

Effects of noise and reverberation on verbal short-term memory in young adults in a classroom-like setting

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Introduction

Verbal short-term memory is impaired by task-irrelevant speech and nonspeech sounds that the participants are instructed to ignore (Kjellberg et al., 2008; Buchner et al., 2005). In this study, the combined effects of noise and reverberation on short-term memory for spoken words were analyzed. It was hypothesized that classroom reverberation increases the detrimental effects of irrelevant sounds on short-term memory, even under conditions of perfect intelligibility of the to-be-remembered words.

Method

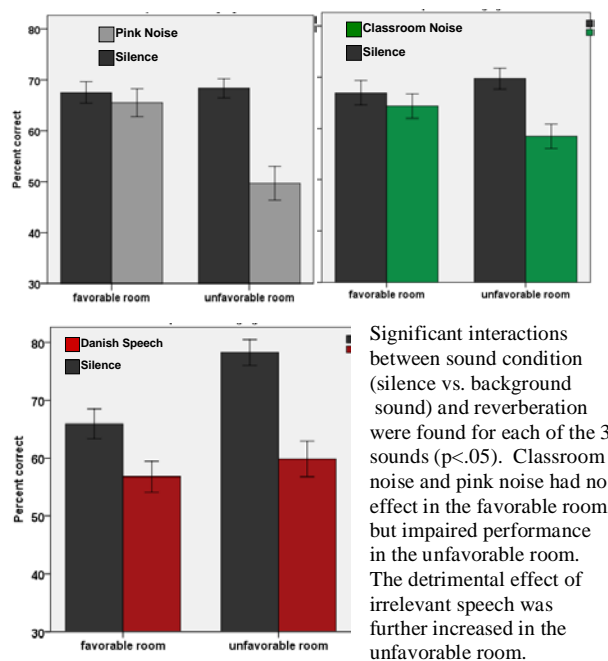
The experiments were conducted in a seminar room equipped with an acoustic system allowing variation of reverberation times (Variable Room Acoustics System, VRAS). The room acoustical parameters of a real, middle-size classroom were measured before and after renovation and reconstructed with a set of tuning procedures. In the favorable room, mean RT was 0.47, according to current guidelines. In the unfavorable room, mean RT was 1.1 s, which is undesirable for classrooms (Klatte et al., 2010).

138 young adults (mean age 24 years, 40 male) took part in the experiment. The task required serial recall of sequences of 7 spoken words (e.g. Ball (*ball*), Haus (*house*), Banane (*banana*)), by entering the digits 1 to 7 into drawings representing the words on prepared answer sheets. The speech signals were presented via a loudspeaker located in front of the seminar room with 66 dB(A) in 1 m distance. Each participant was tested in quiet and in the presence of one of the background sounds, in one of the two reverberation conditions. Background sounds were presented via 8 loudspeakers, 2 on each side wall. Background sound levels (L_{aeq}, 20 s), measured at a seat position in the centre of

the room, were 53 dB in the favourable room and 55 dB in the unfavourable room.

Results and Discussion

A word-to-picture matching test confirmed perfect intelligibility of the speech signals in each background sound x reverberation condition. Mean %correct scores in the short-term memory task with respect to sound and reverberation are depicted in **Fig 1**.



Classroom reverberation increases ambient noise levels and thereby listening effort. Listening effort further boosts the detrimental effects of background sounds on verbal short-term memory. This holds even under conditions of perfect intelligibility of the to-be-remembered words.

Acknowledgements

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References

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