

Measurement of Spinal Column Shape in Sitting on an Automobile Seat

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Human posture changes according to a target task, and the spinal column shape changes accordingly. It is essential to focus on the shape of the spine when evaluating posture such as sitting on the car seat. In this study, we constructed a spinal column shape measurement system on the premise of measuring the sitting posture on a chair with a backrest, which was difficult to measure in the past. Fig. 1 shows the sensor part for measuring the shape of the spine. In order to measure the spinal column shape from the thoracic vertebrae (T1) to the lumbar vertebrae (L5) in a sitting posture, a strip-shaped sensor is fixed along the spine part of the back. The strip-shaped sensor consists of a strip-shaped thin FPC with a length of 450 mm and a width of 10 mm, and 10 acceleration sensors are arranged at intervals of 50 mm. Fig. 2 shows how the belt-shaped sensor is attached. First, a medical tape (1. Medical tape) is pasted along the spine, and the sensor of Ch1 is fixed on top of it with tape (2. Adhesive tape) so that it is above the first thoracic vertebra (T1). From Ch2 onwards, it is possible to move up and down along the guide, and both ends of the guide are fixed with tape (3. Adhesive tape). Fig. 3 shows the measurement results of the spinal column shape in standing state. The origin in the figure is the position of the thoracic vertebrae (T1), and each point is plotted along the shape of the spinal column, representing the situation when viewed from the left side of the experimental participant. As shown in this figure, in the case of this experiment participant, a convex shape can be seen around the origin, but it can be confirmed that the part further down has an almost straight shape. Next, Fig. 4 show the measurement results when the participant was directed to seat on the car seat. Compared to the standing state in Fig. 3, the shape of the spine has clearly changed when sitting on the seat. This is because the contact force received from the backrest affected the shape change of the spine.

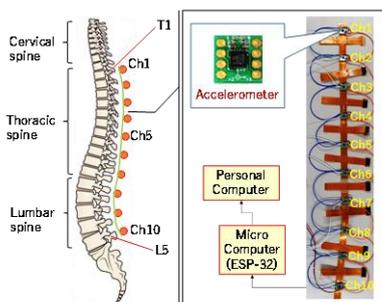


Fig.1 Sensor for spinal shape measurement

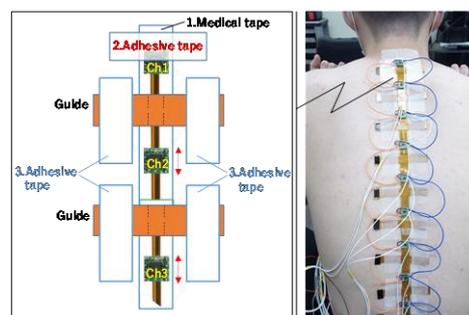
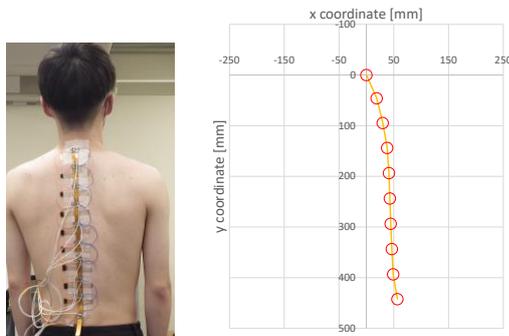
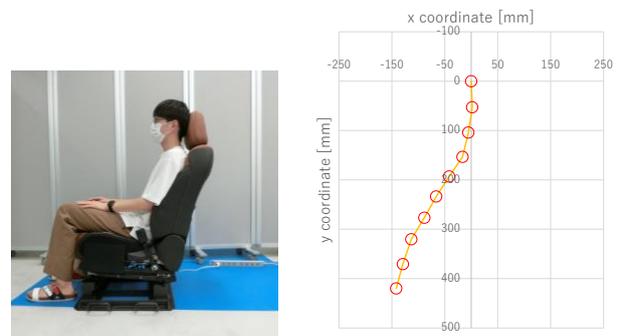


Fig.2 Method to fix the sensor



(a) Posture (b) Spinal shape
 Fig.3 Measurement (Standing situation)



(a) Posture (b) Spinal shape
 Fig.4 Measurement (Seat back angle: 0 deg.)