

Dissertation thesis  
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## **ABSTRACT**

**Title:** Detection of head biomechanical response during extreme loading

**Objectives:** The aim of the work was to monitor the current state of knowledge on the issue of closed head injuries, in contact and contactless respectively impacts, to establish appropriate biomechanical indicators for the detection and analysis of internal mechanical response under external mechanical load and to assess the specific circumstances that may affect the resulting injury criteria especially with regard to the actual reaction of the organism before impact.

**Methods:** To the processing research were included and cited in particular impacted world-class publications and bibliography in the number of more than 80sources. The measurements and analysis of contact impacts were taken on the constructed impactor and the analysis of the contactless collisions were taken on the impacts simulator. The monitored biomechanical values were in particularly kinematic data describing the movement of the head towards the neck, values of acceleration of the head, head injury criteria and activity of selected muscles of the neck.

**Results:** It consists diagram of the process of head injury and analysis of two main branches - contact and contactless impacts. It turned out that for the determination of external mechanical response of the head is an important parameter of activity neck muscles, respectively expectation or non-expectation of the impact. The quantities affecting neck injury and head injury criteria were decreased related the visual perception and stronger pre-activation of muscles sternocleidomastoid and trapezius.

**Key words:** EMG, frontal impact, Qualisys, simulator of impacts, Whiplash.