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ORIGINAL RESEARCH

Risk-taking Behavior in Skiing Among Helmet Wearers and Nonwearers

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Objective.—To examine differences in on-the-snow ski behavior between helmet wearers and nonwearers.

Methods.—The data were collected using a survey. Several tourist agencies helped in administrating the survey to the skiers during the 2008–2009 and 2009–2010 seasons. The survey consisted of multiple-choice questions. The subjects were asked to choose answers most suitable for their skiing style and preferred skiing technique, volume of off-piste skiing, readiness to use time measuring systems on the slopes, and group-skiing preferences, such as leading the group, beside the group, away from the group, etc. The Risk Index was then calculated for each subject.

Results.—The answers of 710 skiers (mean age 35.5, range 16–81 years) were analyzed. The predictive power for risk-taking behavior was tested for gender, age, educational level, level of skiing, years of skiing, and helmet usage. Younger age, male gender, higher skiing level, and helmet usage were used as independent predictors for the overall Risk Index (Power [1-β err prob] = 0.942). Significantly higher risk was assessed for the male helmet wearers while the results were not significant for the female helmet wearers. The male occasional helmet wearers were found to be the most prone to risky behavior. In female nonhelmet wearers, there was a significant decrease in risk-taking behavior with age but this was not true for female helmet wearers.

Conclusions.—For males under 35 years of age, helmet use is one of the factors influencing risk-taking on the slopes. This is demonstrated for occasional helmet wearers in particular.

Key words: risk-taking, helmet, skiing, behavior

Introduction

Of all ski injuries, the most dangerous occurring on the slopes are of the head. Therefore, it is understandable that wearing a ski helmet is widely recommended by many experts as effective protection against head injuries.[1–4] Moreover, some experts have suggested that wearing a ski helmet on the slopes[5] should be mandatory, especially for children and juvenile skiers.[6]

The amount of protection against traumatic brain injury provided by a ski helmet diminishes at higher speeds on an open slope.[7] It is also known that riskier skiing activities, usually occurring in terrain parks, are related to increasing risk of head injury, regardless of helmet use.[8]

For the above-mentioned reasons, one may speculate that any skiing activity in which skiers push themselves beyond their abilities might lead to higher rates of injuries despite helmet usage.[9] It has also been observed that wearing a ski helmet does not reduce fatalities on the slopes, since 35% of skiers who have died were wearing a helmet, which is a much higher rate than the rate of helmet usage among the general population of skiers.[10] This statistic raises the following question: do helmet wearers take more risk on the slopes by overestimating the protection power of the ski helmet and, consequently, does that risky behavior decrease the protective characteristics of the ski helmet?

Some researchers introduced the term "risk compensation theory" and have tried to investigate its presence in helmeted skiers.[11,12] It refers to the observation that

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some people tend to adjust their behavior in response to perceived changes in risk—for example, behaving less cautiously in situations where they feel "safer" or more protected. The findings of those studies were limited, since individual perception and psychological profile play a part in determining whether one would perceive his/her style of skiing as risky. That is why self-reported risk taking may not be a good indicator of actual risk behavior. In our opinion, a single direct question asking "Do you take more risk?" does not provide the best assessment of risky behavior. Following that reasoning, we have opted to test the risk compensation hypothesis by introducing more objective measures such as on-site exploration of skier behavior.

The objective of this study was to examine the differences in on-the-snow ski behavior between helmet wearers and nonwearers. The second goal was to determine the percentage of ski helmet usage and to explore reasons that contribute to the decision whether or not to wear a helmet.

Methods

SUBJECTS

Data were collected using a survey administered to Croatian skiers during the 2008–2009 and 2009–2010 seasons with the help of several tourist agencies. The survey showed acceptable test-retest reliability across 30 days on a pilot sample of 50 skiers ($r = 0.87$, $P < .001$). The sample size calculations showed that, for the Power of 99% and Type I statistical error of 0.001, the sample in the control group (without helmets) should be over 393 and, in the experimental group (with helmets), over 192.

The subjects were not informed about the purpose of the study but were told that the survey aims to explore the skiing preferences and skiing style of Croatian skiers; helmet questions were placed at the end of the survey. The first part of the survey consisted of 5 multiple-choice questions that were filled in by all skiers. The participants were asked to choose answers most suitable for their skiing style regarding their preferred skiing technique, preferences regarding off-piste skiing, readiness to use time-measuring systems, and their behavior around a group of skiers (prefer skiing alone, leading the group, beside the group, and similar inquiries). Only consistent or occasional helmet wearers filled in the second part, consisting of 3 items. That part was comprised of questions regarding the reason for choosing a helmet, skiing behavior with a helmet, and questions about the feelings related to wearing a helmet. The general descriptive data of the sample like age, gender, level of skiing technique, number of skiing seasons in the past, as well as their level of education were also noted.

DATA MANAGEMENT

Three independent judges from the Croatian Association of Snow Sports Instructors (HZUTS), all members of the HZUTS Educational and Scientific Committee (2 of them also being sports medicine MDs), independently ranked the answers for each item according to the risk involved. The reliability of the judges was calculated by means of interclass coefficient of correlation (ICC) and the result was more than satisfactory (ICC = 0.93). Numeric values representing the level of risk-taking behavior in each question were then attributed to the ranked answers, and those values were rated on the Risk Index (ranging from 6 [low] to 21 [high]).

The obtained data were analyzed by Statistica (Tulsa, OK, USA) for Windows 9.0. The Kolmogorov-Smirnoff test showed that the distribution of the data did not significantly differ from a normal distribution, and we proceeded with the parametric statistical techniques. The student *t* test for independent samples and analysis of variance (ANOVA) were used to search for differences between the groups, and the multiple regression analysis was used to identify factors that might have the predictive power for the Risk Indices. The *P*-value significance threshold was set at $P < .05$.

Results

The total number of subjects was 710, with average age of 35.5 ± 11.56 (range of 16–81 years; male = 494, female = 216). The sampled skiers were well educated: 0.88% finished only elementary school, 32.39% high school, 54.08% had a university degree, and 12.25% had a Master of Science or PhD degree. This sample is representative of the Croatian skiing population, which usually comes from higher socio-economic backgrounds. The mean number of skiing seasons was 18.26 ± 7.9, while their self-reported skiing knowledge average was 4.50 ± 1.52 on a scale from 1 (very poor or only 1 season of skiing) to 7 (ski teacher or ski demonstrator).

Out of the total sample (N = 710), 48% of the subjects did not wear a helmet, 15% wore one occasionally, and 37% reported that they always wore a helmet. No statistically significant differences were observed in helmet usage between the genders (Figure 1).

The Risk Indices were then calculated. Prior to the calculation of the Risk Indices, the inter-rater reliability of the judges who evaluated the riskiness in answers was calculated by means of interclass coefficient of correlation and was more than satisfactory (ICC = 0.93). The