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The Effect of Background Music on Second Language Learning

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ABSTRACT

Background

The intricate relationship between music and language has been the subject of scholarly debate since the time of Aristotle. A growing evidence base has demonstrated a number of interactive relationships between the way that music and language are processed in the brain (Patel, 2008). One such relationship is seen in dual processing paradigms; the effect of presenting both types of stimuli concurrently.

Music has been shown to have a positive influence on verbal task performance in various ways: these include the positive influence of musical experience on task performance (Schön, Magne & Besson, 2004), the positive influence of music on recall of text (Wallace, 1994), film (Boltz, Schulkind & Kantra, 1991) and advertising messages (Stewart & Punj, 1998; Tom, 1990; Yalch, 1991), and the general positive influence of music on psychophysiological arousal level during cognitive tasks (Thompson, Schellenberg, & Husain, 2001).

However, music that is highly complex (i.e. changes in rhythm and tempo, multiple timbres and vocalisations) can make excess demands on the limited processing capacity of the attention and cognitive systems thereby minimizing resources available for any primary cognitive task (Kämpfe et al., 2010; Schellenberg, 2012).

One interesting finding within this field is that music can help improve memory for new verbal materials in both adults and infants (Schön et al., 2008; Thiessen & Saffran, 2009). This finding suggests that the presence of low complex music could potentially aid verbal learning in real life situations, such as trying to learn a new language. The present study aimed to build on this finding by examining memory for new verbal materials in just such a real world setting.

Aims

Previous research into the effect of music on language learning and memory has focused largely on the use of sung words as stimuli; no study to date has examined the effect of background music on verbal memory in an ecologically valid language learning scenario. The present study aimed to determine whether background music would be beneficial to second language learning in adults by testing short-term memory (Experiment 1) and long-term memory (Experiment 2) in monolingual English speakers using a commercially available language learning CD (earwormslearning.com).

Method

Participants in Experiment 1 had no previous knowledge of the language they heard, while Experiment 2 comprised only monolingual English speakers with no previous knowledge on the language they wished to learn. Participants in Experiment 2 were matched on age, NART (general intelligence), working memory (all $p > .05$), and gender (4 male and 4 female for each condition of Arabic, 2 male and 6 female for each condition of Chinese).

In Experiment 1, participants took part in a standard lab based memory study where they listened to a set of Arabic numbers (1-10) with or without background music (see the following paragraph for details of the music), followed by two recognition test phases, interpolated by a 10-minute delay.

Experiment 2 comprised an ecologically valid two-week language learning trial. Participants studied either Arabic (atonal language) or Mandarin Chinese (tonal language) and were randomly assigned to Music or No Music background conditions. Participants were given the option to choose their preferred language in order to maintain similar level of motivation for each group, as motivation can significantly affect language learning performance (Masgoret & Gardner, 2003). The learning materials were sourced from commercially available language learning CDs (see Acknowledgments). Background music for each track was specifically created for the CDs. The music is described by the composer as medium tempo, 'easy-to-listen', non vocal tunes that fit into the rhythm of learning materials, and that avoid similar frequencies to those heard in the human voice. Participants were asked to listen to the assigned learning materials for 20~30 minutes each day. Strict instructions were also provided to minimize differences in learning environments and strategies: participants were asked to avoid any concurrent activities that could potentially distract their listening and learning such as watching TV, talking with others, or reading other materials.

One day after completing the learning session, participants were invited to the lab for a test session. We tested speaking (translation from English words/phrases into the new language) and understanding skills (translation from words/phrases in the new language into English), as well as pronunciation, which was rated by native speakers. We also collected self-rated levels of achievement and enjoyment both during the trial and on completion (rated on standard Likert scales), musical sophistication scores (Goldsmiths Musical Sophistication Index or Gold MSI: Müllensiefen et al., 2011), working memory scores (Operation Span: Unsworth et al., 2005) and assessed general intelligence (National Adult Reading Test: NART, Nelson, 1982).

Results

In Experiment 1, a mixed ANCOVA was used to examine the effects of music presence or absence and language on memory for the Arabic numbers, while entering age, gender, and musical sophistication as covariates. The results indicated that participants in the background music condition performed significantly better in general when compared to participants who heard no background music, $F(1, 14) = 12.765$, $p < .01$. Age was the only covariate that emerged as significant in the

analysis, $F(1, 14) = 12.204$, $p < .01$, in the form of a negative correlation with test score.

In Experiment 2, an overall MANCOVA was conducted to assess the effects of music and language on achievement across the three main dependent variables (speaking, understanding and pronunciation) while entering musical sophistication (Gold MSI) sub-scales as covariates. The results showed a significant difference between Arabic and Chinese scores, $F(3, 24) = 7.834$, $p < .01$, reflecting better performance in Chinese on the speaking test ($\mu = 19.31$, $\sigma = 6.18$), understanding test ($\mu = 23.59$, $\sigma = 5.63$), and pronunciation ($\mu = 6.19$, $\sigma = 1.05$) compared to Arabic (speaking test $\mu = 14.25$, $\sigma = 9.08$, understanding test $\mu = 17.22$, $\sigma = 7.75$, pronunciation $\mu = 4.31$, $\sigma = 1.67$). Also, the variances between languages were significantly different for all test scores, $p < .05$, as seen in the larger difference between standard deviations for each score in Chinese compared to Arabic. Therefore, separate MANCOVAs were carried out for each language.

Whilst the Arabic group did not show significant difference between Music and No Music conditions (all $p > .05$), the Chinese group showed significantly better performance in the Music condition for both speaking test, $F(1, 12) = 7.118$, $p < .05$, and understanding test, $F(1, 12) = 7.757$, $p < .05$, compared to the No Music condition. There was no significant effect in the pronunciation task and no effect of musical sophistication (Gold MSI) as a covariate on any of the test scores ($p > .05$).

A separate MANOVA was conducted to examine the relationship between background music and enjoyment / achievement level. Participants in the Music conditions showed significantly higher overall achievement level, $F(1, 28) = 5.077$, $p < .05$, and borderline significance on daily enjoyment, $F(1, 28) = 3.701$, $p = .065$, and overall enjoyment, $F(1, 28) = 3.604$, $p = .068$, compared to participants with No Music, with no significant difference between two languages, $p > .05$.

Conclusions

Based on both studies, we conclude that background music has the potential to be used as an effective aid for second language learning, in conditions where the music is prepared carefully with the learning materials so as not to act as a cognitive distraction. The most likely explanation of the positive effect at present is in line with previous studies indicating that background music can raise psychophysiological arousal levels, which then has beneficial impact on concurrent cognitive tasks (Thompson, Schellenberg, & Husain, 2001). However, this factor is unlikely to explain the present experiment effects completely, given that participants in both language groups reported higher enjoyment but only participants in the Chinese learning group showed improved performance.

The relationship between music and higher enjoyment and achievement of learning is also important when considering how likely a person is to persevere with their language learning. The fact that music boosts enjoyment and sense of achievement could be a factor which leads people to continue their language learning in the future.

Further studies with different languages (including the possible difference between tonal and atonal languages), musical settings or brain activity investigations could give clearer idea on the role of background music in language learning and the precise locus of the effects seen on both short-term and long-term memory performance. Overall, this research shows that background music can have a positive effect on memory performance, in an ecologically valid language learning setting.

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Keywords

Background music, second language, verbal memory, learning

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