition (conditional fitness) of a person. If we move the body to the same thing we Also stimulate and train the brain, (Hasibuan, 2010). Because The brain itself is a center of the body driving. Irregular body movements and measured, in addition to body refresh , will Also increase of the blood flow in your body Including diotak.5 So with the study expected later this useful and can help sufferers of hypothyroidism in order to improve Reviews their quality of life.

2. Material And Metods

This study was an experimental study, design posttest only control group design. Postes to analyze changes in the number of pyramid cells in the cerebral cortex of hypothyroid rats kongenital.Subjek this study is the mother rats (*Rattus norvegicus*) *Sprague Dawley*, 4-5 months of age, healthy and ready to mate and pregnant .In this be used Sprague Dawley because they are more sensitive to hormones, resistant to treatment, omnivorous, have physiological characteristics more like humans than rabbits and can be controlled in terms of food intake to reduce the occurrence of bias in study.

Pregnant parent required as many as 12 were divided into 6 each group of two tails. Four (4) groups induced hypothyroidism with given prophilthiourasil (PTU), 2 Other groups of Other normal.group . Mice children are born grouped by treatment among other things normal without treatment (KI), normally with a brisk walk adequate on a treadmill at a speed of 10 m / min (K II), hypothyroidism without treatment once the child is born from the mother who gets propyl tiourasil 15 ppm during gestation (K III), hypothyroidism with adequate brisk walking on a treadmill at a speed of 10 m / min (K IV), hypothyroidism with thyroxine treatment by therapy of 1.6 ug / g thyroxine (KV), and hypothyroidism with thyroxine treatment and brisk walking adequate (K VI). Randomization was performed on the mother and children in a single parent, it is because children are still suckling
mice for approximately 20 days. Each treatment group using 5 mice pups. The size of the sample can be calculated by the formula Federer (1963), after calculation s0 that obtained a minimal amount of sample required is 4 rats untuksetiap group. Once the child Reaches the age sufficient mice (8-10 weeks) will be terminated by using chloroform and brain tissue will be taken. The brain tissue preparations will be made and observed with a microscope with a magnification of 100x (23 x 17 µm = 391 µm2). This research was conducted in UPHP UMY for maintenance, administration of stem treatment, replacement thyroxine hormone treatment, the provision of treatment of children in the form of brisk walking rats on a treadmill mice and rat brain surgery organ harvesting. Making the mouse brain preparations carried out in the Laboratory of Pathology Anatomy Faculty of Medicine. Filming is done in preparation Histology

Laboratory of the Faculty of Medicine . Materials and Instrument research include mother rats white *Sprague Dawley*12 tail, mouse cage, feeding rats, treadmill rat, Propylthiouracil (PTU), thyroxine, a bottle of mineral water a used along with cap and hose, enough water, the drug (chloroform), jars, surgical equipment rat , pot to save the network, which has been diluted alcohol, glass preparations, microscopes and cameras, calculators, computers and others.
Data Obtained from observations of a numerical scale the data. Because, in research inimenggunakan 6 treatment groups (> 2 groups) and not a variable pairs (independent) to test the hypothesis, the difference in all treatment groups used OneWay ANOVA statistical analysis. Before the Data were tested for normality using the descriptive method and metod eanalitikujiShapiro-Wilk because the sample size 30. If it comes to data distribution is not normal, then the statistical test used was Kruskal Wallis. Then, to compare the effect of each terapipada each group against another group, used to test the Post Hoc Multiple Comparison Test. The analytical data obtained from histological observation in mice brains of test animals.

3. Result and Discusion

The following image pyramid cell histology cerebral cortex of group I Group II, Group III , Group IV, group V and Group VI:

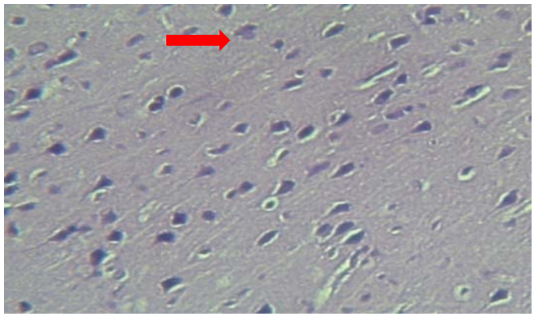


Figure a.
Overview of Histology Cells Rat cerebrum cortex Pyramids Normal H E (hematoxylin eosin, 100x total magnification, wide field of view of 23 x 17 µm = 391 µm2) .: Selpiramid

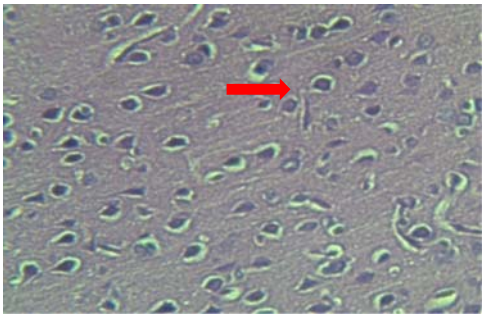
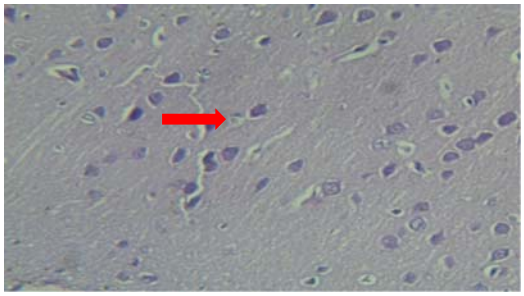


Figure b.
Overview of Histology Cells Rat cerebrum cortex Pyramids K II Normal practice (Hematoxylin Eosin, 100x total magnification, wide field of view of 23 x 17 µm = 391µm2) . Pyramids Cells



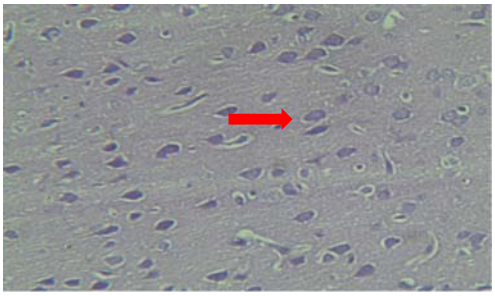


Figure c.
Overview of Histology Cells Rat cerebrum cortex Pyramids Normal HE (hematoxylin eosin, 100x total magnification, wide field of view of 23 x 17 µm = 391 µm2) .: Selpiramid.

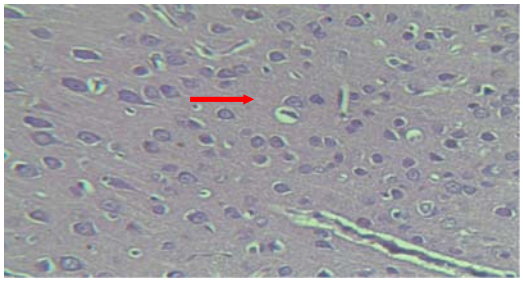


Figure d.
Overview of Histology Cell Pyramids Rat cerebrum cortex K IV Hypothyroidism exercise (hematoxylin eosin, 100x total magnification, wide field of view of 23 x 17 µm = 391 µm2). : Pyramid Cells

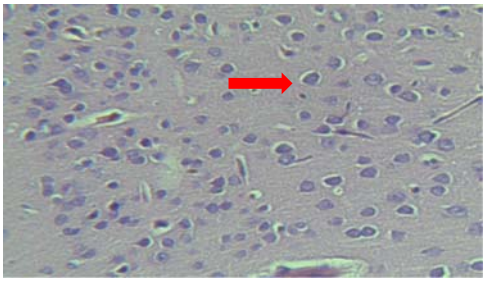
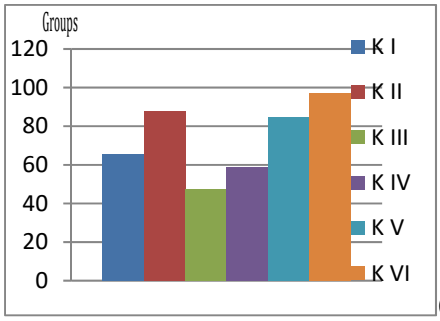


Figure e.
Overview of Histology Cells Rat cerebrum cortex Pyramids K V hypothyroidism thyroxine and exercise (hematoxylin eosin, 100x total magnification, wide field of view of 23 x 17 µm = 391 µm2). : yramids Cells Pyramids

Figure f.
Overview of Histology Cells Rat cerebrum cortex Pyramids K VI hypothyroidism thyroxine and exercise (hematoxylin eosin, 100x total magnification, wide field of view of 23 x 17 µm = 391 µm2). : Pyramids Cells

The results are also presented in histogram form that makes it easier to compare the results, as follows



Groups

Discription :
K I = Normal untreated
K II = Normal exercise brisk walking
K III = Hypothyroidism
K IV = Hypothyroidism with brisk walking workout
K V = hypothyroidism with thyroxine therapy
K VI = hypothyroidism with thyroxine and road cepatl

Table 1. Average number of pyramid cells

Number	Mice Groups	Average ± SD
1	Normal without treatment (K I)	66±7
2	Normal exercise brisk walking (K II)	88±12
3	hypothyroidism (K III)	47±10
4	Hypothyroidism with brisk walking workout (K IV)	59±4
5	hypothyroidism with thyroxine therapy (K V)	85±7
6	hypothyroidism with thyroxine and a brisk walk (K VI)	97±18

In accordance with the tables 1 and histogram above it can be concluded that the number of cells contained the highest pyramid on the group VI, namely congenital hypothyroid rats treated with thyroxine and fast way adequate. While the number of cells contained in the pyramid at least the third group, which is congenital hypothyroid mice without any treatment or therapy. (Table 2)

Table 2 value significance between groups * = Value <0.05 or obvious that there is a difference between information the groups is:

Group	I	II	III	IV	V	VI
KI	-	0,003*	0,012*	0,327	0,009*	0,000*
KII	0,003*	-	0,000*	0,000*	0,663	0,198
KIII	0,012*	0,000*	-	0,101	0,000*	0,000*
KIV	0,327	0,000*	0,101	-	0,001*	0,000*
KV	0,009*	0,663	0,000*	0,001*	-	0,090
KVI	0,000*	0,198	0,000*	0,000*	0,090	-

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After the results are displayed, the normality test beforehand to determine the distribution of the data, by using the Shapiro-Wilk test, because the sample size of 30. The results of this test to the whole group shows the results p> 0.05, so that shows the distribution of the number of normal pyramid cells . Therefore the continued data analysis using One Way Annova. One Way Annova test results show the result p = 0.000 (p <0.05) so that it can be said there are differences in the average number of pyramid cells are significantly among the six groups. Once known there were significant differences among the six groups, then do LSD (Least Significant Difference) in post hoc test to determine which groups are different. LSD test results obtained significant differences in the KI KII, with KIII KI, KI with KV, KI with KVI, KII with KIII, KII with KIV, KIII with KV, KIII with KVI, KIV with KV, KIV with KVI. The value of significance between treatments can be seen in Table 2 In addition, to ensure and prove that the mother rats and mice induced PTU really managed to become hypothyroid rats, the rats have blood drawn prior to the data taken FT4 results can be seen in Table 3

Table 3. Mean FT4 levels of mice treated

Group	FT4 serum levels (ng / mL)		
	Parent	Parent Child Day 15	Children 2 Month
K I	1,42±0,158	1,09±0,145	1,32±0,211*
K II	1,37±0,162		1,77±0,113**

KIII	0,07±0,089	0,09±0,164	0,50±0,094***
K IV	0,122±0,106		1,46±0,327*
K V			1,50±0,20*
K V I	0,23±0,13	0,21±0,17	1,20±0,33

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Kruskal Wallis test: p = 0.002
Extensive details: * The number of different shows significant differences in p≤0,05
PTU given to mother rats cause hypothyroid conditions to the parent as well the son concentration; FT4 hypothyroid rats induced PTU significantly lower than other groups. Hypothyroid group FT4 levels with exercise can increase up to par with the normal group (p> 0.05). While hypothyroid mice receiving thyroxine therapy and exercise treatment also showed similar elevated levels of FT4 normal group of rats.

Test Result of the One Way Annova on the average number of pyramid cells showed p = 0,000. results showed that p <0.05, so that the statistical tests showed that the number of pyramid cells in the cerebral cortex and control have significant differences. The results obtained in accordance with previous hypotheses.

Thyroid , which consists of thyroxine (T4) and triiodothyronine (T3), is essential for normal growth and development of fetus thyroid .Hormon needed for the general growth of fetal life and trigger the development of discrete in fetal brain and somatic tissue early in pregnancy. These hormones also influence idiferensiasi terminal of fetal tissue and gives the effect of prepartum maturation of gluko corticoids that will ensure the survival of the baby. Hormontiroid acting directly through anabolic effects on fetal metabolism and oxygen consumption fetus stimulation. Hormon also acts indirectly by controlling the bioavailability and efficacy of other hormones and growth factors that affect fetal development such as catecholamines and insulin-like growth factors (Forhead & Fowden, 2014).). PTU is a medicine used to lower levels of tirod. Clinical study mentioned that the thyroid hormone affects the formation of cholesterol, especially low density cholesterol (LDL). By giving this drug in the pregnant mother on a certain dose (in this study stem induced a dose of 15 ppm during pregnancy) will be born children who suffer from congenital hypothyroidism. (Furi, & Wahyuni, 2011).The main determinants though not the only determinant of the basal metabolic rate is the job of the thyroid hormone. Increased thyroid hormone alone can lead to an increase BMR.Namun case of hypothyroidism in which the symptoms are generally caused by a decrease in metabolic activity as a whole, then a person with hypothyroidism will decrease basal metabolic rate. (Sherwood, 2011). Decreased metabolic rate will cause hyperglycemia conditions, so it will be conditioned are conducive oxidative stress, a condition in which compared to endogenous oxidant. These conditions will cause organ damage jaringana tau that have a high fat content, because fat is very susceptible to radical attack Itself is free. (Winarsi at al 2012).

While one of the main organs of the brain with a very high fat content (± 80%), so the brain vulnerable to free radical attack. This will lead to an increase nekrosa

pyramidal neurons in particular neuron in hypothyroid rats group. So that this condition will reduce the number of pyramid cells in group hipotiroid. (Utami,2003). Fast walking is fitness exercise consisting of aerobic running at high speed by moving the arms energetically. The definition of this jalancepat located between walking and running, done in a way that requires cognition and concentration in an individual to do so. The fundamental difference of running is the one leg that remains on the ground, while running there is a condition in which both feet float. (Depdiknas. (2002). *Based on research Xiafeng Shen et al (2013) under the title The Effect of Different Intensities of Treadmill Exercise on Cognitive Function Deficit Following a Severe Controlled Cortical Impact in Rats* can be concluded that the treadmill exercise can improve cognitive function and BDNF after TBI (Traumatic Brain Injury) , TBI itself will cause the nerve cells or neurons die, resulting in deficits in learning and memory space. In cases of hypothyroidism are also almost similar pathophysiology, where nerve cells are also in deficit because of their exposure to radical bebas.Sedangkan BDNF itself is part of the "neurotropic factor" (Group of protein responsible for the growth and survival of neurons and repair of mature neurons) that this overflow.BDNF facilitate the growth, proliferation and differentiation of neurons BDNF hippocampus.12 is not only found in the hippocampus, but also there are padakorteks cerebrum. BDNF can be detected in low numbers in mice postnatal day 2 and there is a high number of type Ausia 5 minggu.13 Shen et al. 2013) Therefore, by doing brisk walking exercise adequately during the growth of onshore tmerangsang BDNF, so the existing pyramid cells at cortekxs cerebrum more numerous in the exercise group compared to the group without exercise.

4.Conclusion

In this study we can conclude that with adequate exercise brisk walking can increase the number of pyramid cells in the cerebral cortex of congenital hypothyroid rats.

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