Comparative Study of Body Temperature Measurement In Birds Of Family Pssitacidae and Mamalia Family Leporidae in Captivity

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Abstract
Body temperature is an important variable in animals that affects almost all animal life. Body temperature is a basic physiological indicator. The body temperature of animals is also affected by the temperature of the environment. In endothermic and ectothermic animals, the ambient temperature can describe the physiological state of the animal. The internal temperature can be sampled using a digital thermometer, which is inserted into the anal openings of birds and mammals. In this study, birds were taken using lovebirds and mammals using rabbits, this is because these two species are species that are often kept by most people. The purpose of this study is to compare the body temperature of the species in response to physiological resistance parameters in birds of the Pssitacidae family and mammals of the Leporidae family in the city of Malang and Malang Regency which have different regional temperatures. and Malang regency. The temperature of rabbits (mammals) and birds (Lovebird) located in the city of Malang in the morning is 27.0 °C while in the afternoon it is 27.7 °C. While it is located in Malang district in the morning is 22.6°C while in the afternoon it is 25.3 °C. The temperature of male rabbits and female rabbits (mammals) in the city of Malang is 37.9 and 37.4 °C in the morning to 37.4 and 38.4 °C in the afternoon, while in birds (Lovebird) 42.2 °C-42.0°C in the morning and evening to 42.2-42.4 °C. Rabbit (mammal) temperature in Malang district increased in the morning and evening to 36.6-37.2 °C to 37.4-37.9 °C. While in birds (Lovebird) 40.6 °C to 41.8-41.2 °C. the comparison of temperature in the morning and evening between the city and Malang district was significant, namely 0.018-0.026. A significant ratio of rectal temperature occurred in male mammals (rabbits) in the morning and evening, which was 0.042-0.050. The ratio of rectal temperature of Female Mammals (rabbits) was significant in the morning and evening, namely 0.002-0.024. The comparison of rectal temperature was significant in male lovebirds in the morning and evening, which was 0.020-0.039. The ratio of rectal temperature of female lovebirds was significant in the morning and evening, namely 0.028-0.002.

Keywords: Body Temperature, Mammals and Birds, Environmental Temperature, Regional Differences

1. Introduction

Temperature is one of the environmental factors that limits the requirements for living things to live in various habitats according to the tolerance range of each living thing (Anwar et al., 2016). Based on the regulation of body temperature to the environment, animals are divided into two, namely ectothermal animals and endothermic animals. Extothermal animals are animals whose body temperature depends on the ambient temperature and perform behaviors to adapt to changes in environmental temperature to cool body temperature and sunbathe when the body temperature is cold (Dewi et al., 2020). Endothermic animals are animals whose temperature is regulated through the physiological metabolism of their body and regulated by the hypothalamus

part of the brain as the center of their body temperature regulation so that their body temperature is independent of the environment and stable (Rousdy and Linda, 2018).

The thermal physiology of most birds and mammals is characterized by significant variations in body temperature spatially and temporally. Therefore, body temperature is a key parameter in physiological, behavioral, and ecological research. Internal temperatures can be sampled using thermometry, recorders or transmitters implanted through surgery, gastronitestinal or non-surgical devices (Caaffetry, et al., 2015).

The ambient temperature of ectothermic and endothermic animals is useful for describing a wide range of average physiological states, this may be an understanding of the dynamic properties of thermoggulation. Complex temperature control in endothermic animals occurs through the autonomous regulation of blood flow combined with the process of thermogenesis of shivering and not shivering, sweating, and through a series of thermoregulatory behaviors. (Yahav, 2015).

In a study conducted by (Caaffetry, et al., 2015) it was said that several measurements from different regions may be needed to get a fairly detailed picture of the thermoregulatory process, whereas in ecological studies, a single temperature measurement chosen appropriately may be sufficient. For the purpose, the sampling interval is adjusted in such a way as to provide the necessary temporal resolution in situations where the research design may risk consuming the device's memory. What is most needed is the development of appropriate sampling methods from different captive sites in the body, which will enhance our understanding of how temperatures vary across different regions/captives as well as organs and how temperatures change in response to physiological, behavioral and environmental parameters. Future applications will be aided by technological advances that continue to reduce the size and data collection capabilities of temperature sensing methods. In particular, the development of medical sensing systems connected to mobile phones and wifi will provide great potential for remote sensing of the body temperature of wild animals as well as animals in captivity. And if this research can be published, it is hoped that it can update previous research. That way it can add sources of knowledge and learning to the general public as well as students, and the academic community, especially in the Open University environment.

2. Research Method

This research was carried out in two places, namely the city of Malang and the district of Malang. The object of the study was the mammal family Leporidae and the bird family Pssitacidae in captivity in two different places. This research was carried out by collecting rectal temperature and environmental temperature data. Temperature taking is done twice a day for one month in May. The number of individuals who were taken was 4 individuals, namely 2 mammals and 2 aves animals in two different places, namely the city and district of Malang.

Temperature analysis based on rectal temperature and ambient temperature using Linear Regression with SPSS and Microsoft Excel programs. The analysis obtained is to determine the average difference in rectal temperature and environmental temperature in different regional conditions. So that a linear regression equation is obtained that will be used to predict temperature.

3. Results and Discussions

This study was taken from 2 groups of birds of the Pssitacidae family and 2 groups of mammals of the Leporidae family. For birds we use the lovebird species and for mammals we use the rabbit species. The research was conducted in 2 different places, namely in Malang City and Malang Regency. Each place observed the temperature of 2 birds of each species and mammals (male-female) at the age of 6-12 months. Each animal (respondent) is checked for rectal temperature every day by inserting a digital thermometer into the anal opening every 2 times a day (in the morning and evening/night). In addition to measuring rectal temperature, researchers are also required to record the room temperature based on the HTC 2 Thermometer. After being recorded, every 3 days a comparative test is carried out between the 2 places, namely in the city and Malang regency. After approximately one month, the T Test was calculated to determine whether there was an effect of the difference in place which included environmental temperature on rectal temperature in rabbits and lovebirds.

The results of the study on the comparison of rectal temperature and environmental temperature in mammals and aves are presented in the following table.

Table 1. Results of Descriptive Test of Environmental Temperature Measurement of Rabbits and Lovebirds

Types of Test Animals	Time Morning	Location		Time Afternoon	Location	
		Malang City	Malang Regency		Malang City	Malang Regency
Rabbit	06.00	27.0 °C	22.6 °C	16.00	27.7 °C	25.3 °C
Bird	06.00	27.0 °C	22.6 °C	16.00	27.7 °C	25.3 °C

From the table above, it can be seen that the temperature of rabbits and birds located in the city of Malang in the morning is 27.0 °C while in the afternoon it is 27.7 °C. While it is located in Malang district in the morning 22.6 °C while in the afternoon it is 25.3 °C. Based on Salat research (2019), the ideal temperature of Lovebird livestock is between 25-35 degrees Celsius, because the ideal temperature in the development of Lovebird and the humidity of the captive cage will make Lovebird more comfortable. Based on the results of research that has been carried out in two different places, the temperature of the Lovebird environment still shows a normal range, which is between 22-27 degrees Celsius. Although in the morning it shows a decrease in environmental

temperature, basically the ideal environmental temperature of Lovebirds in the world of bird breeding is not too problematic because Lovebirds are able to quickly adapt to the weather in Indonesia. But environmental temperatures that are too hot or too cold are also not good for breeding Lovebirds because they can have an impact on the quality of the eggs produced.

Based on research by Aji, et al. (2022), the ideal environmental temperature in rabbits is between 13-29 degrees Celsius. Based on research conducted in two different places, the ambient temperature is in the normal range, which is 22-27 degrees Celsius. In the process of raising rabbits, it is different from Lovebirds, because Lovebirds are faster to adapt to the temperature conditions in the region. Meanwhile, rabbits must pay attention to the temperature and humidity conditions of the air in the cage. Because the right air temperature and humidity will maintain the quality of the fur and can stimulate appetite, because when the environmental temperature is too hot and unstable, it will make rabbits experience a decrease in productivity and interfere with animal development (G. M. Putra, 2006).

Table 2. Results of Descriptive Test of Rectal Temperature Measurement of Rabbits and Lovebirds

Types of Test Animals	Time Morning	Location		Time Afternoon	Location	
		Malang City	Malang Regency		Malang City	Malang Regency
Male Rabbit	06.00	37,9 °C	36,6 °C	16.00	37,4 °C	37,4 °C
Female rabbit	06.00	37,4 °C	37,2 °C	16.00	38,4 °C	37,9 °C
Male Lovebird	06.00	42,2 °C	40,6 °C	16.00	42,2 °C	41,8 °C
Female Lovebird	06.00	42,0 °C	40,6 °C	16.00	42,4 °C	41,2 °C

At the time of the research, the activities were carried out on Sundays at 13.00 to 15.00 with the material of writing, sticking, composing and practicing batik ciprat. From this activity, it is hoped that it can hone motor and sensory abilities, especially for children with disabilities. From the results of research with participatory data collection and direct involvement in the community, it was found that there were several children who were constrained in carrying out writing activities, sticking to arranging due to weak muscle conditions, to disability factors, in the process of ciprat batik there were several children who were still unable to control their emotions properly.

We conducted research on 12 members of the disabled community, consisting of 2 toddlers, 5 children, 3 teenagers, and 2 adults with disabilities. From the results of the research there are 2 toddlers who still cannot read and paste, and 3 children who cannot read, 5 children who can paste, 3 teenagers who can paste and read, and 2 adults who cannot read and paste. Meanwhile, making splash batik can be done by 10 people because 2 of them are still toddlers.

Table 3. T-Test Results Comparison of Environmental Temperature Measurement

Scalable Components	T-Test Results
Comparison of ambient temperature in the morning	0,018
Comparison of ambient temperature in the afternoon	0,026

Based on the results of observation and data analysis, the average calculation of the environmental temperature in the morning in Malang regency/city is 0.018 and in the afternoon is 0.026. This data shows a significant result of <0.05 which means that it shows a significant difference between the two variables in two different places. The ecology of endothermic animals, mammals and birds is highly dependent on the thermal physiology of such hreans, as energy is required for thermoregulation (Bozinivic & Rosenmann 1989; Lowell & Spiegelman 2000). Environmental variability in temperature and food availability has a profound effect on the ability of endothermic animals to maintain temperature. Climate change will affect environmental temperatures and primary productivity. The body temperature of endothermic animals can vary in response to climatic variations, thus endothermic animals can compensate for thermoregulatory energy (Glanville & Seebacher 2010).

Huey et al's research The susceptibility of a species to environmental change depends on the species' sensitivity to environmental change, its resilience to disturbances, and its potential to adapt to change. Vulnerable animal populations have only two options when it comes to climate change. First, animals can change their distribution range to habitats whose climate is within the tolerance limit of the species. Both animals can be in a location but adjust to the new climate regime.

In birds, low environmental temperatures cause birds to consume more food to increase body temperature. (Iskandar et al., 2009). The state of hot ambient temperature causes animals to reduce the metabolic rate in the body by lowering feed consumption. The addition of heat from the metabolic results causes the hypothalamus to stimulate the satiety center. Warm temperatures are also an important factor in the hatching of bird eggs. A good temperature for the growth of Lovebird egg embryos ranges from 36-37 ^{o}C. In the phase after hatching, the chicks need a temperature of 33-45 ^{o}C at the age of 7-14 days and the age of 15-30 days need a temperature of 31-33 ^{o}C, after the age of 31 days the young Lovebird can adapting to ambient temperatures (Iswara, et al., 2019).

Table 4. Results of the T-Test Comparative Measurement of Rectal Temperature Measurement of Rabbits and Birds

Scalable Components	Test Results
Comparison of rectal temperature of male rabbits in the morning	0,042
Comparison of rectal temperature of morning female rabbits	0,002
Comparison of rectal temperature of male rabbits in the afternoon	0,050
Comparison of rectal temperature of female rabbits in the afternoon	0,024
Comparison of rectal temperature of male Lovebirds in the morning	0,020
Comparison of rectal temperature of female Lovebird in the morning	0,039
Comparison of rectal temperature of male Lovebird in the afternoon	0,028
Comparison of rectal temperature of female Lovebird in the afternoon	0,002

4. Conclusions

Research on comparative study of temperature measurements of mammals of the Leporidae family and birds of the Pssitacidae family in different regions, namely Malang City and Regency which have different environmental temperatures. It turns out that mammals of the Leporidae family and birds of the Pssitacidae family have thermal physiological resistance and can adapt to different environmental temperature conditions, so that in this study there is an influence of different places which include environmental temperature on the rectal temperature of mammals of the Leporidae family and Pssitacidae family. Mammals and birds are a group of endothermic animals so that they are able to carry out thermoregulation through behavioral adjustment mechanisms and physiological regulation. Based on research, birds have a higher body temperature than the body temperature of mammals. This can happen because birds have feathers that have two functions, namely to help them fly and keep them warm so that they have a hotter temperature than mammals.

Research on comparative studies of temperature measurements on mammals of the Leporidae family and birds of the Pssitacidae family needs to be developed in future studies to deepen the comparative study of temperature measurements on mammals and lovebirds. So it is hoped that this research can continue, because it can also have an impact on biodiversity, especially on mammals (rabbits) and aves (Lovebird). In addition, there is a lack of references to this study, because not many have done this research.

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