

## **Modelling the perception of weather conditions by users of outdoor public spaces**

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Outdoor public spaces play an important role for the quality of life in urban areas. Their usage depends, among other factors, on the bioclimatic comfort of the users. Climate change can modify the uses of outdoor spaces, by changing temperature and rainfall patterns. Understanding the way people perceive the microclimatic conditions is an important tool to the design of more comfortable outdoor spaces and in anticipating future needs to cope with climate change impacts.

The perception of bioclimatic comfort by users of two different outdoor spaces was studied in Lisbon. A survey of about one thousand inquires was carried out simultaneously with weather measurements (air temperature, wind speed, relative humidity and solar and long wave radiation), during the years 2006 and 2007. The aim was to assess the relationships between weather variables, the individual characteristics of people (such as age and gender, among others) and their bioclimatic comfort. The perception of comfort was evaluated through the preference votes of the interviewees, which consisted on their answers concerning the desire to decrease, maintain or increase the values of the different weather parameters, in order to improve their comfort at the moment of the interview.

The perception of the atmospheric conditions and of the bioclimatic comfort are highly influenced by subjective factors, which are difficult to integrate in a model. Nonetheless, the use of the multiple logistic regression allows the definition of patterns in the quantitative relation between preference votes and environmental and personal parameters.

The thermal preference depends largely on the season and is associated with wind speed. Comfort in relation to wind depends not only on the speed but also on turbulence: a high variability in wind speed is generally perceived as uncomfortable. It was also found that the acceptability of warmer conditions is higher than for cooler conditions and the majority of people declared preference for lower wind speed in all the seasons. It was observed that adaptive strategies are undertaken to improve their level of comfort, namely through changes in clothing and displacement between shade/sunshine conditions.

Older people declared lower discomfort, possibly due to higher clothing insulation and lower climatic sensitivity. The perception of wind is strongly influenced by gender, with women declaring a lower level of comfort when wind speed increases. Other personal characteristics found to have a significant influence were: company - people accompanied declared higher thermal comfort than people alone - and geographic origin, e.g. Brazilian people demonstrated a much lower tolerance to cool conditions than other communities. It should be noted that most Brazilians arrived in Portugal much more recently than, for example, African people, whose responses, in turn, did not reveal a significant difference from the general population, probably due to a certain degree of climatic adaptation already acquired.

This study provides a framework to assess the perception of the bioclimatic comfort in outdoor open spaces. Furthermore, it constitutes a potential contribution to the design of more satisfying leisure areas in a future context of warmer cities.