

Analysis of Dominant Sensory and Physical Factors for Sitting Comfort of Vehicle Seats (2nd Report)

-Study of Contact Perception Based on Sensitivity in the Back-

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In order to digitize the feelings for sitting, the dominant feelings for sitting comfort were analyzed in first study. We focused on “size feeling” and investigated the effect of the pressure contact area on that. The result showed that pressure contact area of the backrest has a major effect to “size feeling” as compared with the bottom of seat, and indicated the possibility of additional elements relevant to the comfort. In this second study, we analyzed other elements except contact area.

First, we investigated what the difference is in size feeling. Six participants sat 4 seats of different vehicles and compared size feeling. Then, they drew how the back contacts for each seat. At the same time, the pressure distributions on the seat while sitting were measured with a pressure sensing sheet. Comparing drawing by seats showed difference in the upper back between large feeling and small feeling seat. Some Participants said that they felt presence larger than real contact and the outlines dimmed in the large feeling seat. Conversely, some participants said that the small feeling seat had pressure concentrated on the convex part of the inner edge of the scapula, and it was clearly felt to be the edge of the seat. On the other hand, the pressure measurement results showed that there was no difference in the contact height of the some seat in spite of the difference in the drawing. In addition to contact height, it is thought that the strength of the load itself, contact points, pressure balance between contact points and surroundings, and so on were related with size feeling.

Subsequently, we investigated the sensitivity of the contact for each part of the back to investigate how and where the contact on the back makes the size feel larger. We divided the right side of the back by 12 area based on bone (3 area for the sideways: spine, between spine and scapula, scapula, and 4 area of the verticalways: scapula, ribs, waist, pelvis). Then, we pressed each area with a pressure plate ($\phi 50\text{mm}$) for twelve participants, and they answered the load that felt the same pressure as the reference load. The result showed that the pressure sensitivity was sensitive from the waist center toward the outside of the shoulder (see fig.1).

Furthermore, focusing on comments such as “dimmed” and “expanding”, we conducted a sensory survey of the contact area and the dim level for each part of the back to confirm the parts where the blurring and expanding feels were likely to occur. After simulating a seating state, participants were given randomly load with two size of pressure plate on each part of the back that was the contact edge (top of spine (avoid the bone and placed on the intercostal space), top of scapula, side of scapula, side of ribs, waist, side of pelvis). Participants answered the contact area feeling and level of dim feeling for each trial. The result showed that upper back was easy to feel contact even with small load and recognize the shape of contact surface (see table1). In addition, it was considered that the upper back, in particular, was able to recognize contact even when the pressure was about the lower limit of the measurable range of the pressure sensing sheet. Whereas lower back had low pressure sensitivity and felt dim even at relatively large load, upper back felt easier to be given a change in the impression of blurring and size than lower back. Besides, it was thought that blurring of edge and gradual change in contact make participants feel larger contact area than the actual area or feel fit shape to the body, and thus inducing an illusion that the seat contact continues beyond the recognizable contact. In the future, based on the above results, we will continue to consider the commercialization of seats that feel large without changing the dimensions.

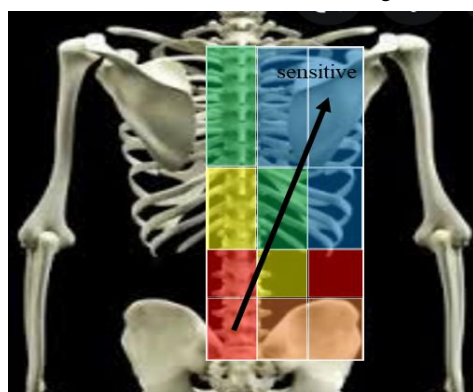


Fig.1 pressure sensitivity image

Table1 Average of 4 panelers' dim level

$\phi 25$ pressure plate							
body region	1N	2N	3N	4N	5N	7N	10N
Top of spine	5.0	4.5	3.8	3.3	3.0	2.0	1.3
Top of scapula	4.5	4.3	3.0	3.5	2.5	2.0	1.3
Side of scapula	5.0	4.3	3.3	2.8	2.0	1.8	1.3
Side of ribs	4.8	4.0	3.5	3.3	3.0	1.8	1.8
waist	5.0	4.8	3.8	3.5	3.0	2.3	1.8
Side of pelvis	5.0	4.3	4.3	4.3	3.8	2.8	2.3

