

# UNDERSTANDING THE EFFECT OF BROADBAND AND BABBLE NOISE ON OPERATORS' COGNITION

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**Background:** Ambient or background noise present in many work environments and in safety critical roles (i.e., aviating) has the potential to adversely affect operator performance. For example, noise generated from aircraft engines (i.e., broadband noise) during flight has been shown to adversely affect recognition memory (Molesworth et al., 2014). Babble noise, a function of many speakers in a closed environment (i.e., office) has been shown to adversely affect sustained attention and memory (Smith-Jackson, & Klein, 2009). **Aim:** The aim of the present study is to investigate the effect of two different types of noise, babble noise and broadband noise, at different signal-to-noise ratio (SNR) on two aspects of cognition, namely working memory and recognition memory. The level of 65dBA was chosen as representative of a reasonably noisy workplace and midway between the 'acceptable' office noise level of 45 dBA and the workplace noise exposure limit with respect to hearing damage of 85 dBA. **Method:** The study contained two experiments. The first experiment, used a Modified Rhyme test, involved 40 participants, and was designed to eliminate any potential extraneous variables such as masking (i.e., where one sound covers another). The second experiment (repeated measures) used two different tests, examined the cognitive effect of noise on working memory (via the Alphabet Span task) and recognition memory (via Cued- Recall task), only in the cases where it was certain that masking could not account for any differences observed. 18 participants completed experiment two. **Results:** The results of the first experiment revealed masking occurred in conditions with a SNR of -10dBA. Therefore, in experiment two, noise effect was tested at 0dBA and -5dBA SNR levels only. The results revealed, with recognition memory, recall performance decreased as the target signal became more difficult to hear for both noise types. A similar effect was noted with working memory in the presence of broadband noise, but recall performance was unchanged at the two SNR levels in the presence of babble noise. Subjective responses to annoyance and perceived effect on performance reflected the results of the objective tests. **Significance:** These findings demonstrate that the detrimental effect of different noises on memory is not equal. Understanding these differences is an important first step in designing systems and controls to manage their effect in the workplace. In safety critical workplaces such as aviating, understanding these differences is important to maintain high levels of safety.

**Keywords:** Noise effect, memory, decision-making, risk management, cognition, performance

## References

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