Literature review: what makes a song 'safe'?

**Insight Summary:**
Surprisingly little research has been conducted in this area. However, brain imaging and cognitive safety research does suggest that music is safer for drivers and arouses greater attention if:

- In terms of tempo of music, there seems to be a U-function:
  - Music that's too slow causes decreased performance
  - Music that's too fast also causes decreased performance
  - Music that's fast but not too fast is ideal

  So music that is between 50-80 beats per minute is safest (it also mirrors the average heart rate which promotes a nice steady calming association)

- Has energetic movement and steady pulsation such as Baroque type music (Vivaldi, Bach, Beethoven)

- The louder the music the more likely drivers miss vital cues to risk. Low intensity music seems to improve driving performance

- There are no lyrics or there are very simple predictable lyrics/chorus – listening to spoken words we know is very distracting from a psychological perspective.

- It is not a well-known tune

- It doesn’t contain a specific melody to sing with

More details around the summary insights

**Summary of research findings on the impact of music on general decision-making ability**

- Participants had to complete a variety of tasks from hard to easy decision-making scenarios; in general they were given same amount of time to complete each task

- at the same time, they listened to either a fast music track (speeded up by 25% from original tempo of 100 bpm) or slow music (slowed down by 25% from original 100 bpm)

- faster music caused more accurate decision making than slower music

- Interaction between music tempo & task difficulty:
  - decision accuracy for hard decision making task was improved in faster tempo music as compared to slower music
  - no difference was found for the easy decision-making task
  - Hence, faster music seems to be an arousal inducer rather than a distractor

- Kahneman's capacity model (1973):
  - faster tempo music arouses the participant
  - this motivates them to increase supply of processing resource
  - this results in increased decision accuracy
  - the additional supplement of mental resource is more beneficial in hard decision-making tasks because the task draws upon the mental resource

- This study shows that manipulating the tempo of the same piece of music can cause sig. differences
However, what happens when people have to make decisions whilst engaged in a complex motor task such as driving?

Summary of research findings on simulated driving performance:
- Participants had to complete laps on a driving game under a variety of different conditions
- Their actual and perceived speed was measured
- Traffic violations such as disregarded red traffic-lights, lane crossing and collisions were most frequent with fast-paced music
- Simulated driving speed and perceived speed estimates increase as the tempo of the background music increases
- Participants completed laps significantly faster when exposed to fast high-arousal music (130 beats per minute bpm) as compared to slow high-arousal music (70 bpm)
- Self-selected music (fast, Mean tempo: 110 bpm) lead to overestimation of time it took to complete a lap
  - this indicates that more information is processed and less attention is paid to the monitoring of internal time mechanisms
  - Self-selected music increased engagement with the activity
- Experimenter-selected (slow) music lead to underestimation of time & poorest performances
  - However increasing the tempo of experimenter selected music resulted in faster performance and increased inaccuracy
- Self-selected music resulted in better performance than experimenter-selected music, suggesting that personal meaning and subjective associations with music prompted increased engagement with the activity, overriding detrimental effects attributed to unfamiliar, less liked and less appropriate experimenter-selected music
- Overall, time estimates were more inaccurate in presence of music than without it

Summary of research on driving safety in relation to music genre listened to.

Music that has been demonstrated to have detrimental effects on driving safety:
- Jazz listeners are significantly more likely to report receiving a fine for speeding than any other music genre
  - This, however, could be due to them being more honest than others or becoming more involved with the music due to its complexity; they also made significantly longer journeys than others, hence might be more likely to encounter speed cameras
- Reggae listeners were significantly more likely to be involved in near misses and risky decision making situations
- Heavy metal, hard rock, garage and some hip hop was related to driving faster (above average speed limits)
Music that has been seen to either have no impact or improve driving safety:
- Baroque music (Vivaldi, Bach, Beethoven) has been seen to heighten attention – as it is ordered, melodic and offers few surprises. It is between 50-80 beats per minute. It has energetic movement and steady pulsation – all good elements for maintaining alertness.

Other elements of music that impact on driving safely from research in this area:
- Music with lyrics seems to be more distracting than instrumental music
- Music that is louder & more complex (more key changes, erratic rhythms, layered textures, voices) might be more distracting
- **Loudness of music** - 107dB loud music was found to impair visual acuity (compared to 70 dB loud music) this effect was not significant with ‘noise’ at the same level, only music – which suggests the complexity of music stimulates divided attention in drivers
- Unfamiliar music is more likely to be distracting
- not liking the music can negatively influence concentration
- During high-demand drives, abrupt music changes calmed the driver more effective than gradual music changes (This was illustrated by reduction in physiological arousal and improved driving behaviour). These changes are called cognitive orienting responses and cause our brain to take stock, assess the sudden change and pay attention.
- **Emotions and music** - Driving with happy music distracted drivers and caused difficulties in controlling speed (marked decrease of mean speed) and trajectory (near the hard shoulder line) as compared to driving without any music or having emotionally neutral music.
- Driving with sad music caused a withdrawn attitude in the drivers – which typically resulted in an increasingly internal focus, which meant they were less responsive to outside threats and responded to these risky situations more slowly.

Effects of age on driving safety and listening to music

- ‘Experienced’ motorists between 25 and 35 years of age are perfectly capable of focusing on the road while listening to music or the radio, even when driving in busy urban traffic – this research suggests experience can offset the negative effects seen in other age groups of listening to the radio or music whilst driving (Ünal, 2013 http://www.rug.nl/news/2013/06/0604-promotie-berfu-unal).
- In novice drivers (17-18 years old), driving with music has been found to be significantly associated with deficient driving behaviours, such as miscalculation, inaccuracy, traffic violations and driver aggressiveness.
- On trips with driver-preferred music there were significantly more severely deficient driving behaviours and unsafe driving behaviour.
Significantly less driving violations and aggressiveness occurred in novice drivers when listening to alternative background music that was specifically designed to improve driver safety.

When listening to music, older drivers required a louder external warning sound (e.g., car horn or police siren) than do younger adults (Slawinski & MacNeil, 2002).

Other work shows associations between possession of "no claims" on motor insurance and a preference for silence over music in older drivers (Dibben & Williamson, 2007).

Other research has also found that music exposure may decrease cognitive performance in older adults (El Haj & Clement, 2006).

Music complexity & interaction with personality traits

- Extroverts and introverts had to complete three cognitive tasks (reading, memory & complex thinking) while listening to simple, complex or no music.
- Complexity of music was defined as high scores across rhythmic, melodic and overall complexity, vocal meaningfulness and instrumental layering.
  - Example of a simple song: ‘Low’ by REM (64 bpm).
- Extroverts performed better with background music than in silence.
  - Greatest recall was seen when complex music was played.
- Introverts performance was impaired by the presence of any musical distraction, most significantly by complex music.
- In every task, introverts outperformed extroverts in silence; the opposite was true in the presence of complex music – extroverts always performed better with music.
- Introverts reported complex music to be significantly more distracting than simple music, whilst extroverts perceived no significant increase in distraction caused by complex music when compared to simple music.
  - Hence, simple music could offer the most suitable stimulation for populations consisting of both introverts & extroverts.

Other relevant research:

Summary of a UK study involving 1780 British drivers on driving and music (Bidden & Williamson, 2007):
- Dance & house music were associated with drivers aged 18-29 with less than four years’ accident free motoring.
  - This type of music tends to be fast tempo, designed to be played at high volumes and sometimes incorporating complex rhythmic patterns and layered textures.
these features are highly arousing for listeners, which can avert attention away from driving (e.g. Brodsky, 2002, see beginning of doc)

- A significant association was found between no-claims car insurance discount and the most listened-to genre for over-50s - these people listened to more easy listening and less chart-pop music – this genre has lower volumes and slower tempos and more melodic rhythms.
- for 18-29 year-olds there was a significant association between no claims discount and radio station most listened to – these such drivers listened less to BBC 1 and more to BBC 2 compared to their peers without no claim discount
- For the same age group dance/house music was playing significantly more often at the time of the last accident
- Drivers aged 30-50 years:
  - 3 genres were played significantly less often at time of accident than expected according to the norm of this group: classical music, chart-pop and indie/rock/punk
- Drivers in the latter 2 age groups who had an accident appear to have listened to the most prevalent genre for their age group less than would be expected from the norm for their age group
  - this could suggest that listening to the usual choice of music for these age groups is beneficial as it requires less effort to attend to and process cognitively, freeing up more capacity for driving attention.

References:


Brodsky, W., & Slor, Z. (2013). Background music as a risk factor for distraction among young-novice drivers. Accident Analysis & Prevention, 59, 382-393. doi:10.1016/j.aap.2013.06.022


