

Accepted Manuscript

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PII: S0360-1323(18)30595-X

DOI: [10.1016/j.buildenv.2018.09.036](https://doi.org/10.1016/j.buildenv.2018.09.036)

Reference: BAE 5712

To appear in: *Building and Environment*

Received Date: 25 July 2018

Revised Date: 14 September 2018

Accepted Date: 19 September 2018

Please cite this article as: Buonocore C, De Vecchi R, Scalco V, Lamberts R, Influence of relative air humidity and movement on human thermal perception in classrooms in a hot and humid climate, *Building and Environment* (2018), doi: <https://doi.org/10.1016/j.buildenv.2018.09.036>.

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Influence of relative air humidity and movement on human thermal perception in classrooms in a hot and humid climate

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ABSTRACT

In equatorial, hot-humid tropical climates, users of naturally ventilated environments are commonly susceptible to heat discomfort caused by high air temperatures and thus require more air movement to improve thermal comfort. To evaluate the influence of relative humidity and air speed on the occupant's thermal perception, field studies were conducted in naturally ventilated and fan-assisted classrooms in São Luis City, North-Eastern Brazil. Indoor environmental variables were measured alongside questionnaires, focusing on thermal environment and air movement evaluation. The results indicated that relative humidity had a significant negative impact on thermal perception when the operative temperature was above 30 °C, while airspeed played a key role in reducing thermal discomfort. Despite the contribution of internal air movement, it was concluded that, when the indoor operative temperature exceeded 31 °C, mechanical cooling is required to achieve thermal comfort. The results also indicated the great acceptability of indoor conditions, as well as the influence of environmental variables on student's thermal perception in naturally ventilated spaces.

Keywords: Hot-humid climate; Relative humidity; Airspeed; Natural ventilation; Classrooms.

1 INTRODUCTION

In hot and humid climates, air movement plays a key role in heat exchange between the body and the environment, reducing the sensation of heat and consequently improving occupants' thermal comfort [1–8]. Additionally, in this type of climate, air moisture levels should be maintained within acceptable ranges, as several studies have demonstrated that this variable has a measurable impact on occupant's thermal sensation [1,4,5,9–14]. Thus, when the temperature and humidity are high, and air movement is low, thermal comfort may not be achieved.

By understanding the effect of air temperature on occupants' thermal comfort, air movement is frequently focused upon in field experiments [1,2,20,21,3–5,15–19], while there is still little

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