THE TRANSMISSION OF FORE-AND-AFT AND VERTICAL VIBRATION TO VARIOUS LOCATIONS ON A CAR SEAT

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Seat transmissibility is used to evaluate the dynamic performance of car seats and characterise the dynamic interaction between seats and seat occupants. The transmission of vertical and fore-and-aft vibration from the seat base to six positions on a car seat has been investigated in the laboratory with 12 male subjects exposed to 120-s broadband random vibration (in the frequency range 0.25 to 40 Hz) at three vibration magnitudes (0.4, 0.8, and 1.2 ms^{-2} r.m.s.).

The vertical transmissibility from the seat base to the seat cushion surface exhibited a principal resonance around 4 to 5 Hz and was also greater than unity at frequencies greater than 20 Hz. The vertical transmissibilities from the seat base to the backrest surface, to the backrest frame, to the headrest surface, and to the headrest frame also showed a first resonance around 4 to 5 Hz. The principal resonance frequency in the vertical transmissibility to all locations (except the seat cushion frame), and the transmissibility at the resonance, decreased with increasing magnitude of vibration, indicating non-linearity in the seat-occupant system. A secondary resonance in all transmissibilities around 37 Hz may reflect a resonance in the structure of the seat frame.

When exposed to fore-and-aft vibration, the transmissibility from the seat base to the seat cushion surface and frame exhibited a slight peak around 3.75 to 4 Hz and increasing transmissibility as the frequency increased, especially at frequencies greater than 30 Hz. The transmissibility from the seat base to the backrest surface and the backrest frame showed a first resonance around 4 to 5 Hz. A similar resonance was evident in the fore-and-aft transmissibility from the seat base to the headrest surface and headrest frame. The transmissibilities from seat base to seat cushion surface and seat frame showed high coherency, whereas the transmissibilities from seat base to the headrest and backrest exhibited relatively low coherency especially with increased vibration magnitudes.

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