Correlation between work concentration level and background music: A pilot study

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Abstract. It is a common phenomenon for office workers to listen to music while executing daily routines at their desks. The aim of this study was to investigate the correlation between work concentration level and background music. This research would first follow examples in previous researches, and then explore the influence of background music on participants' scores on attention tests. We hope to gain a preliminary understanding of the possible influence of background music on people's focus and concentration when doing work. Thirty-two college students were separated into three controlled groups; all were given the attention test. Group \([a]\) listened to background music while being tested for 10 minutes; group \([b]\) had no background music at all; and group \([c]\) listened to the music for 10 minutes prior to the attention test. The test was conducted in a "noise free" environment. The means and error rates for each group were then calculated. The findings showed that, in comparison with "no music at all", those who listened to music prior to testing obtained higher scores in attentiveness (most probably a supplemental effect of the music), whereas those who listened to music during attention test showed extremely high level of variation in attention test scoring. Background music does affect people's job-site behavior. In fact, all three test conditions – no background music at all, background music before the work shift, and background music during work – have affected worker performance on different levels.

Keywords: "piped-in" music, attention test, occupational form, occupational performance

1. Introduction

It is not an unusual phenomenon for office workers, whilst executing daily routines at their desks, to listen to music; the majority of college students also listen to music, while they are working on a computer [16]. Background music (more commonly known as "piped-in" music) is very popular in hotels, restaurants, offices, banks, shops, and hospitals [2]. The authors were interested in measuring whether such music might result in behavioral changes, especially in concentration level, prior to and during tasks. The fact that music influences worker behavior, even extending to influencing work rate and quality, has its foundation in the field of the investigation of human behavior [15,17]. Scholars had long asserted that musical stimuli, is transmitted directly to the human cerebral cortex, when music is played mood and emotion are elevated [11]. Furthermore, other studies have shown that musical stimuli can increase the secretion of \(\beta\)-endorphin [12], subse-
Background music

Occupational Form (Inclusive of: Colors, noise, music, decoration set-up, etc.)

Occupational Performance (Inclusive of: Mood, concentration, etc.)

Work behavior (efficiency, quality, etc.)

Fig. 1. Background music, occupational form and work behavior.

sequently diminishing the level of pain or anxiety, as well as increasing “happiness”.

Analysing the pattern of brain waves, scholars have also discovered that Western style classical music increases the section of $\alpha$ brain wave; making an uptight and nervous person, relax and calm down [4], other researchers have discovered that listening to music may modulate specific neuroendocrine and neuroimmune [3]. Myskja and Lindbaek [13] showed that music directly influences both the sympathetic and parasympathetic nervous systems of the human body, changing people’s feeling and behavior. Such physiological and psychological variations leads to changes in behavioral pattern; from the physiological point of view, this may also explain why music may improve worker proficiency and performance [13].

Based on the theory of occupational therapy, concerning musical interface from frames of references of occupational form and occupational performance, in general, music would be categorized as part of occupational form. Thus, the music category can change the occupational performance [14]. In other words, some studies have shown that environmental sound and background music brings about changes in human behavior.

This research will use the model (shown in Fig. 1) to probe the correlation between work expediency and performance deficiency, under the influence of background music. The authors will also attempt to detect quantitatively any variation regarding work expediency and performance deficiency using psychological forms of assessment.

Researches in the 1960s and 1970s had indicated that background music had great potential to influence work quality [8,21]. Other scholars also pointed out that music can alter listener’s awareness levels, influencing his/her behavior qualitatively and quantitatively [7]. Other studies showed that background music could ease the level of restlessness and distraction in psychosis patients making routine activities progress more smoothly [9]. A research study, aiming at investigating a vocational training program for chronic mental patients, displayed findings that background music clustered their concentration level, lowering their anxiety, and allowing them to finish tasks more quickly [19]. Studies aimed to probe the influence of background music have shown that some music can reduce anxiety and restlessness, while for others music can actually raise anxiety levels as well as creating more distraction [19]. Furthermore, some background music, though lowering the subject’s anxiety level, can simultaneously distract their attention; in other words, although they feel calmer, they can not concentrate well enough to finish the designated task [20]. Thornby et al. [23] conducted a further experiment with chronic lung disease patients under 3 different environments – with background music, with background noise, and with complete quietness. They found that when participants were engaged in activities, better efficiency was achieved with background music, compared to conditions with background noise or complete silence [23].

Using 24 graduate school students, Nittono, Tsuda et al. considered the correlation between music and work proficiency, finding that fast-beat music actually improved task proficiency [15]. A more recent study, employing the methodology of providing background music to readers of newspapers, showed contrasting findings; some readers became more alert and interested in the content, while others were distracted [17].
Additionally, researchers had conducted cognitive tests (general intelligence part I and reading comprehension task) on the influence of background music on participants’ testing scores, hoping to find the possible influence of background music on their cognitive function. And they did find that background can effect case’s score in cognitive test [6,10].

In summary, these studies indicate that music does influence patterns of work; depending on the type of music used. However this could be a positive or negative effect. Therefore, the main aim of this research study was to investigate the influence music may have on the listener. The effect will be measured by psychological standardized assessment tool.

This research would first follow examples in previous researches, and then explore the influence of background music on participants’ scores on attention tests. We hope to gain a preliminary understanding of the possible influence of background music on people’s concentration level when doing work.

In other words, the aim of the research is to determine whether background music played during or preceding a task requiring attention/concentration influences performance. The next section details the research tools, research design, and participants.

2. Method

This pilot study used a Randomized Controlled Trial (RCT).

2.1. Research participants

32 voluntary participants (enrolled in a university in Taipei County) were randomly divided into three groups. (groups 1 and 3 had 11 participants, the second group 10). The participants were aged between 20–27 years old: 14 males and 18 females.

2.2. Research procedure

Each group completed Chu’s Attention Test [5] lasting 10 minutes. “Chu’s Attention Test” is a standard evaluation tool frequently used in occupational therapy in China society [5]. It is usually applied to the study of attention and to demonstrate the level of attention in community task in the future In the test, the participant looks at a series of scrambled codes, searches for the occurrence of “*”, and then writes down the count as the answer. The final score is calculated as the “Number of wrong answers” deducted from the “Total number of answered questions.”

Group 1 listened to classical compositions of Canon while they completed the task, Group 2 completed the test in silence, and Group 3 listened to Canon music for 10 minutes prior to the experiment, but then took the test in silence.

The participants were simply informed that the research was relevant to behavioral pattern on job-site; they did not know that the presence or absence of music was the independent variable, and that attention levels were being measured.

3. Results

Statistical comparisons were made among the three groups, in relation to the total score, number of questioned answered, and error rate. A one-way ANOVA was used to probe into the difference between each group, (Tables 1, 2).

From the point of view of total scoring average: The 3rd group (music prior to test) ranked the highest (with 138.0); then the 2nd group (no music) followed in (with 131.1); the 1st group (music during test) was last (with 114.63). As far as standard deviation is concerned: The 1st group came in at 34.97; the 2nd group rated 8.16; the 3rd group attained 7.98.

Taking the 2nd group (no music) as a control, the authors observed that in this study higher scores were achieved, if music was listened to prior to testing; on the other hand, listening to music during the test provided the largest variation in performance. With the ANOVA Analysis, noticeable differentiation coefficient among the 3 groups was (0.047**). Finding of the experiment shows overall and comprehensive positive, as well as negative, correlation regarding concentration level and background environment.

The total number of questions answered reflects work efficiency. In this respect, the 3rd group (music prior to testing) came in with the highest score (at 138.55); then came the 2nd group (no music – at 131.5); finally, the 3rd group (music during test – with 116.45). Standard deviation for the 1st group was 35.73; for the 2nd group was 8.03; for the 3rd group was 7.99. Once more, using the 2nd group as comparison core; total work volume achieved would be higher, if music was listened prior to test; whilst listening to music during the test produced results in both extremities. Whereas ANOVA Analysis was concerned, differentiation coefficient was detected at (0.069*).
Table 1

<table>
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<tr>
<th>Group</th>
<th>No. of questions answered</th>
<th>N</th>
<th>Mean</th>
<th>Std. deviation</th>
<th>Std. error</th>
<th>95% confidence interval for mean</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
<th>Minimum</th>
<th>Maximum</th>
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<td>11</td>
<td>116.4545</td>
<td>35.7306</td>
<td>10.7732</td>
<td>92.4504</td>
<td>140.4587</td>
<td>63.00</td>
<td>151.00</td>
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<td>2.00</td>
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<td>7.9920</td>
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<td>133.1763</td>
<td>143.9146</td>
<td>127.00</td>
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<td>120.5704</td>
<td>137.3671</td>
<td>63.00</td>
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<td>119.4632</td>
<td>136.1618</td>
<td>61.00</td>
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Table 2

<table>
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<tr>
<th>ANOVA analysis: (a) group listening to music while being tested; (b) group with no music; (c) group which listened to music prior to testing</th>
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<tr>
<td>Total</td>
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</table>

Standard of error reflects the actual quality of work accomplished. The 1st group (music prior to test) had the highest standard of error ratio. Nevertheless, the standard of error ratio for all 3 groups was of very minimal means.

In summary, our pilot study has shown that based on a comparison of near silence: Listening to music prior to an attention test may produce a more efficient working rate; it may also produce results at both extremes. Moreover, group 2 produced greater variation than group 1 and group 3.

4. Discussions and conclusions

In this pilot study it would seem that when compared to working in 'near silence', listening to music prior to undertaking a task maybe increase some participants work rate. However, the same audio environment may also slow down a person's speed (as shown by the differentiation coefficient of 0.047** per ANOVA Analysis). This finding is consistent with previous research that indicated that when people listen to background music their awareness level is raised and they perform the task more enthusiastically [1]. In contrast, other studies have observed that background music can create negative correlations vis-à-vis stenography and typing [17]. A possible reason for slowing down typing speed, may be the distraction caused by the background music. To attempt to rectify this flaw, other researchers have chosen to play relaxed rhythm music, in order to ensure a minimal satisfactory level of work quality [16]. The aforementioned are possible explanations for the minimal gap in standard of error, obtained by this study in relations to the 3 group subjects. This phenomenon may be interpreted as such: Background music has influenced "speed" (number of questions answered) more significantly; but it has influenced "error rate" less significantly.

So why is it, that background music, can make some workers speed up their performance, whilst slowing down others? Potential key factors could be: The type...
of music played; the fashion in which the music is presented; the listeners’ own personal history; as well as his/her liking (or disliking) to the chosen music. For example: If the chosen piece of music is inappropriate to a particular working environment, it may have a direct influence on speed [18]. Directly influence dawned by background music, more specifically, the scheduling and process in which was presented have also been observed by researchers. Szabo et al. [22] found that participants in the slow-to-fast intervention completed a higher exercise workload than all other study conditions (slow music, fast music, and fast to slow music). This study suggests that music may provide a temporarily distracting effect to some of the body’s internal cues associated with tiredness [22].

However, this research study only employed 32 participants, and only one type of melody. The authors believe that future studies could insert additional types of music, as well as working with a broader targeted sample basis. Such future studies would probe and investigate on a deeper level, and obtained more in-depth data, as well as being more objective.

Overall, this research study proposes the following:

1. Background music does affect worker’s job-site behavioral pattern. In fact, all three test conditions – no background music at all, background music before the work shift, and background music during work – have proved to affect worker performance on different levels.

2. More in-depth studies are needed; which should include a wider variety of background music and a larger sample size. Once more comprehensive findings are obtained, they can be used researchers and managerial staff of work environment.

References


