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Background music: Effects on attention performance

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Abstract. *Objective*: Previous studies indicate that noise may affect worker attention. However, some background music in the work environment can increase worker satisfaction and productivity. This study compared how music with, and without, lyrics affects human attention.
Participants: One hundred and two participants, aged 20–24 years, were recruited into this study. Fifty-six males and 46 females participated in this study.
Methods: Background music with, and without lyrics, was tested for effects on listener concentration in attention testing using a randomized controlled trial (RCT) study.
Results: The comparison results revealed that background music with lyrics had significant negative effects on concentration and attention.
Conclusions: The findings suggest that, if background music is played in the work environment, music without lyrics is preferable because songs with lyrics are likely to reduce worker attention and performance.

Keywords: Work environment, music with lyrics, occupational form, occupational performance

1. Introduction

Background music is common in many work environments, including hotels, restaurants, offices, banks, shops, and hospitals [3,19]. Numerous investigations have studied the relationship between sounds and behavior [2,4,7,11,19,20]. Some studies indicate that noise affects mental health status [2,7]; whereas, others indicate that background noise affects memory [4] and cognitive performance [11,20]. Although most studies indicate that environmental noise negatively affects the work environment, others suggest that background music improves worker productivity, continuity [10, 18], and attention performance [19]. Background music in work environments may or may not have lyrics. Whether background music in the work environment undermines work performance as does noise, or improves work performance is a topic worthy of exploring. This study focused on how background music with, and without lyrics, affects worker attention performance.

Opinions about the relationship between background music and worker attention performance vary widely [19]. From the perspective of occupational form and occupational performance", sounds/colors/decor in the work environment are attributable to a certain occupational form [14]. This model maintains that occupational performance changes with occupational form [14]. Song is a very common type of music, and music in

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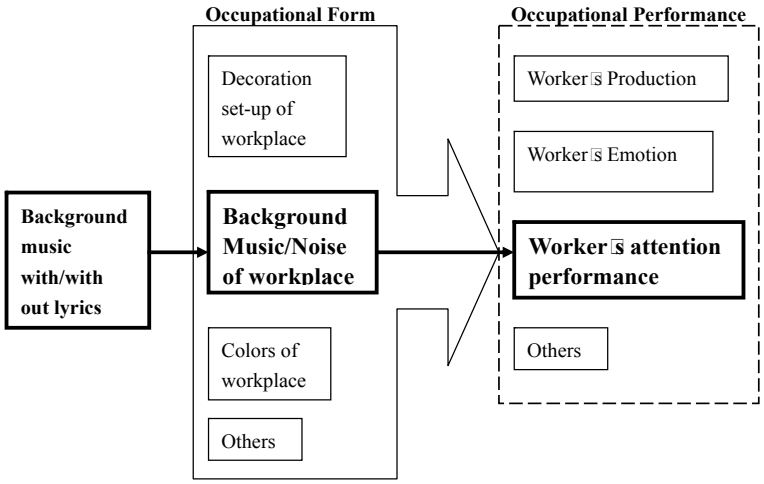

Fig. 1. Background music as an occupational form, and worker's attention performance as a component of occupational performance.

the work environment can generally be categorized as occupational form. Thus, music can affect occupational performance by changing attention and emotion [14,18]. Restated, background music/ noise is attributable to a certain occupational form. This theory suggests that, as occupational form changes, occupational performance also changes. Therefore, environmental noise and background music should theoretically affect human behavior as well [19]. Based on the above studies and themes, Fig. 1 shows how background music is a component of occupational form that can change occupational performance including worker attention performance:

Noise and music can affect human attention and behavior, and background music in the work environment is classified as noise/music (see Fig. 1). Different music may have different effects on worker satisfaction and attention; therefore, this pilot study aimed to explore the relationship between background music and attention performance. Notably, background music in the workplace may actually increase employee job satisfaction [15,17]. However, it may also negatively affect employee work behavior and performance [11,19]. Some occupational therapists report that proper use of background music can enhance employee attentiveness and increase therapeutic effectiveness [1,18]. Others report that office workers who listen to music while working have better work performance, satisfaction, and morale compared to workers who do not [15]. Another study of typing effectiveness in 40 workers found that background noise in the office had both positive and negative effects on typing efficiency [9]. One study found that different genres of background music had different effects on worker behavior such as speed and emotion [10]. Another researcher investigated how volume, tempo, and genre of background music affected restaurant dining behavior such as meal duration and expenditure. Interestingly, only volume affected dining behavior; whereas; tempo and genre did not [21].

Ravaja and Kallinen [16] found that participants who listened to background music while reading were more interested in their reading material compared to those who did not. They also concentrated more on the reading compared to other participants without stimuli [16]. Nevertheless, previous studies of whether background music affects behavior and attention level have tended to focus on factors such as music genre, volume, and tempo [5,13,21]. Few have compared the effects of background music with and without lyrics. Therefore our study aimed to compare how music with, and without, lyrics affects worker attention and performance. Figure 1 shows the theoretical basis of the detailed analysis of musical sound in the work environment, which was tentatively used in this study to determine how background music with, and without, lyrics affects attention level. Previous studies have tested cognitive performance to determine the effects of background music on cognitive performance [8,11,12]. The results provide a reference that managers can use for selecting background music that optimizes worker attention.

2. Methodology

This pilot study elucidates the findings of previous cognitive studies of the influence of background music

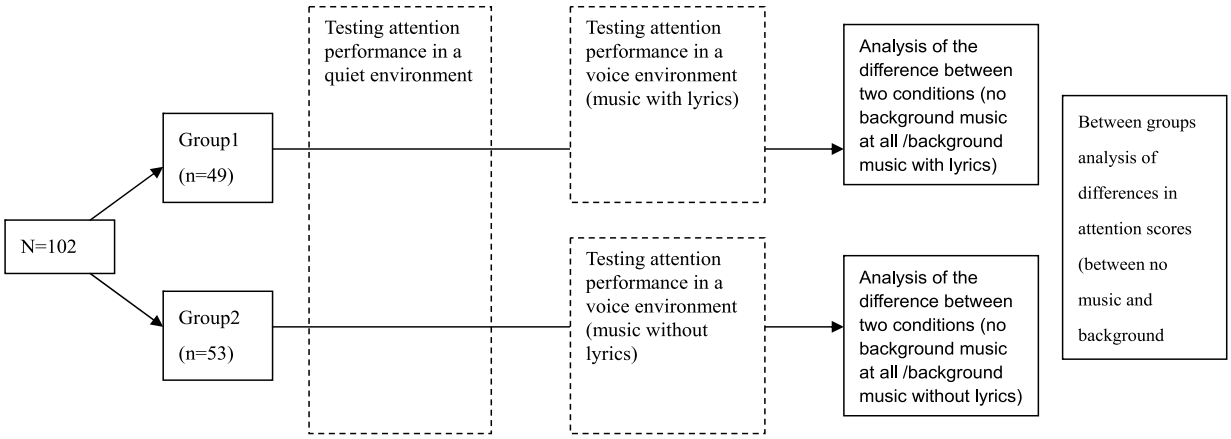

Fig. 2. Randomization of participants to one of two test conditions: Group 1 (music with lyrics) and Group 2 (music without lyrics).

on worker performance [8,11,12]. Restated, attention was the research index for studying the effect of background music with and without lyrics on worker attention performance using a randomized controlled trial (RCT).

2.1. Participants

The 102 voluntary participants providing informed consent, who were students enrolled in a Taipei County university, were randomly assigned to two groups that received one of two different stimuli: music with lyrics, and music without lyrics. The participants were 20–24 years old. Fifty-six males and 46 females participated in this study.

2.2. Tools

1. The Chu Attention Test is a standard tool for evaluating occupational conditions in Chinese speaking populations [6]. Although Chu's Attention Test was originally designed to measure visual attention, the researchers are able to use the test items to estimate participants' task attention. In this study, Chu's Test was used to estimate the influence of background music on visual attention in the working environment and examine the difference between the influence of background music with lyrics and without lyric [6,19]. Each question on this 100-item written test requires the participant to indicate the number of times an asterisk (*) symbol appears in each series of scrambled codes. The testing time is 10 minutes, and the final score is calculated by deducting the number of wrong answers from the total number of questions. This tool is used to test correlations between worker concentration level and background music [19].
2. Background Music: Four pairs of music samples were selected. Each pair had the same title, tune and volume; the only difference was the presence or absence of lyrics.

2.3. Procedure

Figure 2 shows our research procedure.

Step one: 102 voluntary participants were randomly divided into Group 1 (49 participants) and Group 2 (53 participants). We used independent samples t-test in step 1 to ensure there were no significant differences in age and gender between groups 1 and 2.

Step two: The Chu Attention Test was administered separately to Groups 1 and 2 in a quiet environment to test attention performance at baseline, i.e., when there was no background music. An independent samples t-test was used to determine the difference in baseline attention performance between groups 1 & 2.

Step three: Three weeks later, the Chu Attention Test was again administered to both groups. While taking the test, however, Group 1 listened to music with lyrics, and Group 2 listened to music without lyrics.

Step four: Paired sample t-test was applied to analyze the difference between no background music and background music of both groups (group 1: no background music at all /background music with lyrics; group 2: no background music at all /background music without lyrics) on scores of attention test. That is: Can background music influence people's attention performance? Which format of background music

Table 1
Mean a ttention performance scores of Group 1 and group 2 at baseline (with no background music)

Group	N	Mean score	SD	Std. Error Mean
Group 1 (music with lyrics)	49	105.5	17.8	2.5
Group 2 (music without lyrics)	53	109.3	18.2	2.5

has more influence on people's attention performance, lyrics music or no-lyrics music?

Step five: An independent-samples t-test was used to determine the difference in baseline attention performance between both groups (background music with lyrics/ background music without lyrics).

3. Results

Table 1 shows that, in Group 1, the average (SD) attention performance score without background music was 105.5 (17.80). In Group 2, the average (SD) score was 109.3 (18.17). Independent-samples t-test revealed no significant between-group differences in attention performance scores at baseline ($p = 0.804$).

Attention performance scores among all participants were affected by background music with lyrics. Table 2 shows that the average score in Group 1 had a significant decrease between baseline without music (105.5) and when listening to music with lyrics (98.4, $p < 0.001$). The average attention performance score in Group 2 was lower when listening to music without lyrics (106.6) compared to baseline where there was no music played(109.32); however, the difference was not statistically significant ($p = 0.055$). Attention performance was also lower when the background music had lyrics compared to when the music did not have lyrics, but the difference was not statistically significant ($p = 0.869$). Being as for the whole, the difference was significant between two conditions (no music/ music with lyrics) in group1, and was not significant between the two conditions (no music/ music without lyrics) in group 2.

4. Discussion

Sounds have important effects on worker behavior and attention, and music and songs can be a major source of workplace sound. Many scholars have studied the effects of background music on human behavior such as dining behavior, drinking behavior, and frequency of inappropriate behavior in psychological occupational therapy [5,13,18,21]. A study of work concentration level and background music showed that people who listened to music during attention testing had widely varying scores on attention tests [19]. This research explored how background music, with or without lyrics, affected worker attention performance. Scholars note that music can affect different behaviors including alertness, eating and reading behavior [5,16]. Some studies report that background music alleviates restlessness and distraction in psychiatric patients and enables their activities to proceed more smoothly [1, 18]. In summary, the "occupational form and occupational performance" model supports the notion that background music is a component of occupational form that can affect attention, which is a component of occupational performance [14,18].

This study also found that background music with lyrics has a greater effect on attention performance compared to that without lyrics. Music certainly comprises a major portion of environmental stimuli in the workplace. Russell and Snodgrass [17] suggested that the complexity of environment stimuli determines the extent of human arousal, which may then moderate approach-avoidance behavior. This theory suggests that, the higher the complexity of the environmental stimuli (music included), the larger the effect on humans. Music with lyrics is a more complex stimulus than instrumental music alone, which explains the current finding that background music with lyrics has an even larger negative effect on attention performance compared to that without lyrics. A previous comparison of background music with and without lyrics by Furnham and Allass indicated that instrumental music improves reading comprehension performance whereas songs with lyrics tend to distract listeners [12]. A Taiwanese study also tested the effects of songs with lyrics as background music during group therapy. They found that, in comparison with classical music and traditional Chinese music, songs with lyrics tended to increase the frequency of inappropriate behavior and inattention in the group therapy process [18], The finding of this research is consistent with the current study.

Although background music may affect worker attention, this study showed that background music without lyrics has a lesser effect on attention performance. Previous studies indicate that background music in the workplace may increase employee job satisfaction [10, 15,17]. If background music without lyrics also increases job satisfaction without substantially affecting attention performance, then managers should consider its use in the workplace.

Table 2
Impact of background music on attention performance

Group	n	Mean attention performance score at baseline (no back ground music)	Mean attention performance score with background music	Within group comparison[a] p
Group1 (music with lyrics)	49	105.5	98.4	0.000*
Group 2 (music without lyrics)	53	109.3	106.7	0.055
Between groups comparison[b] p		0.804	0.869	

[a]Comparison performed using paired t-test, $p < 0.05$; two-tailed test.
[b]Comparison performed using independent t-test, $p < 0.05$; two-tailed test.

As all 102 participants in this study were in their early 20s, future research projects may compare the effects of music among different age groups. A laboratory experiment was used in this pilot study; however, future studies can be done in actual workplaces, and the quality and quantity of employees' task performance can be evaluated to explore the effects of background music on the task attention of employees. Future studies are required in order to generalize findings beyond this pilot study.

5. Conclusions and implications

Music can impact on worker mental status and attention, and background music is common in the work environment. Therefore, background music may also affect worker concentration and productivity [15,17,18]. A novel finding of this pilot study of 102 participants is that lyrics in background music negatively affected worker attention performance. Although background music without lyrics also affects human attention performance, the effect is smaller. Based on the results of this study, we make the following suggestions:

1. If background music is played in work environments, music with lyrics should be avoided because it is likely to reduce worker efficiency. Instead, music without lyrics should be selected.
2. Future studies may compare the effects of background music, with and without lyrics, between attention performance in actual workplace, such as factories and offices.

However, the effect of background music may vary by genre of music, ethnicity, age, and education. The association between Music in the working environment and worker attention and productivity is a worthy topic for future study.

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