Designing Auditory Warnings for Preventing Arousal-Level Decline during Train Operation and Examining its Effectiveness

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Train driving is characterized by late-night and early-morning shifts when operators may be prone to drowsiness. This study developed and evaluated a system aimed at maintaining and improving arousal level by presenting auditory warnings. First, auditory warnings were designed based on survey of the opinions of train operators. In our experiments, designated auditory warnings were scored and selected in terms of three conditions ("audibility," "distinctiveness," and "arousal function") under train noise. The result shows that the arousal effects of the warning auditory were confirmed by presenting the designed sound during a monotonous task with the train driver environment.