

CHAPTER 1

INTRODUCTION

1.1 Background

The motorcycle is a popular vehicle for middle to low-level society. It is considered as an economic transportation mode to make a short or long trip or just to go around the city. Therefore, many people use this vehicle because of its flexibility. Traffic demand also lead motorcycle to be chosen as private vehicle (Wandani, et. al., 2016). According to Indonesian statistical center bureau (BPS), the amount of the motorcyclist in Indonesia is highest in 2016 as much 105.150.082 million and it will increase continuously (Badan Pusat Statistik, 2018). Indonesia is one of circumstances where motorcycles are utilized as family vehicles which is usually children tend to travel as pillion riders at an early age, most commonly seated in front of the rider, either on fuel tank or in the carrying basket or alternatively behind the rider (Paiman, et. al., 2014).

As stated in Indonesia constitution number 22 of 2009 on Road Traffic and Transportation Article 106 paragraph (9) that "Every person who drives a motorcycle without an additional train is prohibited in carrying passenger more than 1 (one) person". It means that motorcycle is for 2 passengers. In fact, according to the preliminary study that has been done with 15 interviewees, most of them used a motorcycle for bringing more than 1 passenger for longer 2 hours of a long trip, The passenger's sitting position during riding motorcycle is even in astride-sitting and sideways. The standard position of motorcycle passenger is astride-sitting as it is designed with two pedals on each side. For those passenger in 3-4 years old does not be

able to put their foot on the footrest or hang up/down. It because of no facilities to support passenger's feet. Moreover for children whose age are 3-4 years old, the seat depth is not suitable to them that were too shallow increased muscle work, thus increasing fatigue and discomfort (Odunaiya, et. al., 2014). Since movement skills supported by the muscle that used for daily activity needs a physical fitness. Muscular strength and balance are latent by nature. Gender differences has difference motor response as its physical exertion phenomenon in potential of physical fitness and movement skills(Ikeda & Aoyagi, 2009). Footrest is needed for motorcyclist and passenger to make a balance of the upper body and legs as well as avoiding a fatigue. But it is currently designed suitable for those who are adequately tall (Amrutkar & Rajhans, 2017). This condition will produce the inner-thigh pressure which occluded blood supply then it it leads to transient paresthesia (Alhoseini, et. al., 2012). As stated by (Shivakumara BS. and Sridhar V., 2010), the blood is having role to give the muscle energy to get muscular system activity. The measurement of blood pressure is needed to know whether there is the decreasing or increasing the blood flow and the blood flow pressure impact to the semimembranosus muscle during riding motorcycle to avoid transient paresthesia.

Transient Paresthesia is an abnormal sensation of burning, numbness, tingling, itching or prickling caused by the insufficient blood supply to muscle so as inflicting muscle fatigue at the bottom of the thigh (Alhoseini, et al., 2012). A study from Suhardi, et al., (2016) expressed that unavailability of the footrest can leads to the muscle fatigue, especially for children. Muscle fatigue is a decrease in the ability to produce force which it is caused by a reduce the net blood flow to the working muscle (Wan, et. al., 2017). So that, if the blood flow is occluded, the oxygen will be misfired and nerve cannot deliver muscle contraction (Joyner & Casey, 2015).

The Hamstring muscle is located between the hip and knee behind the thigh area. It is composed by three muscle bellies of Bicep Femoris, Semitendinosus and Semimembranosus muscle. The muscle location which from medial hamstring and lateral hamstring is Semimembranosus, Semitendinosus and Biceps Femoris muscle (Onishi et al., 2002). Astride-sitting position is having contact to the lower extrimities of buttock pressure, and another system around the seat. for those who cannot reach the

pedal, the inner thigh surface will be pressed as it balances the physical human posture (Balasubramanian et al., 2014). In this case, the semimembranosus muscle is involved as its location in the inner of the thigh while the hamstrings are contributed in hip and knee postural flexion (Higashihara, et. al., 2014).

To know the muscle activity, the tools named Electromyography or EMG is used for measuring muscle contraction through the electrical signal that could be detected by using electrode pad. It is one of the ergonomic purpose to measure how is a design is caused physical injury to the user (Konrad, 2005). As recognized by many research works, surface electromyography (sEMG) is one of the reliable devices used to evaluate muscle fatigue that is safe for use as it is affixed skin surface to know the muscle activity (Criswell, 2011). Windblast, vibration, noise and motion is environment element that could be (Rashid et al., 2017). This research involve vibration factor as it is a factor that could give impact to blood pressure. Static vibration will cause the blood flow is not smooth by the accumulation of the lactic acid increasing that lead multifunctional muscle pain (NIOSH, 1997). The magnitude of EMG activation was determined using three methods: peak RMS (pRMS), mean RMS (mRMS) and integrated EMG (iEMG). Peak RMS was calculated as the maximum value of the RMS signal during the stance phase of gait. Conversely, mean RMS was calculated as the mean of the RMS signal during the stance phase of gait. For the integrated EMG analysis, EMG signals were integrated across the stance phase of gait (Renshaw, et. al., 2010).

Then, objective of this study is to investigate of muscle contraction of children's inner thigh for motorcycle passenger by using Surface Electromyograph and the signal calculated by mRMS to get the amplitude.

1.2 Problem Formulation

The research problem in this study is “How is the effect of prolonged sitting on motorcycle as passenger at Semimembranosus muscle contraction and blood pressure using *Surface Electromyography* (sEMG) and Oscillometric blood pressure and what is the difference between male and female?”

1.3 Objectives of Research

Based on the problem formulation above, the objectives of research can be arranged as follows:

1. To Evaluate the Semimembranosus muscle contraction in thigh based on EMG signal when riding motorcycle as passenger between male and female passengers.
2. To Evaluate the blood pressure when riding motorcycle as passenger.

1.4 Scope of Research

Every research that done requires the scope and focus of the study is directed. Therefore, this research should be given the restriction, so it can be focused and produce good research. Restrictions on the problem as follows:

1. The experiment of this research involved to motorcycle driver and children in age range 3 – 4 years
2. The family bounded for Family with three-family member with high frequency of motorcycle use as their daily transportation
3. The tools that used in this research are Surface Electromyograph (sEMG) and Oscillometric blood pressure device.

1.5 Benefits of the Research

This topic is beneficial for children who are often join their parents in riding to several destinations. The result of this study is aimed to make children comfort during riding motorcycle as passenger.

1.6 Systematical of Research Writing

This research has been created systematically in chapters as shown below:

Chapter one describes the introduction of this research. This chapter consists of background of research, problem formulation, scope of research, research objective, benefit of research, and systematical of thesis writing.

Chapter 2 is literature review. This chapter will elaborate the deductive and inductive study. Inductive study is important to determine previous literature research and show the knowledge that added in this research. Deductive study is become supporting theory that used for basis in solving the existing problems and answers the problem formulation.

Chapter 3 is methodology of the research. This chapter will describe the methodology by elaborating steps of research in the form of flow process of research that used for describing process of problem solving.

Chapter 4 is data collecting and processing. This chapter will elaborate from showing data that has been obtained and will be process in accordance with the research methods to achieve the objectives of research.

Chapter 5 is result and discussion of the research based on the data collected and processed on chapter 4. This chapter will discuss and analysis the result of data processing. Discussion will be presented result of data processing and analyze with refers to the theory and flow of research that has been presented.

Then, the last chapter is conclusion of this research. The final section will describe the overall conclusions from the results of study and the suggestion for the future research.