

# Study on an estimation of comfort and fatigue in seating using a musculoskeletal simulator

Shinya Okamoto<sup>1)</sup> Hisato Fukuda<sup>1)</sup> Tsutomu Iwase<sup>1) 2)</sup> Shuta Imai<sup>1)</sup> Nobuaki Nakazawa<sup>1)</sup>

Masaaki Sakamoto<sup>1)</sup> Shunpei Nakamura<sup>2)</sup> Norio Ido<sup>2)</sup> Yusuke Takagi<sup>2)</sup>

1) Gunma University,

4-2 Aramaki-cho, Maebashi-shi, Gunma, 371-8510, Japan

2) SUBARU CORPORATION

1-20-8 Ebisu, Shibuya-ku, Tokyo, 150-8554, Japan

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Fatigue affects various factors related to driving, such as muscle weakness as well as poor concentration and judgement. Therefore, it is important to quantify the degree of comfort and fatigue in the seated posture during driving. The purpose of this study is to estimate comfort and fatigue in seating from the results of simulator analysis. The advantages of a musculoskeletal simulator are the ability to estimate all of muscle activity, the ability to estimate the function of deep muscles, and the low cost and load of experiments. In this experiment, a musculoskeletal simulator: Anybody was used to calculate muscle activity during seating. In this experiment, total muscle strength in the body was used as a measure of fatigue. This value indicates the amount of energy used by all the muscle in the body. Figure 1 shows the total muscle strength for each posture analyzed by the musculoskeletal simulator. The vertical axis of the figure is the total muscle strength required to maintain the posture, arranged for each postural condition. Color-coding of the bars indicates the various parts of the human body. These results were compared to the sensory evaluation during seating, which was determined by experiment. Although total muscle strength was expected to have a linear effect on fatigue, no such as this result. Comparing the total muscle strength and sensory evaluation results for each part, lower extremity muscle load has little effect on fatigue (Figure 2). Fatigue in the lower extremities seems difficult to estimate with a musculoskeletal simulator. On the other hand, the muscle load above the waist was in good agreement with the sensory evaluation results. In particular, the hip-joint muscle load was in good agreement with the sensory evaluation results (Figure 3). When estimating fatigue from a musculoskeletal simulator, the focus is on the hip joint. These results provide some insight into estimating fatigue and comfort in a musculoskeletal simulator.

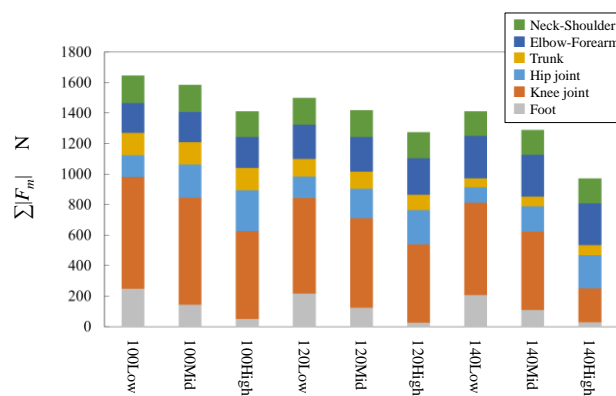


Fig.1 Postural comparison of total strength.

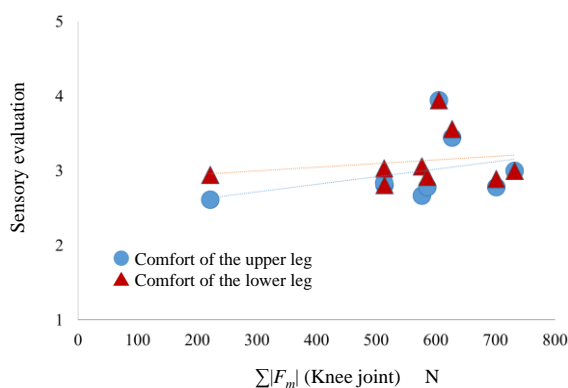


Fig.2 Knee-joint muscle strength and sensory evaluation results.

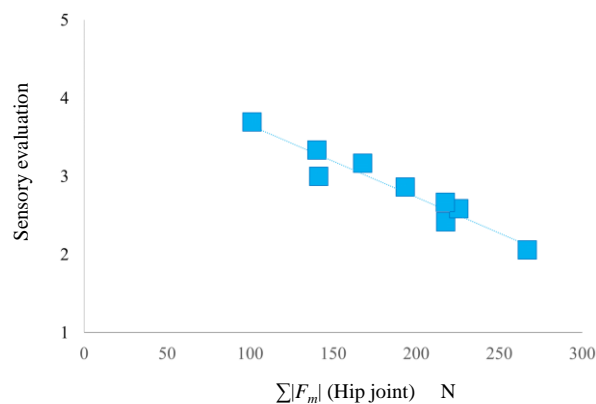


Fig.3 Comparison of hip joint muscle strength and lumbar sensory evaluation results.