CHAPTER 1

INTRODUCTION

1.1 OVERVIEW

Soccer is a most popular game on this planet which involved so much method to play it included heading. Soccer is a sport that not identified as high risk for concussions, but several studies have shown that concussion rates in soccer are comparable with and often exceed those of other contact sports. The actual incidence of soccer-related concussion varies in the literature and likely depends on variables such as age, gender, and level of participation. But the fact is it can lead to traumatic brain injury because of this heading. It is proved by some researchers complained that soccer heading impacted force can cause brain injuries to football player (Andrew Rutherford, 2003). A soccer player can be subjected to an average of six to seven incidents of heading the ball per game. So it was suggested that a single heading will not injure the brain but repetitive heading will. Many researched have proven that heading in soccer can bring bad effect such as concussion and tissues deformations (James R. Funk, 2010). Many existing human skull and neck dummy was developed to study in car crash field such as HYBRID dummy. This kind of dummy can only react to small amount of force and cannot be adjustable to study requirement.

This study requirement is to mimic real neck response while heading the ball and force can be up to 1000 N. New design of neck dummy needed to be developed so it can be fit with requirement of study. So by developing this experimental setup we can analyse how much force impacted to football player’s head during soccer heading by using appropriate.
The acceleration of head during heading also will be determined by placing accelerometer in brain dummy. Experimental results were compared to computed pressures and it was determined that pressures above 34 psi could cause brain concussions (Warren N. Hardy, 1993). So that is why we put accelerometer in brain and not by attached it to the dummy skull. Development of head impact experimental setup is an analysis of force impacted to human head (soccer heading). To analyse this force, setup of experiment need to be developed first which consist of three components, neck, skull and brain. This dummy needed to have almost same properties with real human parts to get better accuracy of result analysis. Finally some derivations of equation and calculations needed to determine whether force impacted will bring harm to human skull or not.

1.2 OBJECTIVES

1. To develop significant method to build neck dummy based on real human neck reaction during soccer heading.
2. To study real neck response during soccer heading
3. To fabricate neck dummy model.
1.3 SCOPE

Soccer is the only sport where the head is used to redirect motion of a ball. Head injury during soccer is usually the result of either direct contact or contact with the ball while heading the ball. There are few types of impacts that can occur to human head such as car crash and another type of collisions. For this experimental setup, scope is limited to impact of soccer heading which force that supply from moving ball and impacted to football player head by soccer heading. So as stated, some researchers believe that this kind of impact can cause concussion to our brain. Besides, the scope is also to build a replica of human neck. The replica is needed to have same properties with real human body part such as damping, stiffness, and elasticity. Neck replica with or without muscular activities may lead to different result because oscillatory head motion and neck muscle activity continue for up to 0.5 s post impact (Philip E. Riches, 2006). Then for validation of this experiment setup, using necessary formulas we will carry out an experiment to make sure this experimental setup can be use and can provide an accurate result. The important for us to develop neck dummy is to assist existing head dummy that used to determined forces impacted to the head. By develop this dummy, force absorbed will be more close to real one and force distribution can be improved.

This dummy need to result same reading of head acceleration of skull attached onto it. Besides, angle of bending also one of parameter that being look for comparison purposed with real human neck.