A FIELD STUDY OF PREFERRED LISTENING LEVELS FOR MUSIC PLAYED ON PERSONAL STEREO PLAYERS

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1. INTRODUCTION

Over the last decade, audio devices and music consumption habits have changed dramatically. Larger amounts of music are being consumed via Personal Stereo Players (PSPs). These portable devices allow continuous playback of large collections of music. Public concern over the extent to which PSP use represents a hearing health risk has increased rapidly, and some manufacturers have responded by making volume limiters available. Although the level of risk is difficult to assess and will likely remain controversial, it may be particularly acute for at least a subgroup of listeners who have a preference for high music levels (Ahmed et al., 2007). Laboratory studies indicate that the risk level may be further exaggerated in noisy environments (Ahmed et al., 2007; Hodgetts, Rieger, & Szarko, 2007). Preferred music listening levels tend to be higher in high background noise environments than in low background noise environments. This study provides ecological validation of these laboratory findings by demonstrating a relationship between music level and background noise level in the field. Simultaneous recordings were made of PSP sound output levels and ambient noise levels in three environments in the city of Toronto: the subway (TTC), a busy street corner (Dundas Square), and a university library (Ryerson).

2. METHOD

2.1 Participants

Previous research has shown that earphone type influences PSP sound output levels (Filgor & Cox, 2004). Samples were thus limited to listeners using insert earphones (i.e., earbuds). Our sample of 75 participants included 46 men and 29 women with an average age of 24.6 years (SD = 7.04).

2.2 Procedure and Apparatus

Potential participants were approached in the same environment in which recordings were made. The initial contact was made nonverbally by gesturing for the user to remove the earphones. The majority of users followed the nonverbal request by removing one or both of the earbuds. Those users who manipulated sound levels in addition to or instead of removing the earbuds were not considered in the final sample. Thus, the reported sound level measurements reflect actual listening levels.

All music and background noise level measurements were based on 10-second samples obtained from consenting PSP users. Music levels were obtained by porting headphone-out of the PSP directly to mic-in of laptop and applying a correction factor to approximate the sound level that would be obtained with earbuds (some variability exists across manufacturers). Background noise levels were obtained with a Bruel and Kjaer preamplified microphone (model 2671) that was connected to the same laptop via a National Instruments analog input module USB-9233 4-Channel, +-5V, 24-Bit IEPE. Music and background noise levels were obtained simultaneously.

3. RESULTS

Mean and standard deviation of music level and background noise level (dBA) in each environment is displayed in Figure 1. Music levels were highest in the street (M = 96.61; SD = 15.14), and were comparable in the subway (M = 77.10; SD = 16.83) and the library (M = 76.29; SD = 15.36). Background noise levels were highest in the subway (M = 77.68; SD = 4.54), lowest in the library (M = 58.71; SD = 2.58), and intermediate in the street (M = 69.30; SD = 5.09).

Music levels were significantly higher than background noise levels in the street, $t(25) = 6.88$, $p < .0001$, and in the library, $t(18) = 4.85$, $p < .0001$, but there was no significant difference in the subway, $t(29) < 1$.

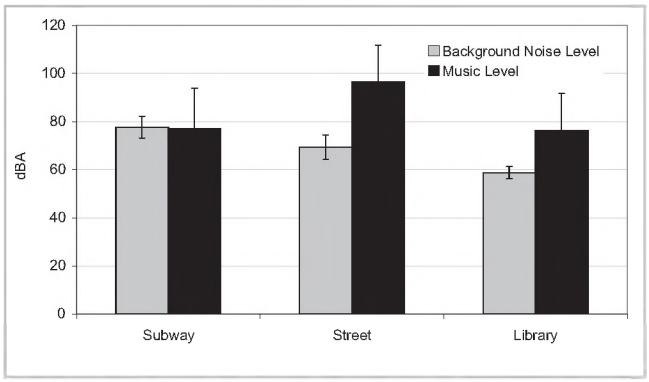

Fig. 1. Background noise and music levels (dBA) in three environments. Error bars represent standard deviation.

It is interesting to note that music levels in the subway and library did not differ significantly, $t(47) < 1$. This pattern of results might be interpreted to suggest that background noise level has no influence on preferred music listening

levels; however, there are numerous social factors that likely moderate the effect of background noise level, making comparisons across environments misleading.

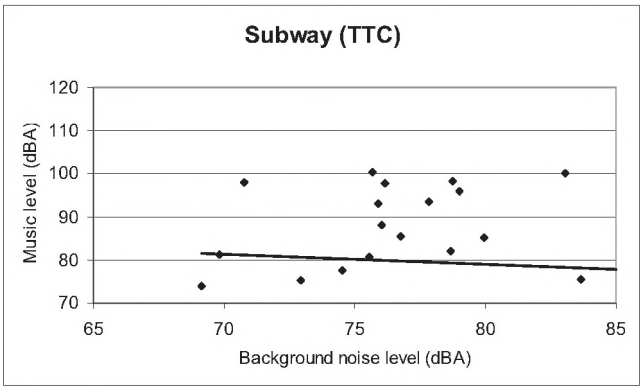

Fig. 2. Background noise and music levels (dBA) in the subway environment, r (28) = -.07, n.s.

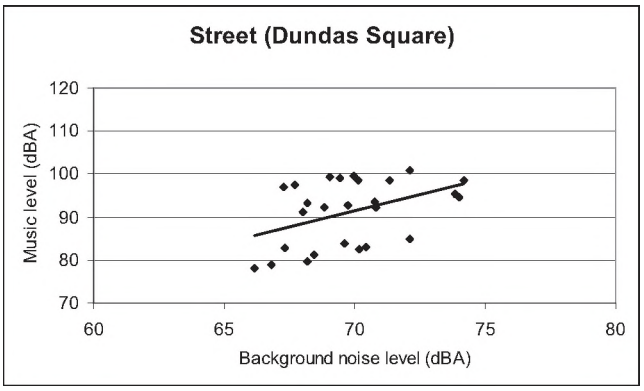

Fig. 3. Background noise and music levels (dBA) in the street environment, r (24) = .43, p < .05.

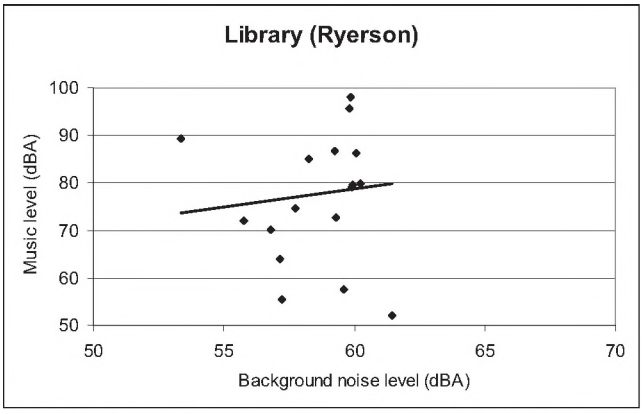

Fig. 4. Background noise and music levels (dBA) in the library environment, r (17) = .11, n.s.

Scatter plots comparing music level and background noise level for each environment are provided in Figure 2 (subway), Figure 3 (street) and Figure 4 (library). A significant correlation between music level and background noise level may only be observed in the scatter plot for the street environment.

4. DISCUSSION

The highest music levels were observed in the street environment. A substantial percentage of the measurements obtained in the street (42.3%) revealed dangerous listening levels (>94 dBA) that would present a hearing health risk for exposures in excess of 1-hour per day (NIOSH). These music levels are considerably higher than preferred listening levels obtained in laboratory studies utilizing background traffic noise. The lower preferred listening levels observed in laboratory studies may reflect a bias towards pleasing the experimenter and/or the absence of visual clutter.

Preferred music listening levels were higher than background noise levels in the street and library but not in the subway. The subway environment is unique in that people tend to be stationary and in very close proximity to one another. These factors may lead some PSP users to be self conscious about their music listening levels. Although social expectations may also constrain the preferred listening levels in the library environment, PSP users have more flexibility to isolate themselves.

Social expectations in the urban streetscape are minimal and the movement of pedestrians provides an acoustic blanket of anonymity. Indeed, a significant correlation between background noise levels and music levels was only observed in the street environment.

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