SKYDIVING NOISE LEVELS

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Introduction

The United States Parachute Association (USPA) is a non-profit, self-governed organization with more than 32,000 members. It is estimated there are approximately 3 million jumps per year at more than 220 USPA-affiliated drop zones nationwide. The USPA promotes safety in all skydiving activities using recognized training programs and following the skydiving community's basic standards of safety[1]. As skydiving has been known to be a noisy event, the use of earplugs is recommended in the 2009-2010 Skydiver's Informational Manual which is published by the USPA.

All skydives, regardless of the type of jump, have three components: the plane ride, the freefall, and the canopy ride (parachute ride to the ground). These three components have been documented to be noisy events on an individual basis. Maximum sound levels averaging 101.3 dBA have been recorded from a Cessna 172S aircraft[2], commonly used at smaller skydiving drop zones. Sound levels reaching 112.0 dBA have been recorded from motorcyclists' helmets when traveling at a speed of 100 mph[3]. Furthermore, this study determined the wind noise was the dominant noise source, and not the engines of the motorcycles. Skydivers freefall at approximately 120 mph for horizontal orientations and from 150-200 mph for vertical orientations.

While the current literature has an application to each component of the skydive, there are not any published studies that investigate the noise levels of a skydive as a whole. The purpose of this study was to investigate skydiving noise levels for a significant number of trials. This study would also determine if skydivers wearing hearing protection would be at risk for a noise-induced hearing loss using a permissible exposure limit (PEL) of 90 dBA and 5 dB exchange rate, the US industry standard which was adopted by Occupational Safety and Health Administration (OSHA) in 1983.

Methods

Participant: TH, a certified USPA skydiver and audio engineer, wore the Howard Leight QuietDose™ Exposure Smart Protector Personal Dosimeter which made the recordings for all skydives. TH is 61 years old, 186 pounds (247 pounds with the tandem rig), and is approximately 5'11".

Apparatus: 4 Howard Leight QuietDose™ were used to measure the recordings for all skydives. The microphone harness transmitted recordings from the in-the-ear microphones to the ESP dosimeter. The in-the-ear microphones were coupled to the QuietDose™ Matrix™ ET medium eartips with a SLC80 20 – Class 3 rating.

Methods (continued)

Figure 1: View from Left

Figure 2: View from Front

Figure 3: Eartips secure during skydive

QuietDose™ Version 2.4 software was downloaded to a laptop computer and the QuietDose™ infrared reader transmitted the data from the dosimeter to the laptop.

Procedure: All skydives were performed by TH at the same skydiving drop zone from June - September 2010. The dosimeter was turned on immediately before boarding the plane and was turned off immediately after landing. The data from the dosimeters was successfully uploaded for 78 trials (68 tandem skydives and 10 solo freefalls) and the following data was uploaded from the dosimeter: date, session number, duration of recording, dose (90 dBA / 80 dBA / 5dB), LEQ (8) dBA, time > 115 seconds, battery, timeout, and internal calibration.

Results

Results showed a mean noise dosage of 9.73% (95% CI= 8.85-10.61) across all 78 trials using a permissible exposure limit of 90 dBA and 5 dB exchange rate.

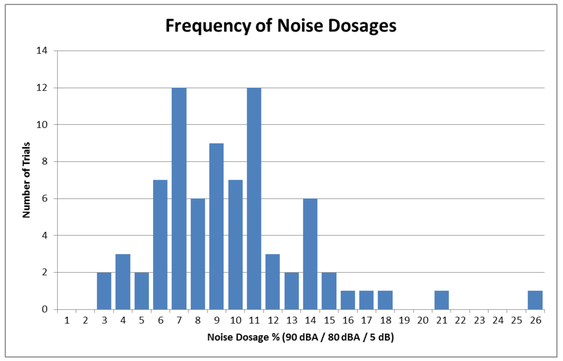

Figure 4: Noise dosages ranged from 3% - 26% across all 78 trials and averaged a noise dosage of 9.73%.

Results (continued)

57 trials exceeded 115 dBA with a length of duration ranging between 1-52 seconds. There was a statistically significant relationship between the duration of noise exposure exceeding 115 dBA and noise dosage, r (76) = .798, p <.01. The relationship between the duration of recording and noise dosage was not statistically significant, r (76) = .109, p >.05. LEQ (8) DBA ranged from 76.78 dBA – 107.4 dBA across all 78 trials. These results were not used for data analysis as most skydivers do not skydive 8 hours a day, 5 days a week.

Discussion

Skydivers who wear hearing protection (rated class 3 or stronger) are less likely to receive a noise dose higher than 9.73% per skydive and would not exceed his or her noise dose if skydiving 10 times or less within an 8 hour time frame. Alternatively, skydivers who do not wear hearing protection (or hearing protection rated weaker than class 3) are more likely to receive a noise dose higher than 9.73% per skydive and would exceed his or her noise dose if skydiving 11 times or more within an 8 hour time frame.

Measuring the precise noise level in the presence of wind is difficult due to the physical interaction between wind and the microphone. Wind noise has been known to provide noise levels higher than the actual exposure. Alternatively, an in-the-ear dosimeter may record noise levels lower than actual exposure due to the isolation of the microphone, protected in the ear canal, from the wind noise.

This is the first known study which has investigated skydiving noise levels, leaving many opportunities for future research. Potential areas for future research include comparing the noise level across different types of hearing protection (eartips, earmuffs, helmets, etc.), calculating the noise level of each component of the skydive (plane ride, freefall, canopy ride), and investigating the use of hearing protection and the prevalence of a high-frequency sensorineural hearing loss among skydivers.

References

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