The Influence of Music on Driver Stress

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In order to examine the efficacy of music in dealing with daily stressors, automobile drivers were randomly assigned to either a music or nonmusic group. The music group listened to their favorite music, while the nonmusic group abstained from any music or talk radio during their entire commute to or from school or work. Using a cellular telephone, state measures of driver stress were obtained during a single commute in low- and high-congestion conditions. A Condition × Music Group interaction was found. Driver stress was greater in high congestion than in low congestion, but the nonmusic group demonstrated extreme levels of stress within high congestion. Listening to self-selected music appeared to limit driver stress only within highly frustrating and irritating traffic congestion.

Driving as a Source of Stress

Automobile driving is an event that is often interpreted as stressful (Gulian, Matthews, Glendon, & Davies, 1989; Hennessy & Wiesenthal, 1997). Within any
Music therapy has been found to be an effective tool in controlling psychological stress through a variety of psychological and physiological processes, such as reductions in tension (Holland, 1995); arousal (Takeshi & Nakamura, 1991); anxiety (Hammer, 1996; Parente, 1989); negative affect (Hanser & Thompson, 1994); and blood pressure, heart rate, and skin conductance (Aldridge, 1993; Allen & Blascovich, 1994); and an increase in immune response (Bartlett, Kaufman, & Smeltekop, 1993). Music may also increase performance and perceptions of situational control (Anderson, Baron, & Logan, 1991; Stevens, 1990). According to Allen and Blascovich (1994), surgeons who listened to self-selected music while operating experienced a reduction in both blood pressure and pulse rate and, as a result, performed more effectively under the stressful conditions of surgery. Similarly, dental patients who listened to music while undergoing treatment rated control over their treatment as higher and displayed less pain and stress, which, in turn, facilitated further stress reduction in the specialist, who performed a more technically correct procedure (Anderson et al., 1991). The utility of music as a stress-reduction tool is heightened by the fact that it is very simple to implement, inexpensive, and typically requires little to no training (Avants, Margolin, & Salovey, 1991).

One mechanism through which music facilitates coping is as a distraction from stressful stimuli. Music has been found to briefly distract patients from the experience of pain and stress (McCaffery, 1990; Wostratzky, Braun, & Roth, 1988). According to Hoyos (1988), attention capacity is a limited cognitive resource, divisible among multiple tasks. As the number of demands for attention increases, the amount of resources available to any single source is decreased. Music acts as a distracter in that it assumes a portion of cognitive or attentional resources that might otherwise be directed toward a stressful situation (Baron, 1986). As a result, the salience of the experienced stressor is reduced. However, under conditions of extreme demand or multiple stressors, cognitive overload (Milgram, 1970) can occur, where demands exceed cognitive resources, resulting in elevated stress (Wildevanck, Malder, & Michon, 1978). Under conditions of overload, participants have been found to focus attention on the most salient demands and to ignore more peripheral requirements, such as music (Baron, 1986).

Music also acts to facilitate relaxation, which relieves psychological and physiological arousal (Kroener et al., 1988). Those individuals listening to music have been found to report greater levels of relaxation during exposure to the stressors of both social density and excessive noise (Kroener et al., 1988; Stratton, 1992). Anderson et al. (1991) have also found increased relaxation and decreased stress among dental patients exposed to music during their procedures. Corah, Gale, Pace, and Seyrek (1981) provide contrary evidence that relaxed patients failed to display decreased stress when listening to music because of the possible operation of a floor effect for relaxation level. McCaffery (1990) found that both fast-tempo music (believed to increase physiological activity) and soft, relaxation music were equally effective in reducing stress. Allen and Blascovich (1994) found that fast-tempo music may only relieve stress when it is the individual's preferred musical taste. According to Stratton and Zalanowski (1984), ratings of relaxation are positively related to ratings of liking for musical selections. The option of permitting participants to choose the music they listen to may provide a heightened sense of perceived control in the presence of an uncontrollable stress agent, thereby strengthening the positive influence of music on stress (Anderson et al., 1991).
Predictions

Despite a lack of agreement as to the exact mechanisms responsible for the influence of music on stress, it has been established that music can alleviate stress. However, most research has been concentrated within a medical environment, where patients experience stressful medical conditions or stressful treatments. Comparatively less emphasis has been placed on the stress-reducing properties of music within common everyday situations, such as automobile driving. Similarly, there has been little comparison of the influence of music between situations of varying degrees of stressfulness, such as low- and high-congestion conditions. According to Hennessy (1995), listening to music is one behavior that is often used by drivers to deal with demanding traffic conditions. It is predicted that greater stress will be reported in high than in low traffic congestion, and that participants who listen to music while driving will report decreased stress, particularly in high congestion, compared to those who do not listen to music.

Method

Participants

The voluntary participants were 40 York University students and members of the North York business community. All of the participants traveled to or from school or work along Highway 401 in metropolitan Toronto, Ontario, Canada. Half of the participants were males and half were females; their ages ranged from 21 to 50 years of age, with an average age of 26.2 years.

Apparatus

Nokia cellular telephones (model number LX12/C15) were equipped with a cigarette-lighter power adapter for continuous in-automobile power access and a stationary antenna. A visor-mounted microphone provided hands-free capability. Dialing was automatically performed at the push of one button.

Measures of Driver Stress

The State Driver Stress Inventory (Hennessy & Wiesenthal, 1997) was developed to assess the situation-specific experience of driver stress, using a variation of the Driving Behavior Inventory–General Driver Stress questionnaire (Gulian, Matthews, et al., 1989) and the Stress Arousal Checklist (Mackay, Cox, Burrows, & Lazzerini, 1978). The Driving Behavior Inventory–General (DBI–Gen) scale has been developed as a valid assessment of a general disposition, or trait susceptibility, to driver stress (Matthews et al., 1991). The DBI–Gen consists of 16 items such as, “When I get irritated I drive aggressively,” “Trying but failing to overtake frustrates me,” or “I get annoyed by driving behind other vehicles.” The DBI–Gen has been found to be a robust and reliable self-report measure of driver stress (Glendon et al., 1993). For the purpose of the present study, three items that did not pertain to highway driving were eliminated (“Annoyed when traffic lights change to red when I approach them,” “I am more tense on new than familiar roads,” and “I feel bothered when overtaking at a junction”). Two additional items were eliminated because pilot-study participants had difficulty understanding the key concepts (“Driving gives me a sense of power,” and “I do not feel indifferent when overtaking other vehicles”). All items were also reworded to represent state rather than trait measures of stress; for example, “Trying but failing to overtake is frustrating me,” rather than “Trying but failing to overtake frustrates me.” The scoring system was also changed from a 7-point scale to a 100-point scale to facilitate its administration to the driver in the automobile while in traffic. Previous research has found the DBI–Gen to maintain its stress-predictive properties under such revisions (Hennessy & Wiesenthal, 1997).

In addition 10 items from the Stress Arousal Checklist (Mackay et al., 1978) were included with the 11 DBI–Gen items. Half of the Stress Arousal Checklist items were positive mood items (relaxed, contented, peaceful, calm) and the other half were negative mood items (tense, bothered, nervous, uneasy, and distressed). Stress arousal items were also reworded to represent a state measure of stress; for example, “I am feeling tense,” rather than simply “Tense.” Responses were placed on a Likert-type scale ranging from 0 (strongly disagree) to 100 (strongly agree), indicating the extent to which participants agreed that each item pertained to their experience in the present driving situation. A manipulation check was added to determine if low- and high-traffic congestion conditions were, in fact, perceived as distinct (“Traffic conditions are congested”). Finally, three items were used to tap time urgency (“I am in a hurry,” “I am concerned about getting to my destination on time,” and the reverse-keyed item “I have a flexible time schedule”) since it has been found to covary with driver stress (Hennessy, 1995). Previous research has found the State Driver Stress Inventory to demonstrate high reliability in both low-congestion ($\alpha = .92$ to .97) and high-congestion ($\alpha = .90$ to .95) conditions (Hennessy, 1998; Hennessy & Wiesenthal, 1997, 1999).

Procedure

The present study was designed to measure driver stress in actual low- and high-congested conditions, through the use of cellular telephones. Research participants were enlisted through course recruitment and personal contact. During an initial appointment, informed consent was obtained, and instructions regarding the experimental procedure and cellular-telephone operation were given.
Participants then provided information regarding their regular travel route along Highway 401, since all measures were administered during their usual daily commute. Highway 401 was chosen because it is the major traffic artery for metropolitan Toronto, with as many as 14 lanes divided into a series of express (core) and collector lanes. The average annual daily traffic on this highway for the metropolitan Toronto area is over 255,000 vehicles (Ontario Ministry of Transportation, 1992). For each participant, two areas along their regular commuting route were chosen: one that is typically lowest and one that is typically highest in traffic congestion. Two landmarks were then chosen: one that is unique to the selected low-congestion area, and one that is unique to the selected high-congestion area. The landmarks were to be subsequently used during their actual journey as a cue to initiate a cellular-telephone call to the experimenter. Both the low- and high-congestion telephone interviews were scheduled during a single journey.

Two groups of drivers were formed: those who typically encounter high traffic volumes prior to low traffic volumes, and those who typically encounter low traffic volumes prior to high traffic volumes. This process allowed for the assessment of cumulative state driver stress through the comparison of the high-congestion-first group and the low-congestion-first group, and helped rule out state driver stress simply as a function of fatigue. Subsequently, each group was randomly divided into either a music or a nonmusic group, with a stipulation of equal gender representation in each group. The music group was instructed to select a cassette tape or compact disc of their favorite music to play during the entire trip. The nonmusic group was instructed specifically not to listen to music (or talk radio) during the entire journey. All participants were alone in their automobiles during the entire duration of the journey.

Prior to initiating the commute, participants were allowed to make a practice cellular-telephone call to the experimenter in order to ensure that the telephone was functioning properly and to avoid any confusion regarding its use while actually driving. No measurement took place during the pretest telephone call. Participants were reminded of the response scale and were instructed to commence their journey as usual. Upon approaching their first designated landmark, participants telephoned the researcher, utilizing a single-button speed-dialing feature. Once a successful telephone contact was made, the State Driver Stress Inventory was administered verbally while the driver was engaged in the actual driving process. Upon completion of the first telephone interview, the cellular-telephone call was terminated and the participants continued driving until their second landmark was reached, which prompted the second telephone call. The State Driver Stress Inventory was again administered verbally.

All measures were obtained between October and February in Toronto, Ontario, Canada. Participants were tested only on Tuesdays, Wednesdays, and Thursdays, since most participants were not available on weekends, and Mon-
Time urgency scores did not differentiate between low- and high-congestion conditions ($M = 48.78, SD = 23.96$, and $M = 49.54, SD = 23.75$, respectively), $F(1, 36) = 2.20, p > .05$. Similarly, the music group reported equivalent levels of time urgency as did the nonmusic group ($M = 53.20, SD = 24.16$, and $M = 52.85, SD = 23.26$, respectively), $F(1, 36) = 0.32, p > .05$. Finally, female and male ratings of time urgency were similar ($M = 52.33, SD = 25.19$, and $M = 46.38, SD = 22.21$, respectively), $F(1, 36) = 0.82, p > .05$.

Discussion

Consistent with previous research (Hennessy & Wiesenthal, 1997, 1999), driver stress was greater in high congestion than in low congestion, demonstrating the importance of the driving situation as one important element in determining driver stress levels. Because of increased traffic volume and slower travel pace, high-congestion conditions represent greater potential for undesirable or demanding encounters, capable of taxing a driver’s coping resources. The present findings further strengthen the power of the DBI-Gen as a valid and reliable predictor of driver stress, which has been shown to be capable of predicting both a trait susceptibility and state levels of driver stress (Gulian, Debney, et al., 1989; Gulian, Matthews, et al., 1989; Hennessy & Wiesenthal, 1997, 1999).

The present findings also highlight the importance of music as a mechanism for coping with driver stress. Within high congestion, participants who did not listen to music displayed significantly greater stress than did those who listened to music. Previous research has shown music to alleviate stress experienced in highly arousing medical situations, such as dental surgery and cancer treatment (Aldridge, 1993; Anderson et al., 1991), and in mildly stressful common situations where strangers awaiting an experiment felt more relaxed when they could listen to music as opposed to waiting in silence (Stratton, 1992). Music has been found to distract (Wostratzky et al., 1988) and to relax (Kroener et al., 1988) people during stressful encounters.

During periods of high congestion, under conditions of increased attentional demand, listening to music may act to relax and distract drivers from highly undesirable circumstances. However, the positive influence of music may be limited. Within low congestion, the music and the nonmusic groups reported similar levels of driver stress, possibly as a result of the fact that situational demands are less severe during periods of low volume. With fewer demands, the potential for negative interpretations of the situation and perceptions of stress are less likely. Little attention has been paid, in previous research, to the influence of music on varying degrees of stress. Perhaps the stress-reducing effects of music operate only under mild to high stress. Further research is needed to determine the influence of music under low-stress conditions.

One possible confound exists in the present study involving the choice of listening to music that had previously been chosen by the driver. It may be that choice in and of itself is more important in producing the stress reduction than the actual playing of recorded music. It may also be that the distraction provided by the music engenders the stress reduction. These reasonable hypotheses need to be tested in future research contrasting some drivers listening to talking books (recorded literature), while other drivers listen to popular music. These are easily collectible data that could make the highways a safer environment.

References


