Recognizing Parents Emotions through Heart Beat Sensors as Prevention Efforts Parents Violence toward Children

Dewi Eko Wati*, Intan Puspitasari, Alif Muarifah & Anton Yudhana
Universitas Ahmad Dahlan
**dewi.ekowati@pgpaud.uad.ac.id*

ABSTRACT

This research is a collaboration between psychology and electronics engineering. This study aimed to detect emotions through the heart rate by using a heart beat sensor. The study was conducted using five subjects aged between 20-23 years. The procedure of the study was carried out through two steps. In the first step, the five subjects did not carry out any strenuous activities for five minutes and then measured their heart rate. The second step, the subject was asked to watch a horror movie and then measured his heart rate again. The experimental process is at the fingertips of the subject put a heart beat to get the heart rate sensor. The LED light that penetrates the fingertip is received by the Receiver Circuit and then processed into a digital data by the Arduino Uno microcontroller. Data that has been received by Arduino was forwarded through software processing to display the output on a computer screen. The output on the computer screen shows the condition of a person's heartbeat. Emotions and heart rate are interrelated. Emotions involve a variety of accompanying physiological experiences, for example the speed of the heart. The faster the heart rate, the person is in an emotional state. Emotions are formed by a part of the brain called the limbic system. Parental violence against children that occurs when emotional conditions are driven by the autonomic nervous system and limbic system. Violence is a form of physiological reaction from emotions. The results showed that there are differences in heart rate between relaxed conditions and emotional conditions. Emotional condition heart rate is ranging from 100 to 140 Beat PerMinute (BPM) and relaxed conditions is ranging from 60 to 90 Beat PerMinute (BPM). This is because the heart pumps blood faster.

Key Words: *emotions, heart rate, prevention, violence, parents, children*.

1. INTRODUCTION

The heart is a vital organ in humans that functions to pump blood and carry it throughout the body. One of the heart's performance is indicated by the rapid slowing of the heart rate. Heart rate according to Acharya, et al (2006) describes the body's psychological reaction to the environment. Psychological reactions are one of the emotional images that arise from the individual. This opinion is in line with the opinion of Appelhans and Luecken (2006) which states that there is a relationship between heart rate and one's emotional state. Conditions of anger, sadness, disappointment, etc. will affect the heart rate. Therefore, knowing the condition of the heartbeat is important to know our emotional condition which in turn affects the behavior that we emerge. This is in line with the emergence of the behavior of parents of violence against children caused by the low regulation of emotions of parents.

The problem of violence still occurs because parents have difficulty managing their emotions. Emotional regulation of parents is said to be an important key for their children when looking for role models (Zimmer-Gembeck et al., 2018). Because how parents manage emotions and how to express their emotions will be an example for children. According to Zimmer-Gembeck et al. (2018) parents who have low regulatory abilities are more prone to violence against children.Based on research conducted by Wati and Puspitasari (2018) in four sub-districts in Yogyakarta City also showed that of 320 respondents (parents) only 8% said they never committed violence against children in physical or non-physical forms. While 92% of respondents stated that they had committed violence against children both physically and non-physically.

Emotions arise because of the stimulation that causes emotions. According to James Lange (Ni'matuzahroh, et al. 2018) situations that give rise to emotions give rise to certain physiological responses such as trembling, sweating, and accelerating heart rate. In conditions of anger there will be some changes in the human body such as increased heart rate, accelerated breathing, increased body temperature, and changes in facial expressions. In normal conditions an adult's heart rate ranges from 60-100 times per minute, whereas in an angry condition the heart rate will increase. This is due to an increase in stress hormones namely adrenaline and cortisol (Pulopulos, Vanderhasselt, & De Raedt, 2018).

Detection of heart rate can be the first step for parents to know the condition of their emotions. Thus parents can try to anticipate the emergence of anger which leads to actions that hurt the child. As expressed by Pulopulos, Vanderhasselt, and De Raedt (2018) that one's awareness of changes in physiological conditions at the time of anticipation is an adaptive response so that the individual can adjust his behavior, cognitive, and physical. With this adaptive response, individuals are better prepared to face real stressors.

The heart is a human organ that functions to pump blood, the heart will contract where one cycle of contraction is usually called a heartbeat. The number of a person's heart rate in one minute or better known as Beat PerMinute (BPM) is one indicator of a person's health. Checking the heart rate is very important, because by examination it can be seen whether the heart is working properly or not (Wijaksono, et al. 2011). This research uses Arduino board and sensor hear rate because the price of this component is relatively cheap so that from the production it will reduce the price of production. The output of the heartbeat signal that will be detected will be displayed on a laptop or computer. The idea of using a computer in detecting heart rate is based on things where these activities require a routine and a very high level of accuracy and a time of rapid anticipation. The device can record heart rate signals when a person is relaxed and emotional.

Based on the description above, this study aims to recognize emotions through heart rate in parents as an effort to prevent violence against children. Through the sensor heart beat tool, parents will recognize the emotional condition that is owned so that they can make anticipatory efforts so as not to commit violence against children.

1.1 Heart Beat Sensor

According to Wijaksono, et al (2011) sensor heart rate is a heart rate sensor that works using the principle of photoplethysmography (PPG), which is a non-invasive method for measuring cardiovascular by detecting the volume of blood flow in the pulse that is very close to the skin. The images from the sensor heart rate are presented in Figure 1.

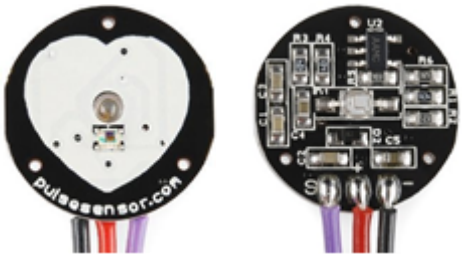

Figure 1. *Sensor Heart Rate*

This sensor uses IR LED and photodetector, where the pulse in the finger or earlobe will affect the flow of light from the IR LED to the photodetector, this change is then converted, filtered and amplified by the sensor module to be processed by Arduino. Arduino Uno R3 is a microcontroller development board based on the ATmega328P chip. It is called a development board because this board functions as a prototyping microcontroller circuit. Using the development board, it's easier to assemble a microcontroller electronic circuit than if you started assembling ATMega328 from scratch on breadboard.

1.2. Emotion

According to Goleman (1995) emotion is a typical feeling or thoughts, a biological and psychological state and a series of tendencies to act. Heart rate and emotions are interrelated. Emotions are psychological factors that influence behavior. Emotions don't just happen for no reason. Emotions arise because of the stimulation that causes emotions. According to James Lange (Ni'matuzahroh, et al. 2018) situations that give rise to emotions give rise to certain physiological responses such as trembling, sweating, and

accelerating heart rate. In conditions of anger there will be some changes in the human body such as increased heart rate, accelerated breathing, increased body temperature, and changes in facial expressions. In normal conditions an adult's heart rate ranges from 60-100 times per minute, whereas in an angry condition the heart rate will increase. This is due to an increase in stress hormones namely adrenaline and cortisol (Pulopulos, Vanderhasselt, & De Raedt, 2018).

2. METHODOLOGY

This research was conducted by testing the sensor heart beat device against the psychological condition of the parents. The research subjects were 5 people. Testing is done on the subject of relaxed conditions and emotional conditions. Relaxing condition means that the subject does not do any activity for 5 minutes before the sensor heart beat is installed. The emotional condition of the subject is raised by showing a horror film. After that, the heart beat sensor is placed in one of the fingertips which is then processed by Arduino to become a digital data and displayed through software processing.

3. DISCUSSION

Recognizing parental emotions is done by placing a heart beat sensor at one fingertip. The psychological conditions detected are relaxed conditions and emotional conditions. Below is an example of a picture of the heart rate in a relaxed condition, that is, testing is carried out on a subject that is conditioned not to carry out heavy activity for approximately 5 minutes. The number of heartbeats per minute is 85 Beat PerMinute (BPM) and Inter Beat Interval (IBI) or heart rate which is 782mS.

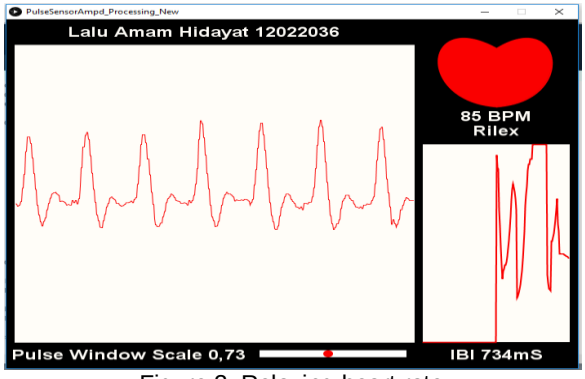

Figure 2. Relaxing heart rate

After testing the tool with 5 people in a relaxed condition, the results are the values of each person's heart rate. Data from the test results are presented in table 1.

Table 1. The results of testing the tool in relaxed conditions

No	Name	Age	Heart beat (BPM)	IBI (mS)
1	A	20	85	734
2	B	21	60	1128
3	C	23	58	1062
4	D	20	75	808
5	E	23	55	1018

Based on table 1, the results of testing the heart rate in relaxed conditions range from 60 to 85 Beat PerMinute (BPM), while Inter Beat Interval (IBI) is the speed of the heartbeat between the first beat and the next heart beat.

In figure 3 is an example of heart rate during emotional conditions. testing in this condition the subject of watching a horror film to get the emotional state of the object. The number of heartbeat results after finishing watching a horror movie is 137 Beat PerMinute (BPM) and Inter Beat Interval (IBI) or heart rate which is 608mS.

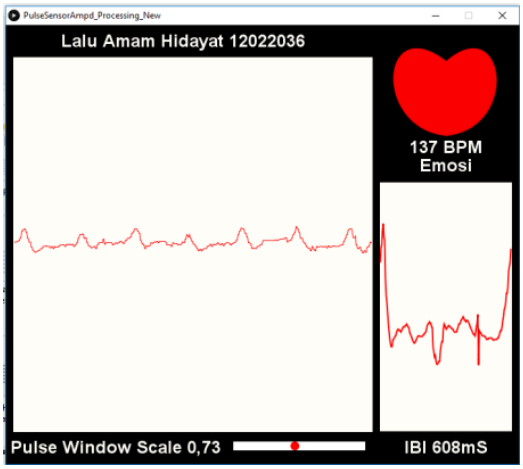

Figure 3. Emotional heart rate

Table 2 is the result of heart rate in each subject during emotional conditions. Based on table 2, the results of testing the heart rate on emotional conditions range from 100 to 140 Beat PerMinute (BPM), while Inter Beat Interval (IBI) is the speed of the heartbeat between the first beat and the next heartbeat.

Table 2. Results of testing tools for emotional conditions

No	Name	Age	Heart beat (BPM)	IBI (mS)
1	A	20	137	608
2	B	21	116	802
3	C	23	108	582
4	D	20	148	252
5	E	23	116	784

From the two tables above, it shows that there are differences in heart rate values on subjects in relaxation and emotion. Based on this, the heart beat sensor can be used as a tool to recognize a person's emotions through the heart rate raised by the device. The hope is to recognize the emotional state of parents can prevent behavior caused by emotional conditions such as violence against children both physical and verbal violence.

4. CONCLUSION

Based on the results of testing and research that has been done it can be concluded that the heart beat sensor is able to be used to recognize a person's emotional state which is indicated by the ability to release the sensor from the device which is then interpreted through numbers. The difference in heart rate values is also evidence that the device is effective enough to recognize heart rate. The difference between the output of the heart rate at the time of relaxed and emotional conditions lies in the number of heartbeats, for the number of normal heartbeats when relaxed ranges from 60 to 85 Beat PerMinute (BPM) while the heart rate when emotional conditions range from 100 to 140 Beat PerMinute BPM). With the existence of these tools, it is expected that parents can recognize their emotional conditions so that they are able to make prevention efforts not to commit acts of violence against children.

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