

Bibliography

- [1] C. Philip Beaman and Dylan Marc Jones. Role of serial order in the irrelevant speech effect: Tests of the changing-state hypothesis. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 23(2):459–471, 1997.

KEY: Beaman1997

ANNOTATION: Perham & Sykora, 2012 “If task does not involve seriation then changing-state sound is not disruptive”

- [2] Christopher F. Chabris. Prelude or requiem for the ‘Mozart effect’? *Nature*, 400(6747):826–827, Aug 1999.

KEY: Chabris1999

ANNOTATION: META-ANALYSIS

Demonstrates that any cognitive enhancement is small and does not reflect any change in IQ or reasoning ability in general, but instead derives entirely from performance on one specific type of cognitive task and has a simple neuropsychological explanation.

A shared right-hemisphere locus for the complex visual transformation processes involved in spatial tasks and cognitive arousal provides a plausible explanation for an intermittent, small, positive ‘enjoyment arousal’ effect of Mozart’s music on difficult spatial tasks.

- [3] Herbert A. Colle and Alan Welsh. Acoustic masking in primary memory. *Journal of Verbal Learning and Verbal Behavior*, 15(1):17–31, feb 1976.

KEY: Colle1976

ANNOTATION: ISE INFORMATION

According to model’s such as Sperling’s, short-term memory maintains a substantial amount of its information by storing it in an auditory sensory memory. Since the auditory sensory memory is used to store memory information these models predict that concurrent auditory stimulation should destroy memory information and, hence, reduce recall performance.

To test this hypothesis, a foreign language was presented over earphones while subjects performed a serial recall task with visual presentations and written recall. The subjects were told to ignore the noise. In Experiment I the presence of the irrelevant foreign language noise reduced recall performance on phonologically different lists (FKLM) but it did not reduce performance on

phonologically similar lists (BCDG).

In Experiment II participants had to complete an arithmetic task between seeing the letters and recalling them. The noise effect was eliminated after 30 sec of silent arithmetic, indicating that the noise effect is a primary memory phenomenon.

- [4] Cecil M. Freeburne and Murray S. Fleischer. The effect of music distraction upon reading rate and comprehension. *Journal of Educational Psychology*, 43(2):101–109, 1952.

KEY: Freeburne1952

ANNOTATION: Two questions are raised in the present study. First, does listening to specific types of nonvocal music (classical, semi-classical, popular and jazz) have any significant effect upon rate of reading and reading comprehension? Second, are rate of reading and reading comprehension in the presence of music a function of the subject's intelligence?

Reading material was expanded from the Robinson-Hall Test for Reading Ability. 283 Introductory Psychology students were assigned to the 5 groups. 208 students completed the study. All participants within a group were tested at once in a classroom. Music was played from a phonograph in an adjoining room.

Rate of Reading Results: ANOVA - No significant difference among groups. A t-test showed that the rate in the jazz group was higher than the control group.

Comprehension Results: ANOVA - No significant difference among groups. A t-test indicated no differences between groups.

There was no relationship between rate of reading or comprehension and subject's intelligence (based on ACE percentile rankings).

- [5] Adrian Furnham and Kathryn Allass. The influence of musical distraction of varying complexity on the cognitive performance of extroverts and introverts. *European Journal of Personality*, 13(1):27–38, 1999.

KEY: Furnham1999

ANNOTATION: This study investigates the nature of the relationship between personality and music distraction on cognitive performance. Specifically, it explores the extent to which musical complexity is responsible for variance in task performance. In this experiment introverts and extroverts performed 3 cognitive tests in the presence of silence, simple and complex background music. All music was popular music and was rated on complexity by musicians. 48 participants

Reading comprehension task, memory task (immediate and delayed recall), pattern completion task

Results: no main effect of background music on performance in any task.

Theory of stimulus information load - Berlyne 1971,1974 - relates perceived stimulus complexity to preference

- [6] Adrian Furnham and Anna Bradley. Music while you work: the differential distraction of background music on the cognitive test performance of introverts and extraverts. *Applied Cognitive Psychology*, 11(5):445–455, Oct 1997.

KEY: Furnham1997

ANNOTATION: Music has a positive effect on factory workers, but this effect depends on type of music and age of worker. In workers performing a repetitive task - Music improves performance if it is played just after arousal has peaked. If music is played consistently throughout the duration of the task then there are no differences in performance level to when the task is completed in silence. This study looked at how introverts/extroverts are affected by music while performing a task. Participants completed a reading comprehension test and a memory test. The music was a 10 minute recording of a morning radio show - 3 songs with male talking in between. The total amount of talking time was just over 2 minutes. Results showed that personality type did not make a difference. The presence of music caused marginally lower scores (only significant in 1 out of 3 analyses).

- [7] Adrian Furnham and Lisa Strbac. Music is as distracting as noise: the differential distraction of background music and noise on the cognitive test performance of introverts and extraverts. *Ergonomics*, 45(3):203–217, Feb 2002.

KEY: Furnham2002

ANNOTATION: This study aimed to determine whether there would be a differential distraction of background noise and music on the cognitive test performance of introverts and extraverts on three kinds of task. The tasks were specifically selected in order to be as ecologically valid as possible: the prose recall task relates to examination strategies at any level of education; while the reading comprehension task, which involves assimilating information, involves absorbing and understanding information and then recalling it. Finally, the mental arithmetic tasks are also often conducted in working environments, such as calculating pay and producing figures. **Only complex vocal music was used.** The tests were completed under three conditions: silence, noise, and music.

Results: in all three tasks performance declined in the presence of music, however extraverts did better than introverts. However, music and noise were not significantly different from each other.

- [8] Susan Hallam, John Price, and Georgia Katsarou. The Effects of Background Music on Primary School Pupils' Task Performance. *Educational Studies*, 28(2):111–122, jun 2002.

KEY: Hallam2002

ANNOTATION: The research reported here attempts to establish the effect of music on task performance in 10–12 year olds, while clearly defining the nature of the musical content as perceived by the listeners in relation to its

potential to evoke particular states of arousal. Study 1: Pupil's performance on arithmetic tasks was compared during calming music and silence. When listening to music pupils answered more questions (faster rate of completion), but there was no significant difference in accuracy.

Study 2: Pupil's performance on a memory task (sentence memory) was compared during calming music, silence, and arousing (aggressive, unpleasant) music. Calming music had a positive effect on the memory task, and the arousing music had a negative effect.

Findings suggest that effects of music on task performance are mediated through its effects on arousal and mood.

Does not say if music in study 1 had lyrics or not. Study 2 - no lyrics

- [9] Dylan Jones. The cognitive psychology of auditory distraction: The 1997 BPS Broadbent Lecture. *British Journal of Psychology*, 90(2):167–187, may 1999.

KEY: Jones1999

ANNOTATION: ISE INFORMATION

The primary task in the irrelevant sound paradigm is attentionally demanding. It requires verbatim (serial) recall of events. The primary task is visual, not auditory. While the visual recall task is being undertaken, irrelevant sound is played. Participants are asked to ignore any sound they hear. It is assumed that the degree of processing of the irrelevant material will be revealed by the extent to which serial recall is impaired.

How does this occur? 1. Interference occurs because of the way in which sound impairs the encoding of the visual items OR 2. Similarity in which the events are represented in memory (either based on context, or that both streams of information share a common process).

- [10] Kristin M Nantais and E Glenn Schellenberg. The Mozart Effect: An Artifact of Preference. *Psychological Science*, 10(4):370–373, Jul 1999.

KEY: Nantais1999

ANNOTATION: 84 undergraduates - 56 in experiment 1, 28 in experiment 2 Listened to Mozart or Schubert (piano only) for 10 mins and then completed paper folding and cutting spatial task. In Experiment 1 1/2 listened to mozart, 1/2 listened to schubert, all did silent condition. In Experiment 2 all listened to Mozart and a short story (Stephen King) was used as a control condition. Experiment 1: scores were higher after listening to music - both Mozart and Schubert. Experiment 2: no effect of condition - mozart effect disappeared when control was a short story. Performance was better after preferred stimulus (either music or story) than nonpreferred stimulus.

Mozart effect has nothing to do with Mozart. They didn't measure mood or arousal - but speculate that this is what is driving the effects and is not necessarily specific to music.

- [11] Lucy L. M. Patston and Lynette J. Tippett. The Effect of Background Music on Cognitive Performance in Musicians and Nonmusicians. *Music Perception: An Interdisciplinary Journal*, 29(2):173–183, Dec 2011.

KEY: Patston2011

ANNOTATION: In the present study, musicians and nonmusicians were compared on a language task (sentence comprehension - marking grammatically correct and incorrect sentences) and a visual task (visuospatial search - find difference between two designs) under three conditions: music played correctly, music played incorrectly, and silence. Our goal was to test whether processing of music and language is functionally independent in musicians but not in nonmusicians.

36 musicians, 36 non-musicians. The music did not have lyrics - piano pieces. 2 non-musicians and 27 musicians reported hearing mistakes in the music-incorrect condition.

language comprehension results: musicians completed more items correctly. Significantly more errors in music-incorrect condition. musicians scored higher during silence and music-correct, but not music-incorrect.

visuospatial search results: musicians completed more items correctly. no interactions or other main effects

These findings challenge the view that music and language are functionally independent in expert musicians, and instead suggest that when musicians process music they recruit a network that overlaps with the network used during language processing. Interference is exacerbated by the additional processing required to parse grammatically incorrect music. In summary, the performance of musicians was negatively affected by the presence of background music compared to silence when performing a language comprehension task involving grammaticality judgements. Performance was not affected in a visuospatial task.

In short, there is emerging (but inconsistent) evidence indicating that executive function abilities may be enhanced as a result of music lessons and could, therefore, contribute positively to general cognitive functioning in musicians

- [12] Nick Perham, Simon P Banbury, and Dylan M Jones. Reduction in auditory distraction by retrieval strategy. *Memory*, 15(4):465–473, may 2007.

KEY: Perham2007

ANNOTATION: Perham & Sykora, 2012 “If task does not involve serialisation then changing-state sound is not disruptive”

- [13] Nick Perham and Harriet Currie. Does listening to preferred music improve reading comprehension performance? *Applied Cognitive Psychology*, 28(2):279–284, Mar 2014.

KEY: Perham2014

ANNOTATION: There is discrepancy in the literature about whether or not

background sound improves or disrupts cognitive performance. This study explores this discrepancy by asking participants to perform reading comprehension tasks while listening to quiet, liked lyrical music, disliked lyrical music, and non-lyrical music.

30 undergraduate students. Reading comprehension task was taken from practice SAT tests. Liked music was provided by the student and lyrics were required. The other songs also had lyrics.

Results: significant main effect of sound. Performance in quiet was significantly better than in disliked lyrical music and liked lyrical music.

Liked and disliked music are equally disruptive when compared to quiet. Liked music does not always aid cognitive performance. Biggest effect on seriation tasks or semantic processing. **These findings are not consistent with the music and cognition literature and instead concur with the research on semantic auditory distraction.** Results may have implications for those who read and write while listening to music.

- [14] Nick Perham and Martinne Sykora. Disliked Music can be Better for Performance than Liked Music. *Applied Cognitive Psychology*, 26(4):550–555, Jul 2012.

KEY: Perham2012

ANNOTATION: Research has shown that performance is equally as poor on serial recall whether the participant likes the music or not (Perham & Vizard, 2010). A key feature of this latter auditory phenomenon [irrelevant sound effect (ISE)] is the acoustical variation in the sound that is an inherent part of music. Thus, it may be possible for an unliked, unfamiliar piece of music to be less damaging to performance than liked, familiar music. In this study, an ISE paradigm was adopted in which serial recall was performed in the presence of quiet, liked, and disliked music.

25 undergraduate students. The digits were presented visually and participants were asked to write digits down after presentation.

Results: performance on quiet condition was significantly better than the disliked condition. Performance on the disliked condition was significantly better than the liked condition.

The disliked music had a ‘steady-state waveform’ while the liked music was more variable. In summary, the current study’s findings support that of Perham and Vizard (2010) by once again showing that familiar, liked music impairs serial recall performance by virtue, we would argue, of the acoustical variation in the music.

Many studies report the beneficial effects of listening to music on cognitive performance where the music is listened to before the task begins and the increase in performance is explained by participant’s increase in mood and arousal (e.g. Nantais & Schellenberg, 1999; Schellenberg & Hallam, 2005).

- [15] Nick Perham and Joanne Vizard. Can preference for background music mediate the irrelevant sound effect? *Applied Cognitive Psychology*, 25(4):625–631, Jul 2011.

KEY: Perham2011

ANNOTATION: A popular explanation for this improvement in cognitive performance proposes that if the music is liked then this increases arousal which in turn increases performance (Schellenberg, 2005). However, the general methodology that this explanation refers to requires that participants listen to music prior to performing the task which may be contrary to most people's experience. That is, most people listen to music at the same time as, rather than prior to, performing the task.

Serial recall was performed in the presence of five sound conditions: quiet, liked music, disliked music, changing- state speech and steady-state speech. All songs had lyrics. 25 participants. The task was a serial recall task - participants were presented with a series of consonants and then were asked to recall the list.

Results: performance was best in quiet and steady-state conditions. Liked, disliked, and changing-state speech showed similar impairments. The positive effect of music preference was not observed when listening to music during task performance.

Interestingly, the effect of listening to liked or disliked music before commencing an ISE study is yet to be explored and may provide further information regarding music on cognitive performance.

- [16] Frances H. Rauscher and Gordon L. Shaw. Key components of the Mozart effect. *Perceptual and Motor Skills*, 86(3):835–841, Jun 1998.

KEY: RAUSCHER1998

ANNOTATION: REVIEW

We propose that researchers studying the Mozart effect should consider the spatial components of mental imagery and temporal order when choosing dependent measures.

- [17] Frances H. Rauscher, Gordon L. Shaw, and Katherine N. Ky. Music and spatial task performance. *Nature*, 365(6447):611, Oct 1993.

KEY: Rauscher1993

ANNOTATION: 36 Students were given three sets of standard IQ spatial reasoning tasks. Each task was preceded by 10 minutes of mozart, relaxation tape, or silence. Performance on the task after listening to mozart was improved compared to the other 2 conditions. The enhancing effect of the music condition does not extend beyond the 10-15 minute period during which the subjects were engaged in the spatial task. Including a delay period would allow researchers to determine quantitatively the presence of a decay constant.

- [18] Pierre Salamé and Alan Baddeley. Effects of background music on phonological short-term memory. *The Quarterly Journal of Experimental Psychology Section A*, 41(1):107–122, Feb 1989.

KEY: Salame1989

ANNOTATION: Effect of instrumental and vocal music on the immediate serial recall of sequences of nine visually presented digits. Three conditions: silence, instrumental, vocal. The digits were presented visually and participants were asked to write digits down immediately. Most errors during vocal music > instrumental music > silence In first experiment vocal music was sung in the native language of participants, and in the second experiment the vocal music was in a foreign language. Differences may become more apparent by generating sounds that vary systematically in specified dimensions such as pitch, timbre, prosody, and rhythm, rather than relying on precomposed music.

- [19] E Glenn Schellenberg. Music and Cognitive Abilities. *Current Directions in Psychological Science*, 14(6):317–320, Dec 2005.

KEY: Schellenberg2005

ANNOTATION: Review of music listening and music lessons literature. Focus on cognition literature.

Music Listening: Rauscher et al - Mozart effect paper in 1993. Replication attempts were not always successful. Meta-analysis by Chabris, et al (1999) speculated mozart effect has to do with arousal.

Schellenberg paper - Schubert, and Stephen King effect. Arousal has to do with preference. Tasks were performed **after** listening.

Thompson, Schellenberg, and Husain (2001) show that mood also plays a role - more arousal with happy songs.

Music Lessons: Schellenberg (2004) paper assigned children to music lessons or comparison conditions. Children in music lessons had larger increases across the four main areas of intellectual ability measured by the WISC-III - compared to drama, control groups.

Music listening and music lessons can lead to short-term and long-term cognitive benefits, respectively. This positive answer is qualified because the short-term benefits of music listening do not appear to differ from those associated with other stimuli that optimize arousal level or elicit mild positive affect.

- [20] David W. Sogin. Effects of three different musical styles of background music on coding by college-age students. *Perceptual and Motor Skills*, 67(1):275–280, Aug 1988.

KEY: SOGIN1988

ANNOTATION: The present study concerned the effects of differential stylistic background music on coding of college students. In addition, students' perceptions of the music and the effects of these perceptions on performance were assessed.

96 undergraduate students were assigned to 1 of 4 experimental groups. They completed the task under 1 of 4 conditions: no music, classical music, jazz music, popular music. No lyrics. Coding task - 220 items.

Results: no significant differences in the number of items completed by each group. No significant differences in the number of correct responses.

(1) The experimental conditions of style had no significant effect on the number of eye/hand coordination problems completed on the coding task and (2) no significant effect on the number of eye/hand coordination problems completed correctly. Also (3) no over-all pattern occurred in responses to the question, "Did the musical selections seem to interfere with your completing the problems." (4) For Groups 2, 3, and 4 the musical elements of loudness and rhythm of the music seemed to contribute to distraction. Researchers have concluded that, when music becomes a competing environmental stimulus in relation to another task, the music may be phased out of awareness or simply ignored.

- [21] William Forde Thompson, E. Glenn Schellenberg, and Gabriela Husain. Arousal, Mood, and The Mozart Effect. *Psychological Science*, 12(3):248–251, May 2001.

KEY: Thompson2001

ANNOTATION: We compared the effects of two musical pieces: a Mozart sonata, expected to induce heightened arousal and positive mood, and an adagio by Albinoni, expected to induce low arousal and sad mood. Spatial abilities, arousal, and mood were evaluated after exposure to each piece, and after a silence condition. Listeners also rated their enjoyment of each piece. 24 undergrad and graduate students. 1/2 listened to Mozart and 1/2 listened to Albinoni piece (no lyrics). A modified version of the Paper folding and cutting subtest from the Stanford-Binet test was used. Subscales from the Profile of Mood States were used to assess arousal and mood.

Music was played first - then task was completed.

Results: significant interaction between music/silence and Mozart/Albinoni. Mozart group - performed significantly better after music than after silence. Albinoni group - music had no effect on performance. Mozart group scored higher than Albinoni group. No difference between scores from the 2 groups during silence.

Our results provide the only direct support for previous suggestions that the short-term effects of listening to Mozart on spatial ability are an artifact of arousal and mood. It is possible that the Mozart effect is associated more with positive than with negative mood.