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Journal of Ergonomics

Short Communication

# Effects of Audible Distractions on Work Performance

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## DESCRIPTION

Many workplaces have a wide variety of stimulus distractions which can seriously impact on a workers' performance over time. The effects of distracting stimuli (e.g., loud, erratic, uncontrollable, background noise, loud music, strong smells, flashing lights, change in temperature) on work performance, particularly information processing, has been a topic of considerable interest over the last few decades [1-4].

Much of this work has been on background sounds (music and noise), which is generally perceived to be detrimental to cognitive performance [5,6]. This is important in the design and administration of all work-spaces. Consider the environment designed for air-traffic controllers or that in an operating theatre. The light, sound, and temperature have all been shown to impact on performance particularly when there are needs to sustained concentration, with very serious implications of accidents, errors or mishaps.

The academic work in this area has identified three important and distinct factors: The nature of the distraction (i.e., music vs. noise); the task being undertaken in the presence of the distraction (i.e., memory vs. comprehension vs. manual labour) and the personality of the individual (i.e., extraversion vs. introverts) [7]. Studies in this area often have a three-background (loud music, soft music silence), two-task (cognitively demanding, undemanding) and two personality types (introvert vs. extravert) classic experimental design often requiring large numbers of people studied under highly controlled conditions. The reason is to explore and understand the interactive effects.

Some, but not all studies and the results, have been replicated but it is clear that subtle differences in audible distractors, the tasks involved or the people assessed can have significant and subtle effects. Reseachers in different disciplines have, quite naturally, concentrated on each of these three factors.

### Noise

Studies have looked at various aural distractors including general office background noise, music, sirens etc. Those who have studied music have looked at such features as vocal vs. instrumental, familiar vs. novel, loud vs. soft, major vs. minor key; familiarity of instrument). Those who have studies noise have looked at the type of noise (office background, traffic, and siren) as well as how loud and controllable it is. The literature suggests that loud, fast, familiar music and loud uncontrollable sounds associated with danger (i.e., sirens) are the most distractive and have most negative impact on performance.

The literature on the effects of music on performance has been recently and comprehensively reviewed by Landay and Harms [6] who concluded that the effect of music on cognition is mediated through mood and emotion. Gonzalez and Aiello [8] came to a similar conclusion; "we found that music generally impaired performance on a complex task, whereas complex music improved performance on a simple task. These effects depended on the task performer's personality, suggesting the need to consider music, person, and task-based factors when deciding whether to integrate music into work environments".

### Task

A central question concerns what work is being done: how cognitively demanding it is, over what period of time, and what are the consequences of failure. Very early papers in this area were interested in using music to improve the morale of assembly line workers whose jobs were tedious, repetitive and cognitively undemanding. They found that the right music did improve morale which had a small effect on output.

However, most of the experimental work has been done on more cognitive tasks involving classic information processing such that may be found in intelligence tests. Some have looked at speed and accuracy of processing and others of memory, while others have studied performance in applied settings like operating theatres. Most of the results have confirmed the essentially obvious hypothesis that the more complex the task being done the more negative effect of the distractor on performance.

Critics will point out that many of these studies have low ecological validity in the sense that they individuals specific task performance in very controlled environments over relatively short periods of time. Many people work in teams, do a variety of tasks and over-time adapt to, or have particular ways of coping

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**Received**: April 09, 2021; **Accepted**: April 23, 2021; **Published**: April 30, 2021

**Citation:** Adrian F (2021) Effects of Audible Distractions on Work Performance. J Ergonomics.11.S2:002.

with distractions. However, it is the primary interest of cognitive psychologists who research this area to understand cognitive processes and mechanisms in the presence of distraction and hence their insistence on careful experimentation.

## Personality

It is obvious to anyone that there are strong individual difference reactions to distraction: some people appear powerfully negatively affected while others seem almost impervious many forms of distraction.

Eysenck [9] predicted that individual differences in cognitive performance under distraction could be attributed to the degree of extraversion exhibited by the individual. With the assumption that background sound is stimulating, and possesses the ability to increase levels of cortical arousal, it is plausible that introverts would be affected by background sounds to a greater degree than extraverts. As introverts already have higher levels of cortical arousal, the presence of background sound would result in over-stimulation thus leading them to show a decline in cognitive task performance when distracted, as they would exceed their optimum levels of cortical arousal. As a consequence there have been many studies on the effects of noise on introversion and extraversion and most have confirmed this theory [10-12].

Others have looked at other traits. Reynolds investigated the association of another personality trait (neuroticism) and cognitive performance under distraction. They predicted a main effect of background sound and a negative effect of neuroticism on task performance in the presence of background sound. The results confirmed the hypotheses, showing that stable participants performed better on the mental arithmetic task in the presence of background sound than the unstable participants [13].

Personality researchers have also considered how different traits relate to occupational success from choice of vocation to performance [14-20]. With a greater interest in the dark-side factors at work, this research area will no doubt grow because it seems clear that whilst individual difference variables account for only a small amount of variance in understanding performance in the presence of distraction those effects are both constant and predictable [21-26].

# CONCLUSION

This is an important applied and theoretical area of ergonomics. New methods of measuring performance like the mFRI and related techniques are giving us greater insight into the physiological correlates of distraction which can help us better understand the processes involved. It also remains a multidisciplinary area where ergonomists, engineers and psychologist contribution to the understanding of this important issue so that they can help design working environments that are optimal for the tasks involved.

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