Which Genre of Background Music Best Supports Foreign Language Vocabulary Learning?

Emma Farmer
Durham University

ABSTRACT

Despite many students listen to music whilst studying, previous research has presented an 'equivocality on the influence of music on [verbal] performance' (Balogun et al., 2013: 38). This study explores the effect of contrasting styles of background music on vocabulary learning. Sixty-one native-English participants were tasked with learning four sets of French vocabulary under four musical conditions: silence, fast strings, calm piano, and relaxed jazz. Following each learning session, participants sat a vocabulary test, where they were asked to write the French translations for five words drawn from the previous list; they were also asked to rate how they thought they had fared during the learning task. This study found that the presence of background music had an impact on the participants' ability to learn vocabulary and showed that the genre most conducive to vocabulary learning was calm piano music; the most detrimental was fast string music. Participants' musicality, knowledge of French, and knowledge of other foreign languages were measured. The study found that these additional independent variables do impact the genre of background music that is the best accompaniment to vocabulary learning. This report addresses the study's implications and limitations and proposes avenues for future research.

1. INTRODUCTION

Though De Groot acknowledges that vocabulary knowledge is of crucial importance to the foreign language learner, previous empirical exploration in this field has proven limited (2006: 464). Perhaps, as Schreuder suggests, this is due to the sheer vastness of the lexicon; a language typically contains tens of thousands of words, for which eight types of information must be learned: phonological, orthographic, syntactic, morphological, pragmatic, articulatory, idiomatic, and semantic (1987). In any case, the few studies that have explored this relationship between learning and background music have produced statistically insignificant or contrasting results.

One such study is that of Bad'urová, which investigated the effect of background music on novice Czech learners (2019). Bad'urová's results proved statistically insignificant and only narrowly implied that one's performance in verbal learning exercises is enhanced by the presence of background music. Furthermore, this study presented some unfortunate limitations. Bad'urová's use of the 'musical training' subscale of the Goldsmiths Musical Sophistication Index (Gold-MSI; Müllensiefen et al., 2014) to gauge participants' musicality only assessed a small proportion of what constitutes musicality, and participants' scores to this questionnaire were abnormally high (limiting the extent to which Bad'urová could study varying levels of musicality). Moreover, Bad'urová's two musical stimuli (3rd movement of Mozart's *Clarinet Concerto* and *La calunia è un venticello* from Rossini's *The Barber of Seville*) were problematic, for they refused the study of salient features including tonality, tempo, and emotion, and their relationship to verbal learning.

Bad'urová's findings contradict those of Jäncke and Sandmann (2010), who found that the presence of background music bore no impact on one's ability to learn verbal material. This study bypassed Bad'urová's 'repertoire problem' by using a specially composed musical stimulus that allowed the study of 'the effects of emotion, complexity, tempo, and associated semantic knowledge of the musical pieces' (Jäncke & Sandmann 2010: 2). Though Bad'urová's study worked with subjects that claimed no knowledge of the Czech language, Jäncke and Sandmann's study took the notion of 'learning the unseen' one step further by requiring participants to memorise pairs of meaningless non-words. As such, this study proved more rigorous than the previous; the choice of musical and verbal material alleviated the risk of participants either learning words that they already knew or listening to background music with which they were already familiar, whilst the incorporation of EEG measurement produced a mixture of quantitative, qualitative, and objective neurophysiological data. However, the use of EEG, artificial vocabulary, and stimuli created a similarly artificial environment, forcing us to question the extent to which we should trust these results within a real-life context.

Conversely, Kang and Williamson (2013)'s musical stimuli comprised easy-to-listen tunes, avoiding sounds that participants might find distracting or novel (2013). Participants were tasked with learning Mandarin or Arabic, either with or without background music. The use of two highly contrasting languages provided great insight into the effect of background music on 'language learning' as a whole. Although this study found no significant difference between music and non-music conditions on Arabic learning, the researchers uncovered a 'borderline benefit' of background music on Chinese learning in the long-term (2013: 736). Kang and Williamson credit this to the 'superior musicality or tonality' of the Chinese language, which renders it more susceptible to memorisation when studied alongside music (2013: 730). These researchers also found that a higher level of musicality led to poorer performance in verbal memorising tasks. However, due to the small sample size (with only eight participants in each group) and the short three-week window during which this experiment (seeking to assess the *long-term* impact of music on language-learning) took place, one should be sceptical about the validity of these results.

Lastly, De Groot's study (2006) contradicts Kang and Williamson's findings by suggesting that one's ability to memorise verbal material in the long term *is* enhanced by the presence of background music – and that this is irrespective of

the tonality of the language itself. A key strength of this study was that De Groot incorporated the additional variable of participants' knowledge of other foreign languages, and thus, was able to analyse the tripartite relationship between knowledge of other languages, the presence of background music, and verbal learning. However, De Groot's findings were statistically insignificant, and the collected qualitative data forces us to further question its validity. Furthermore, De Groot's participants (akin to Jäncke & Sandmann, 2010) were tasked with memorising made-up non-words, which again rendered the experiment somewhat artificial.

This brief literature review underscores that whilst the study of the relationship between music and verbal learning is *not* a novel avenue for research; it remains a matter of contention. This paper builds upon existing research by addressing the highlighted limitations in previous methodologies. This study will examine learners of a broad range of abilities in the target language, and rather than using an artificial non-language, will use French. Furthermore, rather than merely studying whether the presence of background music has an impact on one's ability to memorise sets of French vocabulary, this study strives to ascertain the effect of various *styles* of background music on verbal learning. Lastly, this study ascertains whether one's level of musicianship bears any impact on one's ability to memorise vocabulary under musical/non-musical conditions.

Three key hypotheses were established. The first was that the presence of background music *will* have an impact on French vocabulary learning; this would support the findings of Angel, Polzella, and Elvers (2010), Salamé and Baddeley (1989), and Mamarella, Fairfield, and Cornoldi (2007), rather than those of Bad'urová (2019), Patson and Tippett (2011), and Kang and Williamson (2013) – since French is not a tonal language. The second hypothesis was that the type of music that will best facilitate foreign language vocabulary learning might be described as 'low-complex', thus supporting findings by Kang and Williamson (2013), Felix (1993), Furnham and Allass (1999), Jones et al., (2006), Schellenberg (2005), and Thompson et al., (2001). The final hypothesis is that one's level of musicianship will also impact one's ability to memorise and recall vocabulary when subjected to music, supporting the findings of Kang and Williamson (2013) and Cockerton, Moore and Norman (1997), rather than Patson and Tippett (2011), Bad'urová (2019), and Koelsch et al. (2005).

2. METHOD

Design. This experiment employed a within-participants design, whereby subjects completed all tasks in experimental conditions. The independent variable was the four genres of background music that participants listened to as they memorised sets of vocabulary. Immediate vocabulary recall constituted one dependent measure; the other was the participants' perception of their scores under each musical condition.

Participants. Sixty-one native-English speakers, whose ages ranged from 18-75 (M = 24.05; SD = 8.72) completed this study. Prior to completing the main learning task, they completed a series of short questionnaires. Firstly, participants

self-assessed their level of musicality and aligned themselves within one of the six categories that are shown in Table 1 – these levels of musicianship are derived from the Ollen Music Sophistication Index (Ollen, 2006). If 'nonmusician' = 1 point, and 'professional musician' = 6 points, the mean level of musical expertise is 3.16.

Table 1. Participants' Self-Assessed Levels of Musicality

Level of musical expertise	Number of participants that aligned themselves with this category
Nonmusician	5
Music-loving nonmusician	15
Amateur musician	18
Serious amateur musician	13
Semi-professional musician	8
Professional musician	2

Participants also self-assessed their level of French within one of six categories, which correspond to the Common European Framework of Reference for Languages. These categories are shown in Table 2. If 'beginner' = 1 point, and 'upper advanced' = 6 points, then the average level of French (considering all 61 participants) is 3.98.

Table 2. Participants' Self-Assessed Levels of French

Level of French	Number of participants that aligned themselves with this category
Beginner (A1)	3
Elementary (A2)	9
Intermediate (B1)	11
Upper Intermediate (B2)	10
Advanced (C1)	19
Upper Advanced (C2)	9

Finally, 41 participants admitted to having knowledge of (an)other foreign language(s), which are visualised in the word cloud depicted in Figure 1. The more frequently the language was mentioned by participants, the larger it appears in this word cloud; as such, the languages most frequently mentioned by participants were Spanish, German, Italian, and Russian.

Figure 1. Languages with which the participants were familiar

Materials: Learning task. To minimise the risk of previous exposure, the vocabulary with which participants were tasked with learning comprised exclusively of English non-cognates. Four vocabulary lists were created, each including 10 French words and their English equivalents (see Appendix). The French words comprised a combination of topic-specific, scientific, or musical vocabulary or uncommon words/unusual synonyms for common words. The vocabulary used in this experiment was drawn from 'advanced French' vocabulary sets on *Memrise*[1] and *Quizlet*.[2]

Musical stimuli. Three contrasting musical stimuli were used in this experiment, in addition to 'silence' (control condition). The three genres were 'fast strings', 'relaxed jazz', and 'calm piano'. The extracts used to represent each of these categories were found in *Spotify*'s study playlists and were selected on the basis that they might be unfamiliar to the participant (i.e., the most popular tracks were avoided). For each of the three musical conditions, only the first minute of the pieces was used; conversely, in the silent condition, a minute-long countdown was shown onscreen. The musical stimuli and their descriptions are visualised in Table 3.

Table 3. Musical Stimuli Used in This Experiment

Category	Name of excerpt	Description of excerpt
Silence	NA	Silent
Fast Strings	'String Quartet no. 130 in Bb Major: Presto', by L.V. Beethoven	Fast, classical string quartet. Bb major, largely homophonic. Wide variations in dynamics are heard throughout.
Relaxed Jazz	'Stella by Starlight', by Sophie Lemon	Slow, 4/4 homophonic and virtuosic saxophone music accompanied by piano and light percussion. Soft dynamics throughout.
Calm Piano	'Sleepy Meadows', by Julia Andersson	Moderate tempo, 12/8, arpeggio-like piano music. Uses a consistent, arpeggiated bassline and moderate dynamics throughout.

Procedure. This study was conducted online; participants were recruited through social media posts, information was collected via *Qualtrics*. Following the opening questionnaires, participants were provided with instructions for the main task: they were told that they would be asked to learn a set of vocabulary while listening to a one-minute musical excerpt. They were also told that there would be four sets of vocabulary to learn, and that following each round, they would be tested on their recall.

Before the main learning task, participants completed a short practice trial (which required three pairs of vocabulary to be learnt alongside a 30-second extract of *Spring* from Vivaldi's *The Four Seasons*); the data collected here was not included in analysis. Throughout the experiment, participants were asked not to cheat, to leave their volume at a constant level, and to wear headphones.

In the main experimental task, all 10 translation pairs (French words alongside their English equivalent) were presented simultaneously. In the vocabulary test, participants were asked to recall only five of the 10 words that they had just studied; they were asked to write the French equivalent of the English

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[1] https://www.memrise.com/

[2] https://quizlet.com/en-gb

word. To replicate school/university conditions, each vocabulary test was completed in silence. The whole experiment took approximately 10 minutes to complete.

3. RESULTS

The highest possible perception rating and score in each of the vocabulary tests was 5. Figure 2 shows the mean scores, considering all participants in each musical condition. The data indicate that participants both scored and thought they had scored the best under the calm piano musical condition; the mean score was 2.79 ($SD = 1.59$) and the mean perception was 3.02 ($SD = 1.16$). These results show that the genre of background music that was the second-best facilitator of verbal learning was relaxed jazz; $M = 2.64$ ($SD = 1.35$) and the mean perception 2.89 ($SD = 1.05$). This was followed by the silent (control) condition, where $M = 2.36$ ($SD = 1.52$), and the average perception was 2.62 ($SD = 1.24$). This study found that the genre of background music that was least conducive to vocabulary learning was fast strings music, where the average score was 1.67 ($SD = 1.29$) and the average perception was 2.13 ($SD = 0.96$). Two ANOVAs were carried out on these data; one on the participants' mean scores ($F(3,240) = 7.25$, $p<.05$) and the other on the participants' mean perception of their scores ($F(3,240) = 7.25$, $p<.05$). These statistical analyses reveal that these data are statistically significant, and thus allow the null hypothesis to be rejected.
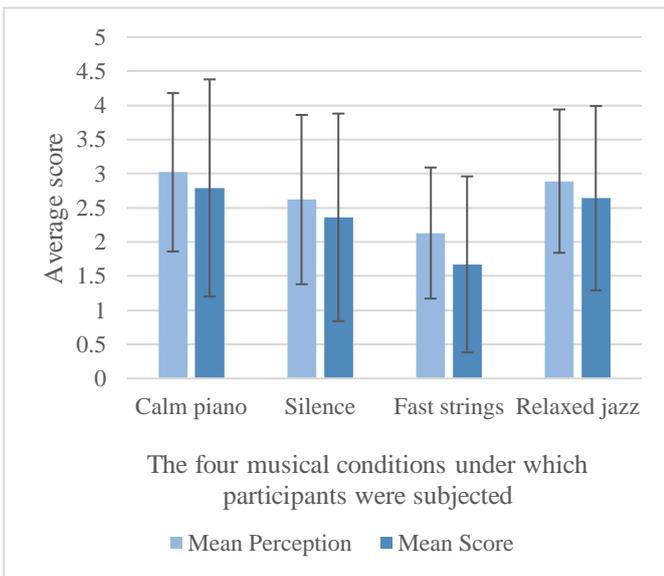

Figure 2. Mean scores and perceptions (SD) on the translation test, across all participants under each musical condition

To ascertain whether musical training as an additional variable explains the individual differences in task performance, participants were grouped into three categories (20 music-loving nonmusicians; 31 serious amateur musicians; 10 semi-professional musicians) dependant on their answers to the 'musicality' questions in the opening questionnaire. This is visualised in Figures 3 and 4. In this experiment, the most musical participants (semi-professional musicians) consistently scored lower than the other participant groups under all four of the musical conditions: $M = 2.40$ ($SD = 1.96$) in the calm piano

condition; $M = 1.80$ ($SD = 1.87$) in the silent condition; $M = 1.40$ ($SD = 1.35$) in the fast strings condition; $M = 2.50$ ($SD = 1.58$) in the relaxed jazz condition. Conversely, the serious amateur musicians on average scored better than the other participant groups under the silent ($M = 2.58$, $SD = 1.43$) and fast strings ($M = 1.84$, $SD = 1.19$) conditions, whereas the least musical participants – music-loving nonmusicians – on average scored better than the other participant groups under the calm piano ($M = 3.05$, $SD = 1.43$) and relaxed jazz ($M = 2.80$, $SD = 1.36$) conditions.
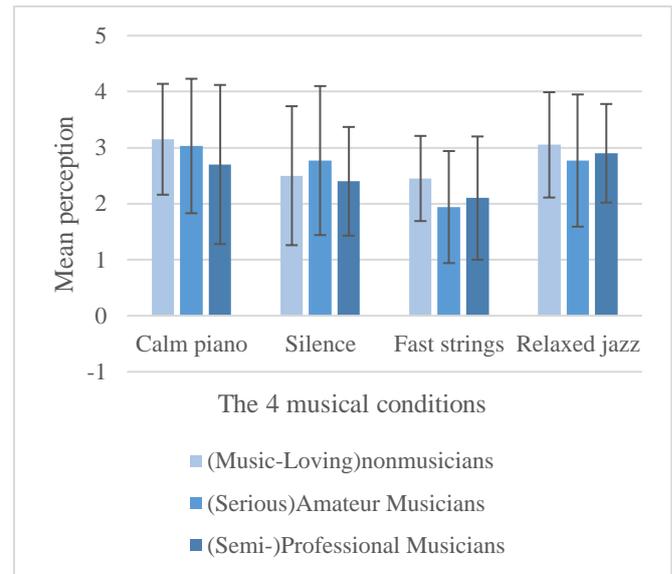

Figure 3. Mean perceptions of scores (SD) between the three musicality groups under each of the musical conditions.
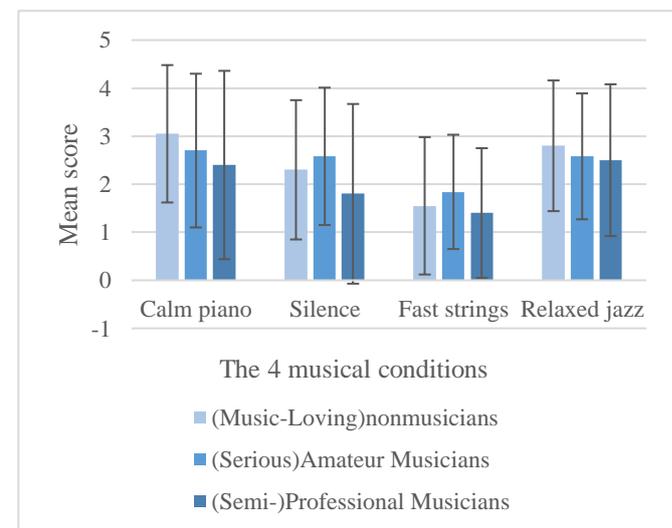

Figure 4. Mean scores (SD) between the three musicality groups under each of the musical conditions.
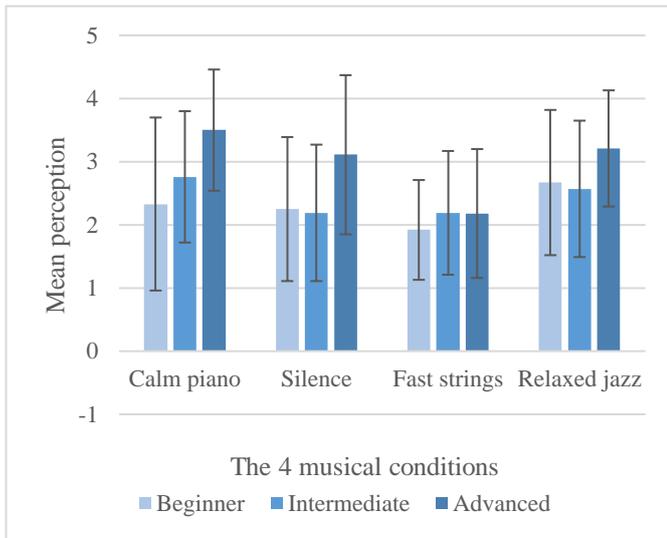
Figure 5. Mean perceptions of scores (SD) between the three French attainment groups under each of the musical conditions
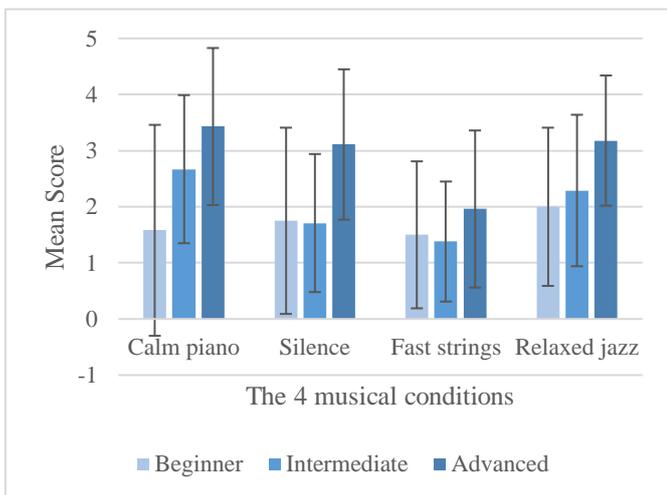

Figure 6. Mean scores (SD) between the three French attainment groups under each of the musical conditions

To determine whether participants' level of French similarly explains the differences in task performance, participants were grouped into three categories based on their answers to the 'level of French' questions in the opening questionnaire; these three categories were 'beginner', 'intermediate', and 'advanced', comprising 12, 21, and 28 participants (see Figures 5 and 6). On average, the 'advanced' participants scored higher than the other participant groups under all four of the musical conditions, achieving a mean score of 3.43 (SD = 1.40) when subjected to calm piano music, 3.11 (SD = 1.34) in the silent condition, 1.96 (SD = 1.40) in the fast strings condition, and 3.18 (SD = 1.16) when listening to relaxed jazz music. However, the results are again less clear-cut for the 'beginner' and 'intermediate' participant groups, for in this experiment the 'beginner' participants on average scored worse under the calm piano (M = 1.58, SD = 1.88) and relaxed jazz (M = 2.00, SD = 1.41) conditions, whereas the 'intermediate' participants on

average scored worse under the silent (M = 1.71, SD = 1.23) and fast strings (M = 1.38, SD = 1.07) conditions.
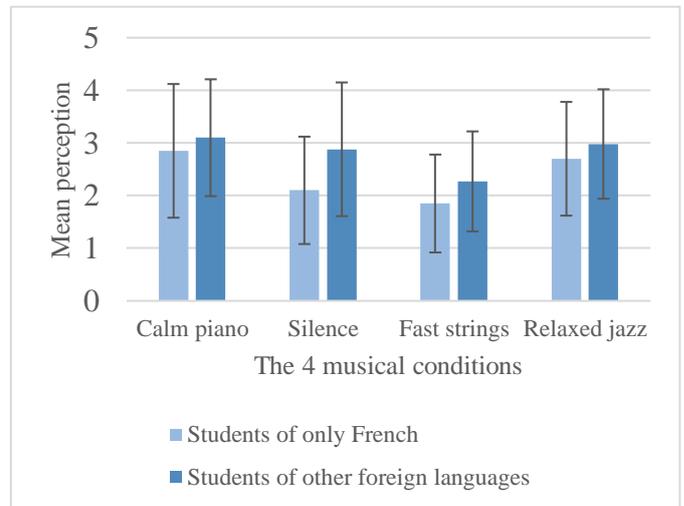

Figure 7. Mean perceptions of scores (SD) between mono- and poly-linguists, under each of the musical conditions
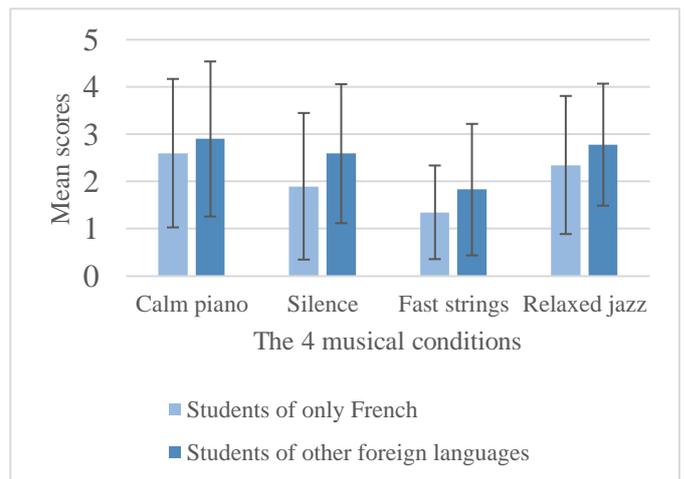

Figure 8. Mean scores (SD) between mono- and poly-linguists, under each of the musical conditions

Lastly, to ascertain whether knowledge of other languages could explain the individual differences in task performance, participants were split into two groups according to their answers to the 'knowledge of other languages' portion of the opening questionnaire (see Figures 7 and 8). These two categories were 'students of only French' and 'students of other foreign languages', comprising 20 and 41 participants respectively. Under each of the four musical stimuli, polyglots scored (on average) better than the mono-linguists, scoring an average of 2.90 (SD = 1.64) in the calm piano condition, 2.59 (SD = 1.47) in the silent condition, 1.83 (SD = 1.39) in the fast strings condition, and 2.78 (SD = 1.29) – compared to the average score of 2.60 (SD = 1.57), 1.90 (SD = 1.55), 1.35 (SD = 0.99), and 2.35 (SD = 1.46) that was scored by the students of only French, in each of the musical conditions. There was the greatest disparity between these two participant groups'

scores when subjected to silence (a mean difference in score of 0.69), compared to the calm piano condition, where there was a mere mean difference of 0.30 points between the mono- and poly-linguists.

4. DISCUSSION

The primary hypothesis – that the presence of background music *will* impact one's ability to memorise vocabulary – is supported by this study's findings. In this study, the genre of background music most conducive to verbal learning was 'calm piano', which supports the findings of Angel, Polzella, and Elvers (2010). These researchers suggest that low-complex background music increases the speed of spatial processing and the accuracy of linguistic processing; this is also supported by Mamarella, Fairfield and Cornoldi, who suggest that 'the presence of music in the background can lead to a significant increase in phonological working memory and phonemic fluency' (2007: 2), and Cockerton, Moore and Norman, who assert that such music can 'enhance intelligence test performance' (1997: 2). Furthermore, Kang and Williamson claim that 'music has the potential to both hinder and help performance on a secondary task by acting as a disruptive or stimulating agent', which leads us to assume that the 'fast strings' condition constituted the latter in this experiment (2014: 729). As the 'fast strings' excerpt was the most 'musically complex' of the extracts, it may have led to excess demands being made on the limited capacity of the participant's cognitive systems, and subsequently hindered participants' ability to succeed in the memorising/testing stages; this aligns with the findings of Kämpfs, Sedlmeier and Renkweitz (2010), and Schellenburg (2012). Conversely, the lower-complex 'calm piano' and 'relaxed jazz' conditions provided a better accompaniment to verbal learning, for they likely increased participants' psycho-physiological arousal and mood, rendering the stimulus stimulating rather than distracting.

Moreover, this study found that the *most* musical subjects consistently achieved the lowest scores across all four musical conditions, whilst the *least* musical consistently scored the best. Koelsch, Gunter, Wittforth, and Sammler suggest that 'musically trained individuals process music in different ways' (2005: 3), and this idea is interesting to consider alongside the findings of Patson and Tippett, which indicated that the presence of background music adversely affects the performance of musicians in such language-learning tasks (2011). Patson and Tippett cite that this may be due to the interference of neural networks recruited in language and music processing in musically trained individuals, whilst in musically untrained individuals the processing of language and music remain more functionally independent or separated (2005: 3).

Though the trend (of calm piano music providing the best accompaniment to language-learning, and fast string music providing a detrimental distraction) remained, this study found that polyglot participants and the most advanced French students consistently scored higher than the other participant categories. This may be because they already knew some of the vocabulary or were able to 'guess' answers due to their knowledge of other languages, rendering this a potential limitation of the study. Moreover, although the sample size was healthy, the participant groups were unbalanced; this issue was not helped by the high drop-out rate (with 96 incomplete responses). A replication might benefit from being shorter, leading to a larger or more even participant group that might produce more reliable results. A replication should also take place in-person, with an invigilator who is able to ensure that participants are completing the study in undisturbed/equal conditions, and that they are not 'cheating', such was the case in Jäncke and Sandman (2010), De Groot (2006), and Kang and Williamson (2013). Moreover, this study only considered one language; a replication should consider more languages, to ascertain whether these results are applicable to multiple tongues.

Previous research (Daoussis & McKelvie, 1986; Furnham & Allass, 1999; Furnham & Bradley, 1997) has considered the relationship between personality traits (notably introversion and extroversion), background music, and verbal learning – which presents another exciting avenue for future research within the context of foreign language vocabulary learning. Finally, given that this study has found that 'calm piano' is the most conducive background musical genre, future research should seek to ascertain *which* instrument playing this calm music, or *which* genre played on the piano, is most beneficial to foreign language learning.

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APPENDIX

Appendix 1. The four sets of vocabulary used in the experiment.

SET A

fute-fute	bright spark
prout	toot
raplapla	deflated
astre	celestial body
cartonner	to attack
contresens	misinterpretation
borgne	one-eyed person
loisible	having the liberty to do whatever you please
meugle	moo
chevrefeuille	honeysuckle

SET B

blablater	to babble
rocambolesque	incredible
loutre	otter
franchise	frankness
disette	famine
airain	bronze
lame	razor blade
anse	bay
creux	hollow
truchement	intermediary

SET C

enchevetrement	labyrinth
cohue	crowd
cabot	mutt
cabale	conspiracy
gresiller	to sizzle
bourrasque	gust
pente	slope
tonneau	barrel
racune	resentment
fureter	to snoop

SET D

devisser	to unscrew
flaque	puddle
fuite	leak
emousse	blunt
loupe	magnifying glass
rouiller	to rust
archet	bow
saccade	jerk
cierge	candle
fourmiliere	anthill