

## Ambient Factors in the Perception of Crowding in Public Transport

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**Abstract :** Travel comfort is increasingly seen as crucial to effecting the switch from private motorized modes to public transit. Surveys suggest that travel comfort is closely related to perceived crowding, that may involve lack of available seating, difficulty entering and exiting, jostling and other physical contacts with strangers. As found in studies on environmental stress, other factors may moderate perceptions of crowding-in this case, we hypothesize that the ambient environment may play a significant role. Travel comfort was measured by applying a structured survey to randomly selected passengers (n=369) on 3 lines of the Beijing metro on workdays. Respondents were standing with all seats occupied and with car occupancy at 14 levels. A second research assistant filmed the metro car while passengers were interviewed, to obtain the total number of passengers. Metro lines 4, 6 and 10 were selected that travel through the central city north-south, east-west and circumferentially. Respondents evaluated the following factors: crowding, noise, smell, air quality, temperature, illumination, vibration and perceived safety as they experienced them at the time of interview, and then were asked to rank these 8 factors according to their importance for their travel comfort. Evaluations were semantic differentials on a 7-point scale from highly unsatisfactory (-3) to highly satisfactory (+3). The control variables included age, sex, annual income and trip purpose. Crowding was assessed most negatively, with 41% of the scores between -3 and -2. Noise and air quality were also assessed negatively, with two-thirds of the evaluations below 0. Illumination was assessed most positively, followed by crime, vibration and temperature, all scoring at indifference (0) or slightly positive. Perception of crowding was linearly and positively related to the number of passengers in the car. Linear regression tested the impact of ambient environmental factors on perception of crowding. Noise intensity accounted for more than the actual number of individuals in the car in the perception of crowding, with smell also contributing. Other variables do not interact with the crowding variable although the evaluations are distinct. In all, only one-third of the perception of crowding ( $R^2=.154$ ) is explained by the number of people, with the other ambient environmental variables accounting for two-thirds of the variance ( $R^2=.316$ ). However, when ranking the factors by their importance to travel comfort, perceived crowding made up 69% of the first rank, followed by noise at 11%. At rank 2, smell dominates (25%), followed by noise and air quality (17%). Commuting to work induces significantly lower evaluations of travel comfort with shopping the most positive. Clearly, travel comfort is particularly important to commuters. Moreover, their perception of crowding while travelling on metro is highly conditioned by the ambient environment in the metro car. Focussing attention on the ambient environmental conditions of the metro is an effective way to address the primary concerns of travellers with overcrowding. In general, the strongly held opinions on travel comfort require more attention in the effort to induce ridership in public transit.

**Keywords :** ambient environment, mass rail transit, public transit, travel comfort

**Conference Title :** ICSRD 2020 : International Conference on Scientific Research and Development

**Conference Location :** Chicago, United States

**Conference Dates :** December 12-13, 2020