

# 運動中心使用情形與室內空氣品質之相關性

## The determinants of indoor air quality in a sports center

### 中文摘要

研究目的：了解某運動中心內各區域、不同時段之空氣品質、室內運動中心工作人員和使用者對其室內空氣品質之感受，探討影響室內運動中心空氣品質與人員感受之相關因素，並據以對該室內運動中心提出管理建議。

研究方法：利用直讀式儀器 PP Monitor SAS 和手提式微粒質量濃度採樣器測量，項目包括二氧化碳(CO<sub>2</sub>)、一氧化碳(CO)、甲醛(formaldehyde)、總揮發性有機化合物(TVOC)、粒徑小於 10 微米之懸浮微粒(PM<sub>10</sub>)、粒徑小於 2.5 微米之懸浮微粒(PM<sub>2.5</sub>)、臭氧(O<sub>3</sub>)、溫度(T)、相對溼度(%)；利用結構式問卷調查運動中心工作人員和使用者基本資料、個人健康狀況、工作環境狀況、使用運動中心情形和運動中心空氣品質感受度調查。

結果：一週之量測結果顯示，除臭氧和二氧化碳值外其他空氣品質數據均未超過環保署建議值。二氧化碳濃度晚上顯著高於上午時段；甲醛和總揮發性有機化合物濃度上午顯著高於下午。多功能運動中心人數超過 80 人、射擊場人數超過 15 人及健身中心人數超過 40 人時，二氧化碳濃度有超過 1000ppm 之虞。問卷結果顯示，健身中心和游泳池為運動中心中使用率最高之場所。89.3%的使用者及 75.6%工作人員對於空氣品質感到滿意。對空氣品質表示不舒適者以游泳池使用者、健身教練、游泳教練以及射擊場教練為主。

結論：運動中心以健身中心與游泳池的使用頻率最高，但此二場所之空氣品質較不理想，建議運動中心可透過有效率的人數管控或增加通風換氣率，加強改善空氣品質以增進使用者與工作人員的舒適感。

### 英文摘要

Purpose : The aim of this study is to evaluate the indoor air quality and the satisfaction of users and workers in a sports center.

Methods : Indoor climate variables monitored were: carbon dioxide(CO<sub>2</sub>), carbon monoxide(CO), formaldehyde(HCHO), total volatile organic compounds(TVOC), particulate mater 10(PM<sub>10</sub>), particulate mater 2.5(PM<sub>2.5</sub>), Ozone(O<sub>3</sub>), Temperature(T) and releative humidity(RH%). The evaluation was carried out at a sports center in Taipei. All data collected were monitored by PP Monitor SAS and Aerocet531. Data were anlyzed by SPSS15.0.Questionnaire regarding the general information was filled in by users and workers in the sports center. Questionnaire containing questions on personal data, personal health condtion, work environment, determinants of sports center quality and air quality.

Results : The weekly measurement shows that most of the air quaily are within the

EPS suggested level except O<sub>3</sub> and CO<sub>2</sub> items. The CO<sub>2</sub> conc. is higher significantly during night than in the morning; HCHO and TVOC conc. are higher significantly before noon than afternoon..When users are more than 80 in multi-function sport court, users of more than 15 in shooting court and users of more than 40 in gymnasium, the CO<sub>2</sub> conc.will probably exceed 1000 ppm and should be concerned. Gymnasium and swimming pool have the highest using rates. 89.3% of users and 75.6% of workers were satisfied with air quality. Persons mainly of the swimming pool users, fitness trainers, swimming coaches and shooting coaches express dissatisfaction.

Conclusion : The most frequent used utilities in sports center are gymnasium and swimming pool; however, the air quality in these places is rather undesirable. Therefore, sport center could stress on improvement of air quality in these two fields, through efficient population control or higher ventilation, to increase the comfort of customers and workers.