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学位論文題目	Investigation into the sitting comfort of train seats by using numerical analysis and psychophysiological evaluation (数値解析と心理生理評価を用いた鉄道車両用シートの座り心地に関する研究)		
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論 文 内 容 の 要 旨

Trains that can transport many passengers are important means of communication and have improved our standard of living. It's necessary for trains not only to be functional, but to have amenities as well, such as sitting comfort. The train seat is important because passengers must often sit for prolonged periods before reaching their destination. Much research has addressed this subject of sitting, which includes many facets. Therefore, we have focused on three topics of sitting comfort. This thesis proposes guidelines for developing train seats from multiple viewpoints. 1) In Chapter 2, we discuss our investigation of sitting comfort from the viewpoint of the internal stress on intervertebral discs, using the finite element method (FEM) for analysis. Stress distribution, which results from internal deformation in the body, should provide valuable information because the sensory receptor detects internal deformation while sitting. We performed three experiments in this regard. First, we performed experiments to categorize three postures that occur while sitting. Second, we constructed three FEM models that correspond to the three sitting postures and estimated internal stress by FEM analysis. Finally, we conducted 30-minute experiments to evaluate impression while sitting both subjectively and through FEM analysis by comparing the internal stress and subjective evaluation results. Based on our findings, large amounts of stress on the lumbar region cause lumbar pain. Thus, stress distribution is one of the important criteria to address when designing comfortable seats. 2) In Chapter 3 we discuss our investigation of the influence of seat colors on comfort because it is assumed that color visually affects KANSEI. We describe three experiments that we performed to this end. In the first experiment we prepared images of different seat colors. In the second, we carried out sensory tests on personal computer displays. In the third experiment, we examined the visual influence of seat colors on sitting comfort using various seat colors on actual train seats. Based on all of the experimental results, it is thought that seat color affects sitting comfort individually as the impressions of the raters were different for the various hues. For instance, evaluation scores for red seats varied widely, green was considered a “safe” color, and blue seats were preferred by most of the subjects. 3) In Chapter 4, because leg swelling that results in languor of the lower legs decreases sitting comfort, we investigated the

angle of the footrest that could alleviate this problem, thereby increasing sitting comfort. We fabricated three footrests with different angles (0°, 15°, 30°) and measured leg swelling and blood flow after using each footrest. The results indicated that leg swelling increased when the footrest simulated sitting on a high stool and decreased when the rater sat on the trial seat with a 30° footrest. It thus appears that there is strong correlation between leg swelling and blood flow.