Association of Behavior With Noise-Induced Hearing Loss Among Attendees of an Outdoor Music Festival: A Secondary Analysis of a Randomized Clinical Trial

Author(s)
Kraaijenga VJC, van Munster JJCM, van Zanten GA.
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Abstract

Importance
To date, factors associated with noise-induced hearing loss at music festivals have not yet been analyzed in a single comprehensive data set. In addition, little is known about the hearing loss–associated behavior of music festival attendees.

Objectives
To assess which factors are associated with the occurrence of a temporary threshold shift (TTS) after music exposure and to investigate the behavior of music festival attendees.

Design, Setting, and Participants
This prospective post hoc analysis gathered data from a randomized, single-blind clinical trial conducted on September 5, 2015, at an outdoor music festival in Amsterdam, the Netherlands. Adult volunteers with normal hearing were recruited via social media from August 26 through September 3, 2015. Intention to use earplugs was an exclusion criterion. Of 86 volunteers assessed, 51 were included. This post hoc analysis was performed from October 3, 2016, through February 27, 2017.

Interventions
Music festival visit for 4.5 hours.

Main Outcomes and Measures
The primary outcome was a TTS on a standard audiogram for the frequencies 3.0- and 4.0-kHz. Multivariable linear regression was performed to determine which factors are associated with a TTS. A questionnaire on behavior, hearing, and tinnitus was distributed to the participants before and after the festival visit.

Results
A total of 51 participants were included (18 men [35%] and 33 women [65%]) with a mean (SD) age of 27 (6) years. Mean (SD) threshold change across 3.0 and 4.0 kHz was 5.4 (5.7) dB for the right ear and 4.0 (6.1) dB for the left ear. Earplug use (absolute difference in the left ear, −6.0 dB [95% CI, −8.7 to −3.2 dB]; in the right ear, −6.4 dB [95% CI, −8.8 to −4.1 dB]), quantity of alcohol use (absolute difference per unit in the left ear, 1.1 dB [95% CI, 0.5 to 1.7 dB]; in the right ear, 0.7 dB [95% CI, 0.1 to 1.4 dB]), drug use (absolute difference in the right ear, 6.0 dB [95% CI, 0.9 to 11.1 dB]), and male sex (absolute difference in the right ear, 4.1 dB [95% CI, 0.3 to 5.9 dB]) were independently associated with hearing loss, with earplug use being the most important factor. Unprotected participants reported significantly worse subjective hearing performance and tinnitus after the festival visit than did participants using earplugs (Cramer V, 0.62 [95% CI, 0.47-0.79] and 0.39 [95% CI, 0.16-0.62], respectively). In the earplug group, the perceived loudness ($r = -0.72$; 95% CI, −1.00 to −0.43) and appreciation ($r = 0.53$; 95% CI, 0.29 to 0.78) of music and speech perception ($r = 0.21$; 95% CI, 0.09 to 0.35) were correlated with the duration of earplug use.

Conclusions and Relevance
The present study identified nonuse of earplugs, use of alcohol and drugs, and male

sex as associated with a TTS at an outdoor music festival. Physicians should consider these factors to raise awareness about the combined risk of attending music festivals without using earplugs while consuming alcohol and/or drugs. The intention to use earplugs was correlated with the loudness and appreciation of music with earplugs, which may advocate for the use of personalized earplugs.

Trial Registration
trialregister.nl Identifier: NTR5401

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