PAPER REF: 4648

STUDY OF THERMAL ENVIRONMENT IN HOSPITAL GYMNASIUMS OF REHABILITATION

C. Rodrigues[1(*)], J. Santos Baptista[1], M. Brito[2]
[1]PROA/LABIOMEP/CIGAR, Faculty of Engineering, University of Porto, Porto, Portugal
[2]CMUP, Faculty of Science, University of Porto, Porto, Portugal
[(*)]*Email:* pee10017@fe.up.pt

ABSTRACT

In hospital gymnasiums of rehabilitation, thermal environmental conditions represent a transversal risk factor to all occupants (patients, professionals) and with great impact on the sustainability of these institutions. In order to evaluate the thermal comfort conditions, in these places, we analyzed three gymnasiums of rehabilitation of patients. The results revealed situations of discomfort, according to the index values PPD / PMV. It is necessary to analyze these situations, carefully, to minimize energy consumption and improve the thermal comfort of occupants.

Keywords: thermal environment, thermal comfort, hospitals, gymnasiums, physical medicine and rehabilitation.

INTRODUCTION

The hospital gymnasiums of rehabilitation are one of the services where the thermal environmental conditions are a risk factor for its users. Although all occupants (patients, professionals) are exposed to the same conditions, the consequences differ due to multiple factors such as metabolism and clothing for each occupant (Khodakarami et Knight, 2008), which depend on the functions and activities they do.

For patients, the thermal discomfort is explained mainly by the thermoregulatory capacity change, which is affected by several factors, including the age, due to a decrease in sweat gland function, blood circulation and cardiac function (Kenney et Munce, 2003), impaired physical capacity and the increased use of medications. The main risk groups are old people, children's, pregnant women's and people with physical and cognitive limitations and low socioeconomic status (Balbus et Malina, 2009).

For professionals, postures more physically demanding induce an increase in body internal temperature (Rodrigues, Guedes et Baptista, 2011). The exposure to elevated temperatures can lead to cognitive behavioral changes (Tawatsupa et al. 2010); decreased ability to wake and resistance (Enander, 1989), the accumulation of fatigue and, consequently, to increase the probability of having an accident. The practice of hard work in very hot or very cold ambient also reduces the ability to work (Rodrigues, Guedes et Baptista, 2011).

In this work, we followed the references of ISO 7730, to assess the conditions of the thermal environment, in hospital gymnasiums of physical medicine and rehabilitation services, in order to finding sustainable solutions for thermal comfort, that may include patients and professionals.

RESULTS AND CONCLUSIONS

The study of the thermal environment focused in two different seasons, spring and autumn, in order to investigate a possible variability in response.

Following the references of ISO 7730, the results show that, regardless of the season, all gymnasiums have thermal discomfort conditions. In both seasons, the thermal discomfort values may be explained by very low values of relative humidity, associated with highly demanding physical activity and posture and also the use of too many garments by professionals.

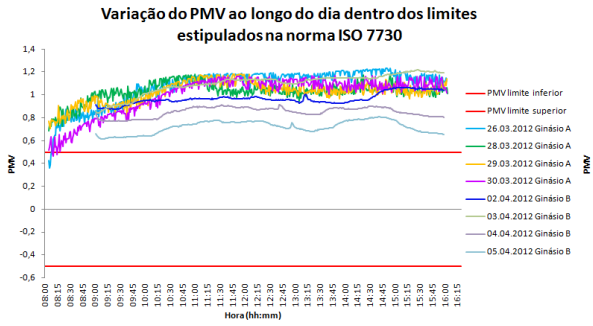

Fig. 1 - PMV values - spring

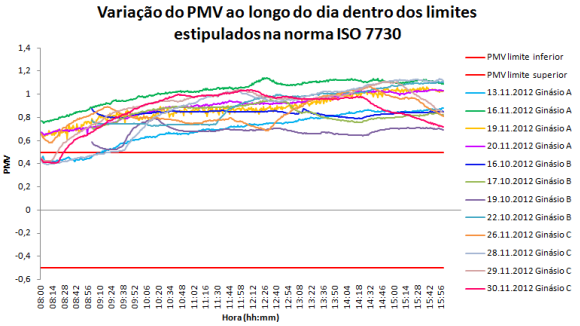

Fig. 2 - PMV values - autumn

Based on the values obtained, we tried to examine the effects, in terms of thermal comfort, of decreasing the metabolic activity (decreased requirement of the task) and the number of pieces of clothing.

The results showed the possibility of obtaining satisfactory and sustainable thermal comfort values through the of not environmental parameters.

REFERENCES

[1]-Balbus, J. M. et C. Malina (2009). “Identifying Vulnerable Subpopulations for Climate Change Health Effects in the United States.” Journal of occupational and environmental medicine 51(1): 33-37.

[2]-Enander, A. E. (1989). “Effects of thermal-stress on human-performance.” Scandinavian journal of work, environment & health 15: 27-33.

[3]-Kenney, W. L. et T. A. Munce (2003). “Invited review: Aging and human temperature regulation.” Journal of applied physiology 95(6): 2598-2603.

[4]-Khodakarami, J. et I. Knight (2008). "Required and Current Thermal Conditions for Occupants in Iranian Hospitals." HVAC & R research 14 (2): 175-193.

[5]-Rodrigues, C., Guedes, J. C. et J. S. Baptista (2011). “Ambiente Térmico e o seu impacto do Homem - Análise numa prespectiva Homem/Ambiente/Trabalho.” Congresso Luso-Moçambicano de Engenharia.

[6]-Tawatsupa, B. et al. (2010). “The association between overall health, psychological distress, and occupational heat stress among a large national cohort of 40,913 Thai workers.” Global Health Action 3: 1-10.