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Background Music Listening During Computer-Based Work: Frequency and Self-Reported Concentration

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ABSTRACT

Background music (BgM) listening refers to playing music while performing another task. Although previous research has examined how different types of music affect the performance of various cognitive tasks, little is known about how frequently individuals choose to listen to BgM during everyday work. The present study examined the proportion of computer-based work time spent listening to BgM (BgM%) and its association with self-reported concentration. Seventy participants were recruited through personal contacts and social media. Participants included 37 women (53%) and 33 men (47%), of ages ranging from 22 to 64 years (M = 32.01, SD = 9.36). The recruitment request emphasized that the questionnaire was intended for both those who do and do not listen to BgM while working. Participants estimated the percentage of their computer-based work time spent listening to BgM. The mean BgM% was 41%, with substantial variability (SD = 32%). Contrary to expectations, the distribution of BgM listening was not bimodal. Only 18% reported never listening to BgM while working on their computers, and the remaining participants were almost evenly divided across low, medium, and high BgM-use categories. Participants also rated their agreement/disagreement with the statement "BgM helps me concentrate while working on the computer" on a Likert scale. A Spearman correlation analysis revealed a strong positive association between BgM% and perceived concentration, $r(68) = 0.78$, $p < 0.001$. This suggests that individuals' beliefs about BgM's impact on their concentration largely determine their BgM-listening behavior. Future research should test whether these subjective concentration assessments correspond to objective performance outcomes.

Keywords: Background music, Concentration, Computer-based work

LITERATURE REVIEW

Music listening is a pervasive activity, commonly performed alongside other tasks, rather than as a primary focus (Bull, 2006; North et al., 2004; Stratton & Zalanowski, 2003; Randall & Rickard, 2017; Greasley & Lamont, 2011). BgM refers to music played while an individual's primary attention is directed to a non-music task (Radocy & Boyle, 2012). Whether BgM supports or disrupts concentration and productivity remains unclear, given decades of contradictory and often inconclusive research (De La Mora Velasco & Hirumi, 2020).

Findings are divided into three patterns that highlight variability. BgM can impair performance (especially in verbal tasks, memory, reading, and

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writing) consistent with interference accounts (Avila et al., 2012; Kämpfe et al., 2011; Iwanaga & Ito, 2002; Cassidy & MacDonald, 2007; Perham & Vizard, 2011; Vasilev et al., 2018; Thompson et al., 2012; Lehmann & Seufert, 2017; Ransdell & Gilroy, 2001). Conversely, BgM has been linked to reduced mind-wandering, greater engagement, faster processing, and less external interference, suggesting benefits in some contexts and circumstances (Kiss & Linnell, 2021; Jones, 2005; Serpian & Jusnawati, 2022; Bottiroli et al., 2014; Angel et al., 2010; Ferreri et al., 2015; Masataka & Perlovsky, 2013). Other studies report null effects, indicating no consistent shift across tasks or people (Burkhard et al., 2018; Kou et al., 2018). Overall, BgM is best explained via mechanisms and moderators rather than a single global effect (Kämpfe et al., 2011; De La Mora Velasco & Hirumi, 2020).

A common account that explains the negative effects is capacity limits, described as concurrent stimulation competing for shared resources (Miller, 1956; Marois & Ivanoff, 2005). Performance may decline when music and task performance demands overlap (Sweller, 1988; Wickens, 2002), especially in verbal tasks, because lyrics and vocal streams interfere with linguistic processing (Perham & Currie, 2014; Alley & Greene, 2008). Studies report poorer reading comprehension and working-memory performance under lyrical or vocal music than under silence, and verbal performance is often higher in silence than with BgM (Perham & Currie, 2014; Alley & Greene, 2008; Avila et al., 2012; Iwanaga & Ito, 2002; Ransdell & Gilroy, 2001; Vasilev et al., 2018; Thompson et al., 2012). Effects also increase in line with task complexity, since demanding tasks leave fewer resources to manage background stimulation (Campbell, 1988; Wickens, 2002; Topi et al., 2005; Sweller, 1988). Meta-analyses align with this view, with overall effects may be near-zero, yet small detrimental effects emerge for memory and reading (Kämpfe et al., 2011).

Positive accounts emphasize regulation of attention, mood, and arousal, suggesting BgM can support engagement in some conditions (Kiss & Linnell, 2021; Bottiroli et al., 2014; Ferreri et al., 2015; Angel et al., 2010). BgM has been associated with less self-reported mind-wandering and better sustained attention, particularly if the music is self-chosen (Kiss & Linnell, 2021; Kiss & Linnell, 2024). Benefits have also been reported for processing speed and some memory processes (Bottiroli et al., 2014; Ferreri et al., 2015; Mammarella et al., 2007). Emotional and physiological pathways may also contribute, as music can modulate affect and arousal in ways that indirectly support concentration for some individuals (Proverbio & De Benedetto, 2018; Liljeström et al., 2013; Taruffi et al., 2017; Nantais & Schellenberg, 1999; North & Hargreaves, 1999). However, perceived focus may reflect mood or arousal changes rather than reliable productivity gains (Haake, 2011; Lesiuk, 2005; Goltz & Sadakata, 2021).

Mixed and null findings are often attributed to three moderators. Task type and complexity shape whether BgM helps or distracts, with language-heavy tasks found to be more susceptible to interference (Gonzalez & Aiello, 2019; Campbell, 1988; Kämpfe et al., 2011). Music characteristics (e.g., lyrics, genre, intensity) also matter (Shih et al., 2012; Yi-Nuo et al.,

2016; Perham & Currie, 2014; Alley & Greene, 2008; Mammarella et al., 2007; Liu et al., 2017; Thompson et al., 2012; Chou, 2010). Individual differences further contribute, including introversion-extraversion and self-regulation tendencies in BgM use (Cassidy & MacDonald, 2007; Furnham & Strbac, 2002; Furnham & Bradley, 1997; Deng & Wu, 2020; Eysenck, 1956; Eysenck & Eysenck, 1968; Goltz & Sadakata, 2021). Workplace evidence likewise shows both improved focus and distraction, underscoring a highly individual relationship between BgM and perceived concentration (Haake, 2011; Lesiuk, 2005; Cloutier et al., 2020; Cassidy & MacDonald, 2009).

To the best of our knowledge, no previous study has systematically examined how much time individuals spend listening to BgM during computer-based work, nor whether this behavior is associated with their self-reported perceptions of BgM's impact on concentration.

RESEARCH QUESTIONS

1. What is the distribution of BgM listening while working on a computer?
2. What is the relationship between the self-reported effects of BgM on concentration and the proportion of time individuals listen to BgM during computer-based work?

Preliminary observations suggested a consistent pattern in participants' self-reports: individuals who listened to BgM during computer-based work commonly reported doing so because it helped them concentrate, whereas those who avoided BgM tended to report that it was distracting. Based on these observations, we hypothesized a positive correlation between the perceived effect of BgM on concentration and actual BgM listening during computer-based work.

METHOD

We used a questionnaire to measure both BgM percentage (BgM%) and self-reported BgM effect on concentration.

Participants

We recruited 70 participants through personal connections and using a social media post (non-random selection). Of the participants, 37 (53%) identified as women and 33 (47%) as men. Their age ranged from 22 to 64 years old ($M = 32.01$, $SD = 9.36$). Of the participants, 35 were high-tech workers (26 programmers, 7 data analysts, and 3 held other technology-related jobs), 6 worked in government offices, 3 were freelancers, 2 were students, 15 held various other jobs and 8 did not report their occupation. During the recruitment process, we stressed that the questionnaire is designed for both people who listen to BgM while working and those who do not. We did so in order not to bias the results of RQ1 with more participants who listen to BgM while working than their percentage in the general population.

BgM% Measurement

BgM% was measured using the following question:

> *Some people frequently listen to BgM while they are working, some do it occasionally, and others do not listen to music at all while working on the computer. Try to think of all the occasions that you worked on your computer (e.g., in the last two weeks). This will be your 100%. Now try to estimate the percentage of that time during which you listened to music (if you do not listen to BgM while working, write 0). I listen to BgM during ____% of the time I work on the computer.*

Perceived BgM Effect on Concentration

To measure the perceived BgM effect on concentration, we asked our participants to what extent they agree/disagree with the following statement: "Music helps me concentrate while working on the computer" on a 1–5 Likert scale.

RESULTS

BgM% Distribution

The distribution of BgM% is presented in Figure 1.

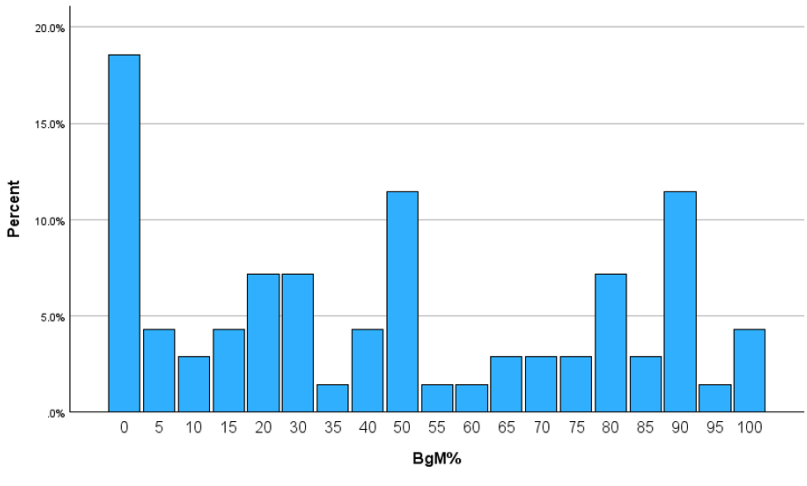

Figure 1: BgM% distribution.

Figure 1 illustrates that BgM listening behavior is not binary. Only 13 participants (19%) did not listen to BgM at all. The remaining participants were distributed relatively evenly across low, medium, and high BgM-use categories (see Table 1). The mean listening percentage was 44% with a relatively high standard deviation of 35%.

Table 1: The BgM% distribution divided into groups.

Group	Participants (%)
No BgM (0%)	13 participants (19%)
Low BgM (1%–33%)	18 participants (26%)
Medium BgM (34%–66%)	16 participants (23%)
High BgM (67–100%)	23 participants (33%)

BgM HELPS ME CONCENTRATE

When we asked participants to what extent they agree/disagree with the statement "Music helps me concentrate while working on the computer" on a 1–5 Likert scale, their average answer was 3.16 (SD = 1.39). A Spearman correlation between "music helps me concentrate" and BgM% was significant and high, $r(68) = 0.78$ $p < 0.001$.

DISCUSSION

BgM% Variance is High and Requires Explanation

Our results indicate that 81% of the participants listen to BgM while working on their computers. The average BgM% for all participants was 41%, which means that on average the participants listen to music for almost half the time that they work on their computers. This finding is consistent with broader research showing that music is frequently used as a secondary activity during other tasks, such as working or studying (Bull, 2006; Greasley & Lamont, 2011; North et al., 2004; Lonsdale & North, 2011; Watson & Mandryk, 2012; Stratton & Zalanowski, 2003). The variance (SD = 32%) is fairly high, which requires an explanation. Contrary to our expectations, the BgM% distribution was not binary, with 19% of the participants not listening to BgM at all, 24% with low BgM listening, 23% with moderate BgM listening, and 33% with high BgM listening.

The More Participants Believe That Bgm Helps Them Concentrate, The More They Listen To It

An unusually strong correlation was found between the factor BgM helps me concentrate and BgM% ($r(68) = 0.78$ $p<0.01$). Importantly, the finding that individuals who believe BgM helps their concentration tend to listen to it more frequently does not imply that this belief accurately reflects actual performance benefits. This should be tested in future research. If our participants were right in their intuitive belief about the effect of BgM on their concentration, then individual differences - a factor that received little attention in previous studies (with the exceptions of Lesiuk, 2005; Furnham & Strbac, 2002; Hallam et al., 2001; Kämpfe et al., 2011; Haake, 2011) - are an essential factor explaining the effect of music on concentration. Failure to account for individual differences in BgM use and perceived effectiveness may help explain why prior research has yielded positive, negative, and null effects of BgM on cognitive performance (Kiss & Linnell, 2021; Jones, 2005;

Serpian & Jusnawati, 2022; Bottiroli et al., 2014; Angel et al., 2010; Ferreri et al., 2015; Masataka and Perlovsky, 2013). Others found a negative effect (Avila et al., 2012; Ersin et al., 2021; Kämpfe et al., 2011; Iwanaga & Ito, 2002; Cassidy & MacDonald, 2007; Perham & Vizard, 2011; Vasilev et al., 2018; Thompson, 2012; Lehmann & Seufert, 2017; Ransdell & Gilroy, 2001) while still others found no significant effect (Burkhard et al., 2018; Kou et al., 2018). These discrepancies had no effect, according to a vote-counting direction analysis (Cheah et al., 2022). On the other hand, if our participants are wrong in their intuitions, then future research should study what causes this mistaken intuition that impacts their behavior.

CONCLUSION

To our knowledge, this is the first study to systematically examine the percentage of time that individuals spend listening to BgM during computer-based work, and whether this behavior is associated with their self-reported perceptions of BgM's impact on their concentration. Contrary to our expectations, the BgM% distribution was not binary, with 19% of the participants not listening to BgM at all, 24% with low BgM listening, 23% with moderate BgM listening, and 33% with high BgM listening. An unusually strong correlation was found between the factor BgM helps me concentrate and BgM% ($r(68) = 0.78$ $p < 0.01$), indicating that the more participants believe that BgM helps them concentrate, the more they listen to it. Future research should test whether these subjective concentration assessments accurately reflect the actual BgM impact on performance.

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