

# Advances in Room Acoustics of Non-Performing Public Spaces

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Room acoustics is one of the most important areas of acoustics and is the study of acoustics in predominantly enclosed spaces such as rooms in the built environment. Since the sound field becomes rather complicated in such enclosed spaces, many studies have been described since W. C. Sabine's seminal work on reverberation in rooms [1]. Since this pioneering work, room acoustics has been developed predominantly concerning spaces for performing arts, such as auditoria, concert halls, theatres, etc.

On the other hand, room acoustics of non-performing public spaces has not been widely studied. However, researchers' attention has recently turned to the acoustic environment of spaces such as schools, hospitals, nursing homes, etc. This trend was sparked by increasing calls to improve acoustic environments in spaces for everyday activities, not just for performing arts.

This Special Issue aims to collect recent works relating to the advances in room acoustics of non-performing public spaces. Nine papers, including a technical note and a review article, are thus enclosed. A brief summary of each paper is given below.

Considering their importance, schools should be one of the most studied spaces in acoustical studies. Evans et al. [2] studied the acoustic environment of a classroom from a unique aspect. They investigated the importance of implementing good acoustics in classrooms using sound amplification systems for a more effective English education for elementary school children. Devices for improving the acoustic environment are also essential. Traditionally, the chosen area of study has been sound absorption materials; however, in recent studies, sound diffusion has been attracting increased attention. Yoshida et al. [3] proposed a crossed rib diffuser as an effective tool for controlling room acoustics after an in-depth investigation. Regarding sound absorption, a study by Hoshi et al. [4] revealed its influence on acoustics in general dwellings, presenting a correlation between sound absorption and a subjective evaluation.

Increasing demands for more health and fitness halls are further increasing the importance of sound environment. Al-Arja [5] studied the interior acoustics—including reverberation time and activity noise levels—of 20 indoor sports and gymnasium halls. Interviews and questionnaires were also used to assess subjective comfort levels.

Devos et al. [6] studied the interior acoustics of nursing homes. They proposed a revised form of a model to predict ambient noise levels based on occupancy, alongside an estimation of the acoustical capacity in nursing homes for dementia patients.

Shopping malls are also important subjects of research in this field. Alnuman and Altaweel [7] compared the interior acoustics of an empty vs. an occupied shopping mall; measuring the reverberation time and the equivalent sound pressure levels (LAeq) at different times of the day. A questionnaire survey also revealed that headaches and difficulties in speech communication are the prominent issues caused by noise in shopping malls.

Wu et al. [8] presented a series of field measurements and subjective evaluations that investigated the thermal comfort and acoustic performance of eighteen hospitals in China. They discussed the interaction between the thermal environmental conditions and acoustic environmental conditions.



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Yang et al. [9] presented a comprehensive systematic review on the sound environments in large public buildings. By searching the Scopus database, they collected studies from museums and exhibition spaces, shopping malls, and transportation hubs and stations; spaces involving large crowds and crowd movement. Studies were selected if they included data on physical outcomes or individual responses to the sounds in such environments. Through a detailed analyses, they concluded that sufficient acoustic comfort can be achieved by integration of the design of indoor soundscapes.

Nojima et al. [10] studied the acoustic environment of a former Hotel Okura Tokyo's lobby that was famous for its superior acoustics. This study shed light upon the acoustic environment of the hotel lobby from a historical point of view from extensive data measurements.

As introduced above, this Special Issue details a wide variety of studies on acoustic environments in non-performing spaces, including schools, meeting rooms, dwellings, fitness halls, nursing homes, shopping malls, hospitals, hotels, and large public spaces, providing recent developments in acoustic studies on the areas of interest.

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