

# THE IMPORTANCE OF PROPER MOTORCYCLE HELMET BUCKLING: A SCIENTIFIC STUDY

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**Abstract.** This research investigated the effect of proper motorcycle helmet buckling on head injury through experimentation. The study used an Instron Dynatup 9250HV monorail impact machine, with a single open-face helmet attached to a Hybrid III dummy and a Shimmer 200g IMU sensor installed in the dummy's skull. The helmet used in the research was a certified helmet from SIRIM Berhad. It was impacted at the frontal location in two different scenarios. Firstly, as a loosely buckled helmet with the impact occurring on the face shield, and secondly, as a firmly buckled helmet with the impact correctly absorbed by the frontal helmet shell. The protective performance of the helmet was evaluated using peak linear acceleration (PLA), peak rotational acceleration (PRA), head injury criterion (HIC), and brain injury criterion (BrIC). The results showed that the loosely buckled helmet had higher values for PLA, PRA, HIC, and BrIC, indicating a higher head and brain injury risk. It is worth noting that the impact on the face shield was at a slightly lower speed than the impact on the helmet shell, but the acceleration profile for the improperly buckled helmet still showed a higher PLA value. The comparison of both scenarios is at the impact speed of 6.0 m/s. This research provides scientific evidence supporting the importance of proper helmet buckling to reduce the risk of injury and potentially save lives.

**Keywords:** Motorcycle helmet; head impact; peak linear acceleration; peak rotational acceleration; head injury criterion; brain injury criterion.

## 1 Introduction

A motorcycle helmet is a type of protective headgear worn while riding a motorcycle. It is designed to protect the motorcyclist's head in the event of an accident and may reduce the severity of head and brain injuries sustained in the crash. The use of helmets is mandatory for both the motorcyclist and the pillion passenger, according to countries.