Collecting Skiing & Snowboarding Injury Data with a Web-Based Survey

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By

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Abstract

In this project, I sought to construct a web-based survey which could be used to collect information about skiing and snowboarding injuries. A web site was written using HTML, JavaScript, PHP and jQuery. A mySQL database was used to store results. The site successfully gathered over twenty results during the course of the project. The data collected with the web site can be used by researchers to learn about injuries and mitigate the risks associated with skiing and snowboarding.

Foreword

This project was worked on by both Gregory Barrett and Michelle Maurice. Michelle filled the role of the domain expert/researcher. She contributed to the creation of the questions, and will submit a separate document further analyzing the results gathered by the survey. When work done by a ‘researcher’ is referred to in this document, she is that researcher.

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1. INTRODUCTION

OBJECTIVE

The objective of this research was to construct a web-based survey which could be used to collect information about skiing and snowboarding injuries.

Several sub-objectives were pursued in order to achieve this objective:

- The web site will be easy to navigate and use.
- The survey will gather the data desired by the researcher using it.
- The survey will be arranged such that users are likely to complete it
- Data will be collected in a manner which allows researchers to analyze and display it.
- A forum will be created to attract users to the web site.
- Advertising will be included to generate revenue. This revenue will be used to promote the site.
- The site and survey will be set up in such a fashion that future researchers can modify it

While it is beyond the scope of this project, the overall objective of the survey is to reduce skiing injuries. This could be accomplished by using the responses gathered to determine the injury mechanisms involved in each accident, then using this information to mitigate risks. Also, claims of non-occurrence of certain types of injuries can be refuted. Achieving these additional goals would require a sufficient number of

responses to be collected with the web site. These objectives will be taken on by current and future researchers. It is intended that they will also be able to use the site to test their own hypotheses.

RATIONALE

It is common knowledge that serious injuries can occur while skiing or snowboarding. There are many different causes of injury. Participants can suffer concussions when colliding with an obstacle or the ground. When a binding fails to release, knee injuries can result. Snow boarders can suffer wrist injuries while catching themselves during a fall.

It is supposed that some of these injuries can be mitigated if more is known about them. For example, if it is discovered that wearing wrist guards is highly effective at preventing wrist injuries, snowboarders can use this knowledge to reduce their risk of injury.

It is further supposed that this survey will be of use in learning the mechanisms of injury, as well as the existence of certain injury types. Since users can provide a detailed response, the causes behind injuries can be explored instead of simply their occurrence. It is worth noting that while this survey can be used to examine causes and the existence of injury, it cannot provide epidemiological data for assessing specific risks. Such data can only be gathered by examining an entire population, such as all the injuries at a given ski area. Since responses to the survey are voluntary, claims cannot be made about the frequency of occurrence of the injuries reported. Claims can only be

made of the existence of certain injury mechanisms, and the existence of certain injury types.

This web site will serve as a tool for future researchers. They will be able to test injury-related hypothesis, and use the knowledge they gain to design strategies for reducing incidence of injuries. This work benefits society, since snow sport injuries will keep occurring for as long as people participate in snow sports.

Background / State of the Art

Web based surveys

The internet has been used to conduct surveys for many years now (Archer, 2003). While web based surveys do have limitations, they have numerous strengths which make them worthwhile.

Responses to web based surveys are strictly voluntary. This property means that the distribution of samples gathered from them may not be the same as the distribution in the greater population. For this reason epidemiological studies cannot be conducted in this fashion. The responses gathered by web based surveys are also more difficult to verify relative to studies conducted in person. Anyone can fill out any response they wish on an online form. There is no way of verifying the truth of the respondent's claims. Some methods can be used to mitigate this, such as monitoring the IP address of respondents. This allows the researcher to easily identify responses which were generated by the same computer in the event of a user making repeated submissions.

Despite these shortcomings, web based surveys are widely used. One reason for this is the audience they are capable of reaching. Anyone in the world with access to a computer is a potential respondent when conducing web surveys. It is just as easy to gather a response from a European or Canadian skier as it is to get a response from someone in the United States.

Another reason for the use of web based surveys is that they are inexpensive. Services such as SurveyMonkey.com (SurveyMonkey.com, 2010) will host surveys for less than twenty dollars per month. If a researcher has the technical savvy to set up their own survey, a web site can be hosted for approximately ten dollars per month. This is substantially less expensive than many conventional forms of performing injury research. For ten dollars per month, only twenty-three surveys could be sent in the mail. This number only takes into account the cost of stamps.

Skiing injury studies

Conducting a true epidemiological study is significantly more expensive than running a web based survey. In order to gather the data used in an epidemiological study, an orthopedist must be present at a ski mountain at all times. A record of every injury sustained must be kept. One of the most famous studies which examined the frequency of injury occurrence took place at Sugarbush North in Vermont (Carl Ettlinger, 1997). The study used data collected since 1972. It implemented a survey which sought to identify the types of injuries found, as well as the population in which they occurred. The results from it have been published frequently, and it is still going on today.

Dr. Mike Langran is conducting an ongoing study about snow sports injuries using a form on his website (Langran, 2010). His study asks questions about the respondent, the conditions on the mountain, the cause of the accident, what type of injury was sustained, and when the injury occurred. The survey is a total of seven pages long. As of September 2009, he obtained 98 responses. Results have yet to be released. Dr. Langran uses the SurveyMonkey service discussed in the previous sub-section in order to power his survey.

While it is impossible to conduct an epidemiological study with a web survey, a survey can still be used to achieve the goals of this project. The web site can provide researchers with the ability to determine injury mechanisms and refute claims of non-occurrence of injuries. Neither of these goals requires the researcher to know the entire population at risk.

Community Forums

Forums are a popular way for internet users to congregate around a common interest. There are forums geared toward many different groups of people. They can contribute to the overall success of a web site by providing a reason for people to visit again and again.

In deciding how best to create a forum for skiers and snowboarders, five currently successful snow sport forums were looked at. Each of them had an active community surrounding it. Most of them had subsections within them, with varying degrees of granularity. Common subsections were areas for racers to gather, a ‘swap’ area where people can buy and sell equipment, and separate sections for skiers and

snowboarders. More detail on these forums can be found in Appendix A - Ski / Snowboard Forum Research.

APPROACH

EASE OF USE AND NAVIGATION

In order to have the best possible experience for the end user, one of the major focuses of the sites design was simplicity. One goal was to have the ability to navigate to anywhere on the site using one set of links. Keeping the layout of the site as minimalistic as possible while still being aesthetically pleasing was another goal. In order to do this, a consistent, simplistic style sheet will be used on all of the pages.

GATHERING THE DESIRED DATA

In creating the survey, extensive time was spent with the researcher to determine what information should be gathered. Questions were formulated with the help of the researcher in order to best elicit this information from the users. By having domain experts select appropriate questions, we can be more certain that the responses collected can be used to draw meaningful conclusions

ENCOURAGING COMPLETION OF THE SURVEY

When a set of questions has been determined, they must be presented in a manner which encourages users to complete the entire survey. There are two primary risks when a user is taking the survey. If a given page of the survey is too long, they may lose interest in completing it. This can be mitigated by making each page minimal in length. Secondly, including too many pages may cause a user to give up part way

through (Archer, 2003). A balance must be struck between these two risks. Each page must be long enough that the total number of pages is kept to a minimum, but the pages must be short enough that no individual page discourages the user.

Related to this is the problem of ensuring that a user knows how far along they are. If a user reaches the third page and sees that there is only one left, they are more likely to finish the survey than if they reach the third page and do not know how much more is left to go (Schleyer & Forrest, 2000). Providing the user a meaningful way of seeing their progress mitigates this risk.

Lastly, users must be able to understand how to answer each question properly (Solomon, 2001). In order to ensure this is the case, each question provides direction on the appropriate way to answer. For example, the question asking how much the respondent weighs specifies that they should answer in pounds.

Data collection

The data collected by the survey must be stored in a manner which allows researchers easy access. The most common way to store responses from HTML forums is a ‘relational database management system’. Such systems allow a user to create sets of tables, and inert into and update these tables as they wish. Each table has columns which specify the name and type of data they contain. For example, an age column would be an integer, and an email address column would be a string of characters. Each row of the table indicates one entry.

This system is popular due to its wide availability and power. Relational databases can be scaled to back the internet's biggest applications. Additionally, numerous implementations are available for free. Perhaps the most popular of these is mySQL, which was chosen for this project. By using one simple table in mySQL, future researchers will have a reliable data store which they may be capable of updating themselves. Additionally, the contents of the database can be exported to a spread sheet without requiring substantial understanding of how the database works.

A results page will also be provided to easily visualize the responses. A php library called JpGraph was used to accomplish this. It allows a user to make stylized graphs, and populate them with information from the database.

THE FORUM

Numerous pieces of free forum building software exist. The product chosen for this project was phpBB, due to its ease of installation and user friendly administrative interface. The contents of the forum will be laid out based upon the other forums discussed in the 'State of the art' section.

ADVERTISING

In order to generate ad revenue, contextual advertising through Google was implemented. Contextual advertising provides ads which are targeted based on the content on each page. For this web site, advertising related to skiing and injuries will be presented. Revenue will be generated for each advertisement that is clicked on by a user.

ENABLING MODIFICATION BY FUTURE RESEARCHERS

In order to accommodate future researchers as well as possible, the site will be designed such that the minimum possible level of technical knowledge will be required to do work on it in the future.

2. METHODS

EASE OF USE AND NAVIGATION

In order to keep the site simple but aesthetically pleasing, a simple style sheet was chosen. It was created by Andreas Viklund, who made it available for public use. It was modified slightly and now contains a header section and two columns. The color scheme is white, with some added effects, such as buttons which change when hovered over.

The header contains the sites name, as well as a banner that contains snow sport related images. Each time the user visits a page, a set of images is chosen to be displayed. The banner fades between these images for the duration of the time the user is on the page. This adds to the aesthetical appeal of the site, while still keeping it simple. The effect of fading between images was accomplished using a JavaScript library called jQuery. jQuery is a free tool which makes it simpler for web developers to create functional, aesthetically pleasing websites. The ability to fade between images is only one of its many uses.

The left column is relatively small and contains a set of links to the pages of the site, advertising, and links to outside resources. The right hand column contains the content of each page, such as the survey or the welcome message.

GATHERING THE DESIRED DATA

Four categories of questions were decided upon in conjunction with the researcher. They are background, conditions, injury, and final questions. Pointed questions geared toward addressing the researcher's goals were included in each of these sections. Different types of answer methods were used according to what was logical in each instance. For example, when a respondent is asked to provide their age, they are presented with a box in which to type the value. When they are asked their ability, they are presented a set of radio buttons with the options beginner, intermediate, and expert. There are also open ended questions, where the user must type in a longer block of text. Larger boxes are provided to facilitate this.

ENCOURAGING COMPLETION OF THE SURVEY

Having split the survey into four pages, the next issue was how to address the length of each page. In order to minimize length, it was decided that not all questions would be asked of all users. For example, a snowboarder does not need to answer questions about using poles. Someone who did not suffer a knee injury does not need to be asked if they tore their ACL.

By using the responses from the first two pages, some of the questions on the third were only presented to the users they apply to. The fourth page contains an additional five questions which will only be presented based on users input on the first three pages.

A progress bar was added to inform users of how far along the survey they are. This mitigates the risk of a user stopping part way through due to not knowing how many pages are left. The progress bar contains a textual representation of progress, such as ‘Progress: Page 1 of 4’, as well as a series of boxes indicating the topic of each page. As the user progresses, this bar is updated and the step they are on is highlighted.

DATA COLLECTION

Each time that a user clicks submit on a page, the information they provided is sent back to the web server and stored in the database. This is accomplished using a combination of JavaScript, HTML, PHP, and mySQL. All of the pages in the site are generated using PHP. It allows for the dynamic creation of pages, as well as the execution of code on the server itself. What a user clicks ‘submit’ on the HTML form, JavaScript is first used to process the state of the form. It is then sent back to the server using a ‘post’ request. PHP code is then run on the server, which further processes their results. It then makes requests to the mySQL database which either creates a new row for the user if they submitted the first page, or updates a current user’s row with their responses for pages 2-4. This data can then be retrieved in the future by researchers.

Researchers are also capable of generating graphs. A PHP script was written that will generate a pie chart of the results for any column of the database.

THE FORUM

After analyzing other snow sport forums, a set of categories was chosen that would most apply to potential users of our site. The specific categories chosen are described in the results section.

phpBB was installed on the web server, and configured so that anyone who wanted could create an account and begin posting. It was also set up such that an administrator needs to approve a post before it is actually displayed to the public, so that no malicious or inappropriate posts will ever be visible to our users.

ADVERTISING

An account in Google's 'Ad Sense' program was created for the website. After approval, a script was written in PHP which enables or disables the ads in the left column of the site. Each time a user visits a page, a new set of advertisements will be presented to them. These ads can be text or images. As revenue builds up from advertising, it can be spent to promote the site. Ideally, this will be a self perpetuating cycle. The more visitors the site receives, the more advertising revenue it will generate. More ad revenue can then be spent to promote the site, bringing in more visitors.

ENABLING MODIFICATION BY FUTURE RESEARCHERS

As mention before, this site is built using HTML, JavaScript, PHP, and mySQL. In order for it to be as easy as possible for future researchers to make changes, the PHP files are made as simple as possible. Parts of the page like the header and advertising

are kept in separate PHP files that a researcher who simply wishes to update the survey will not need to understand.

DESCRIPTION OF LANGUAGES USED

HTML

Hyper-Text Markup Language is used by most web pages. Tags are used to describe elements, such as headings and tables. It can be stylized using Cascading Style Sheets (CSS). CSS files contain information about the look and feel of each HTML element. HTML can use JavaScript to effect its behavior.

JavaScript

JavaScript is used in web development to process a users activity on a web page, and govern the web pages behavior. When a user hits submit on the forms in the survey, JavaScript is used to process the results before they are sent back to the server. JavaScript is also used to control the slideshow in the header of the web site.

PHP

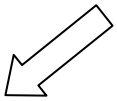
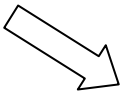
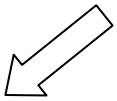
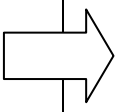
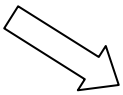
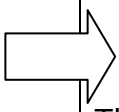
PHP is a recursive acronym which stands for PHP: Hypertext Preprocessor. It is often used to dynamically generate web pages. PHP code is run on the web server. When a user posts their responses, PHP is used to put them in the mySQL database.

MySQL

MySQL is a popular Relational Database Management System. It handles the database, and allows users to make changes to it, such as inserting new rows or updating existing rows.

INFORMATION FLOW WITHIN THE SURVEY

The following chart demonstrates the flow of information as a user takes the survey.

User	Web Server	MySQL Database
User requests the first page of the survey. 		
	Server receives request and sends back that page. 	
User receives the first page and fills out their response, then clicks submit. The response is processed with JavaScript and sent to the server. 		
	The server receives the response and sends the data to the database. Page 2 of the survey is sent to the user. 	 The database creates a new row for that user and stores their response.
User receives the second page and fills out their response, then clicks submit. The response is processed with JavaScript and sent to the server. 		
	The server receives the response and sends the data to the database. The next page of the survey is returned.	 The database adds the responses from the second page to the row already created for the user.

The same pattern is repeated with the third and fourth pages of the survey. After the process is completed, a row in the database will contain all of the user's responses.

3. RESULTS

EASE OF USE AND NAVIGATION

HOME PAGE

The decision to use a simple style sheet resulted in an asthetically pleasing page which was not overly cluttered. The home page can be seen in (Figure 3-1).

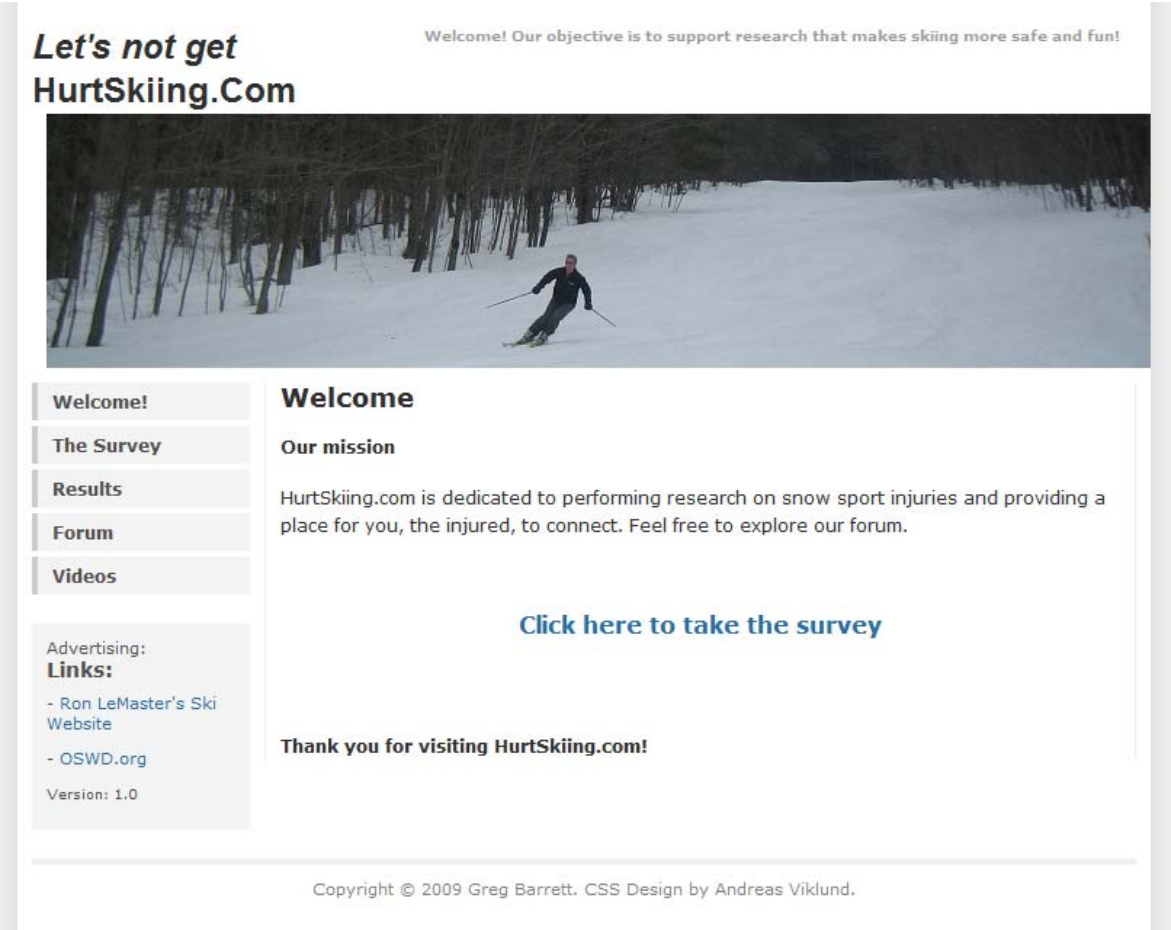


FIGURE 3-1: THE HOME PAGE

NAVIGATION BAR

The navigation bar on the left side of the page is easy to use and reasonably stylized. The advertising is non-obtrusive, yet prominently placed. Advertisements for PSIA courses and ski lodging are shown in Figure 3-2. The selection of links which follow the advertising is small at this time, however it can be added to as time goes on.

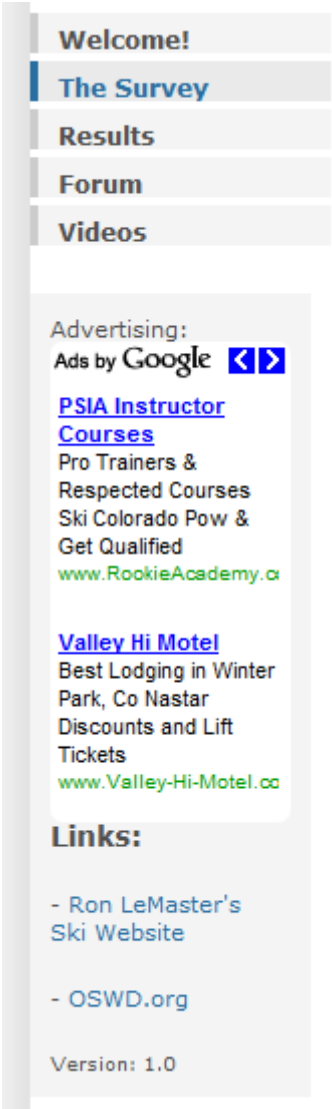


FIGURE 3-2: NAVIGATION BAR

HEADER

The header is simple, but contains the sites motto and a banner which cycles through images. Figure 3-3 shows an example of the header while it is part way through the transition between images.

FIGURE 3-3: HEADER, WHILE FADING BETWEEN IMAGES

SITE LAYOUT

Navigation within the site is made easy due to the simple structure (Figure 3-4). Using the navigation bar a user can easily go between the pages with no risk of becoming lost. The only pages which are not accessible in this manner are the latter pages of the survey, which by design can only be accessed by completing the previous pages.

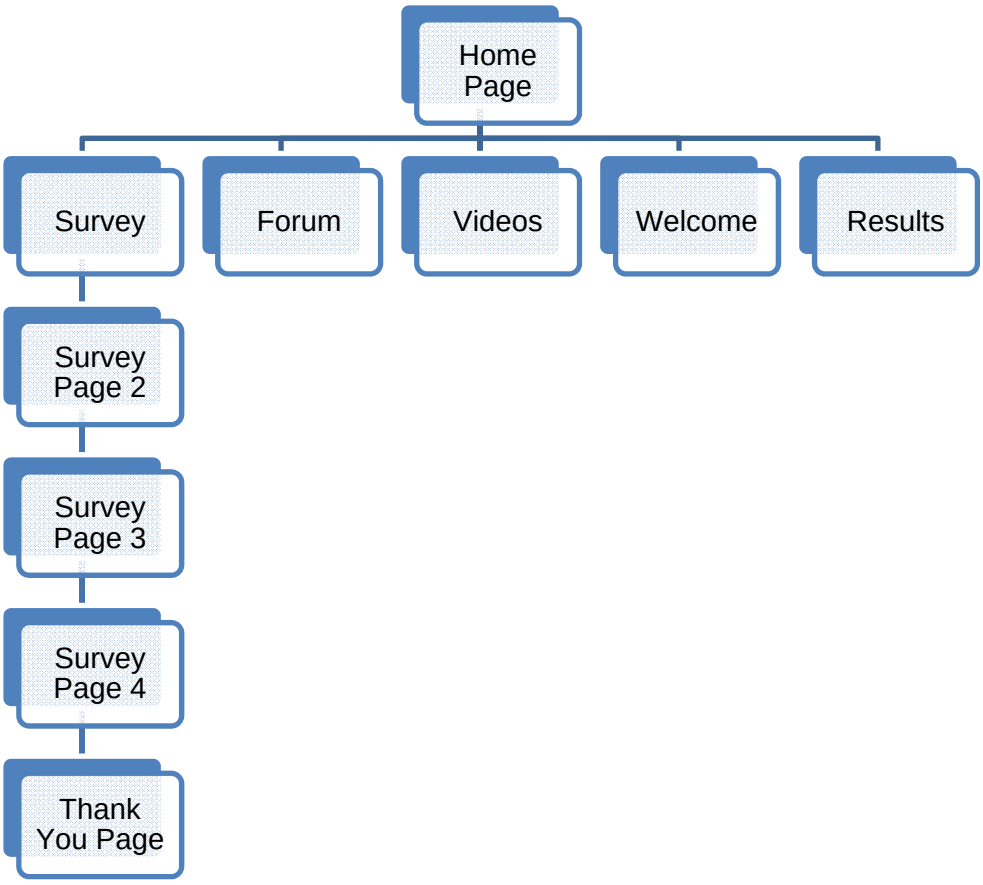


FIGURE 3-4: SITE LAYOUT

GATHERING THE DESIRED DATA

The questions decided upon in conjunction with the researcher were included in their appropriate pages. A sample of the questions can be found in Figure 3-5. The different input types are all shown. The first question uses check boxes, the second radio buttons, the third a text box, and the fourth a text area. When a user submits this page, all the values are put in the database.

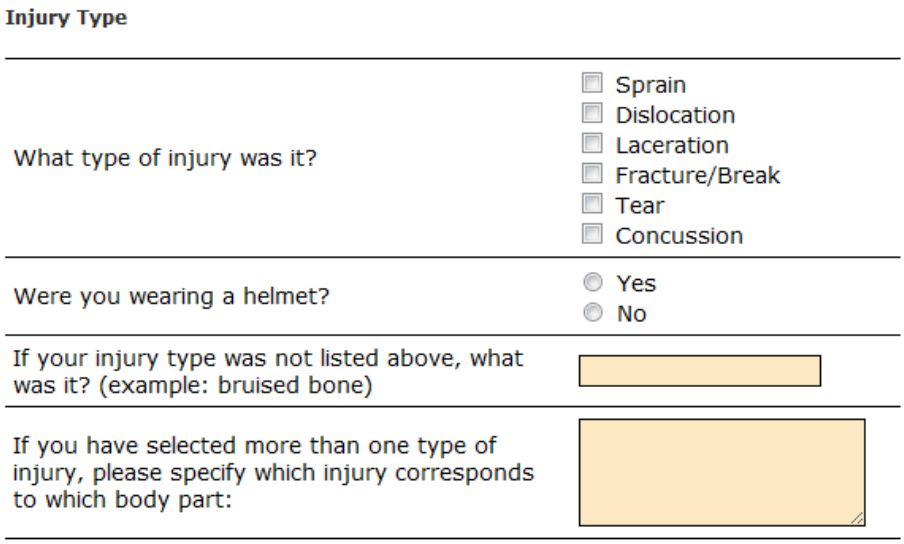


FIGURE 3-5: A SAMPLE PAGE OF QUESTIONS

ENCOURAGING COMPLETION OF THE SURVEY

CONDITIONAL QUESTIONS

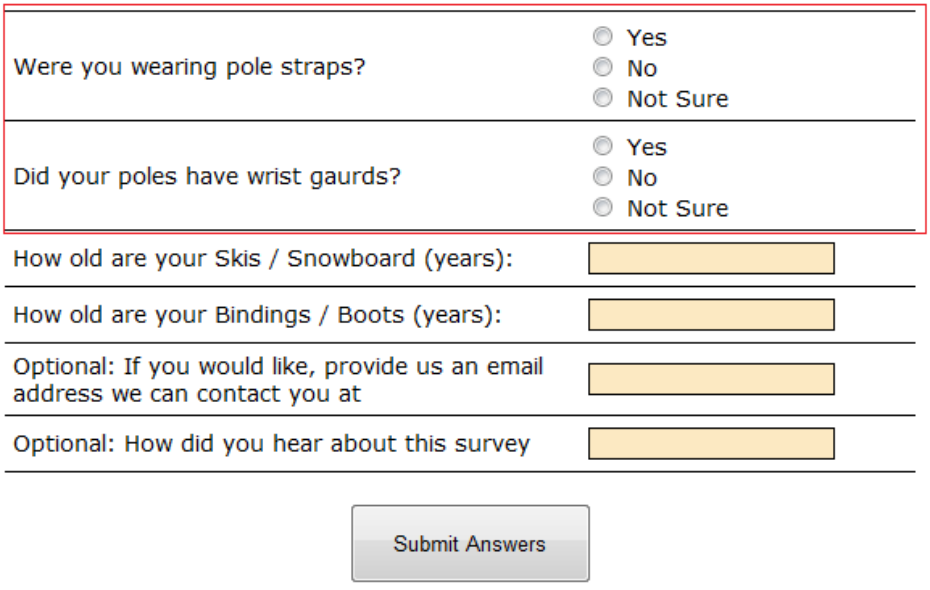


FIGURE 3-6: EXAMPLE OF A BRANCHED QUESTION.THE QUESTIONS CONTAINED IN THE RED BOX ARE ONLYPRESENTED TO SKIERS WITH THUMB INJURIES

Using conditional questions was useful in reducing the length of the last two pages of the survey. Figure 3-6 shows an example of questions from the fourth page that are only presented to a user if they are a skier who sustained a thumb injury. Figure 3-7 contains a list of all the conditional questions.

Conditions	**Question**
Skier	Was your fall caused by an inadvertent binding release?
Snowboarder	Did you have only one foot strapped in?
Snowboarder Wrist Injury	Were you wearing wrist guards?
Skier Thumb Injury	Were you wearing pole straps? Did your poles have wrist guards?
Knee Injury	Select the specific type of knee injury (such as ACL)
Snowboarder One foot strapped in Injury in any of the following: Upper leg Knee Lower leg Ankle	Did your foot/board twist when you fell?

FIGURE 3-7: TABLE OF ALL CONDITIONAL QUESTIONS

PROGRESS BAR

The progress bar that was created does not take up a large amount of space; however it does provide an easy to understand status to the user. An example of the progress bar for page 3 of the survey is shown in Figure 3-8.

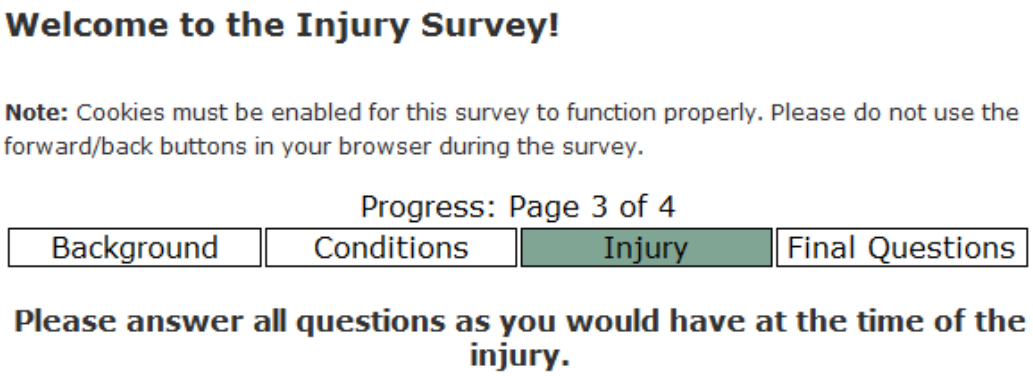


FIGURE 3-8: THE PROGRESS BAR AS IT APPEARS ON PAGE 3 OF THE SURVEY

DATA GATHERED

The survey was answered by 22 participants over the course of about 2 weeks. Of these participants, six did not completely fill out the survey. In addition to the 22 valid entries, 5 entries contained data which had clearly been entered randomly. These entries contained unreasonable values such as an age of over 1000 years. Another handful of entries came from users who submitted the first page but did not fill out any actual responses. The meaningful entries are presented in Section 6 - Appendices.

DATA COLLECTION

The method used for storing data in a mySQL database was successful. An example of the interface is shown in Figure 3-9. Results may also be exported to a spreadsheet or other format if desired.

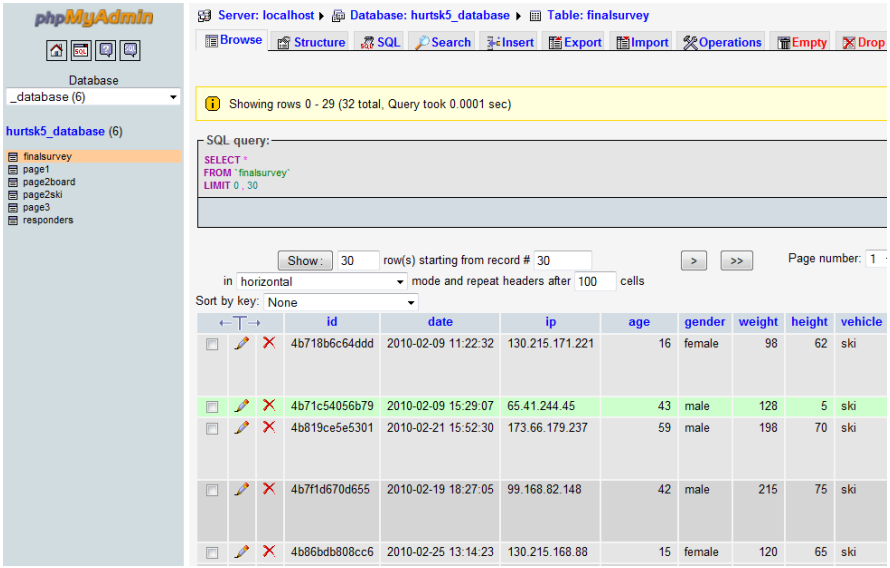


FIGURE 3-9: AN EXAMPLE OF THE WEB INTERFACE FOR VIEWING SURVEY RESULTS

THE FORUM

When a review of other forums was completed, the following categories were settled upon for this forum:

- General
  - Welcome!
  - Fireside Chat
  - Resorts & Snow Conditions
  - Pictures & Videos
  - Comments & Suggestions
- Injuries
  - Ski Injury Stories
  - Snowboarding Injury Stories
  - Recovery & Medical Discussions
- Skiing
  - General
  - Gear Discussion & Reviews
  - Tuning and Maintenance
  - Tips & Pointers
- Snowboarding
  - General
  - Gear Discussion & Reviews
  - Tuning and Maintenance
  - Tips & Pointers
- Instructors
  - General
- Racing & Competition
  - General
  - Recreational
  - USSA : United States Ski & Snowboard Association
  - FIS - Federation Internationale de Ski
- Classified
  - For Sale
  - Wanted

Unfortunately, no users actually signed up for the forum. The only users present were those created to test its functionality. Figure 3-10 shows what the home page of the forum looks like.

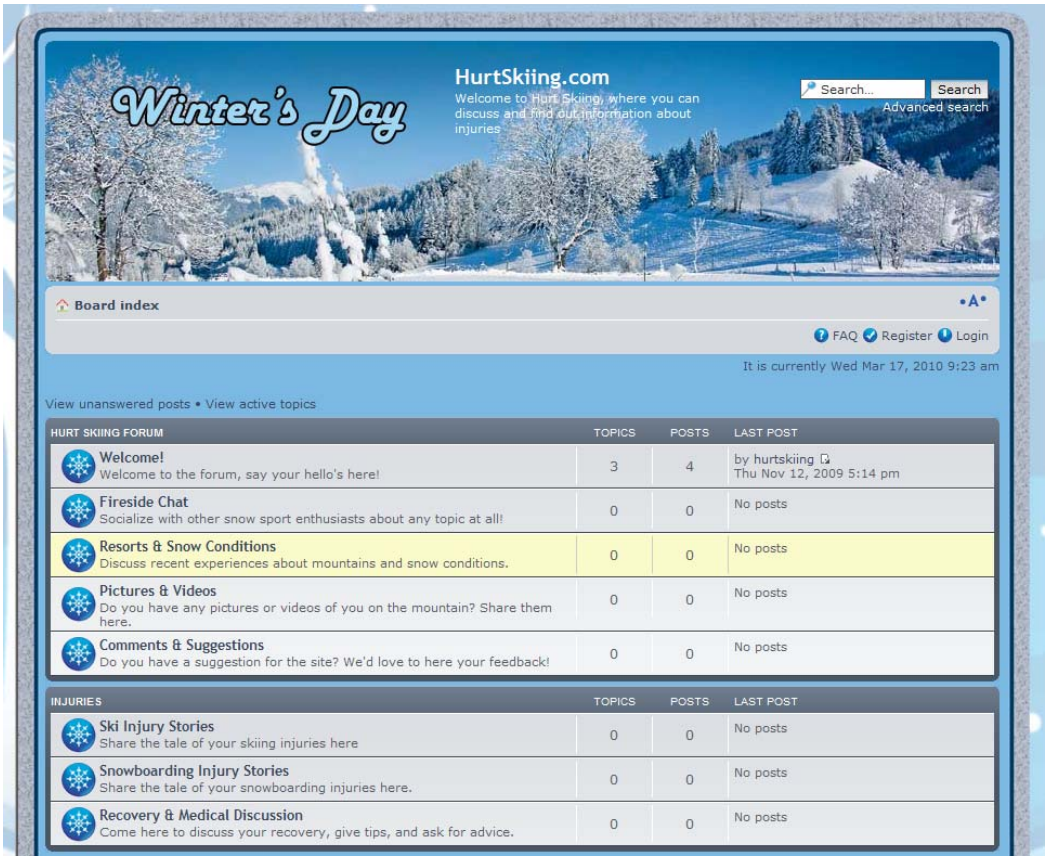


FIGURE 3-10: THE HOME PAGE OF THE FORUM

ADVERTISING

The contextual advertising did serve up meaningful ads, as can be seen in Figure 3-2. These ads were viewed a total of 1,200 times as of this writing. On only three occasions was one of these ads clicked, generating $2.74 in revenue.

ENABLING MODIFICATION BY FUTURE RESEARCHERS

It would not be particularly easy for future researchers to add questions without a moderate amount of web development knowledge. In order to add another question, a researcher would need at least a foundational understanding of HTML, JavaScript, PHP, and mySQL. There are plenty of questions which could be used as examples to learn. Using these examples, a researcher could feasibly add their own questions, but it would not be as easy as was hoped.

4. DISCUSSION

EASE OF USE AND NAVIGATION

This project was successful in making the website easy to use and navigate. While no formal usability studies were conducted to prove this, some test users were monitored while using the web page. None of these test users had any trouble navigating the web site. They also found the layout of the pages intuitive.

I am pleased with the aesthetics of the final page. It has a professional feel, and this is enhanced by the slideshow of skiing photos. Future work could be done to add more color if desired.

GATHERING THE DESIRED DATA

Many iterations of the survey were built and tested. The final one was successful in allowing the researcher to gather useful answers. The biggest shortcoming of this section was the lack of input validation. Invalid values are allowed in all fields. For example, someone could put a negative age. It is possible with JavaScript to check users responses before allowing them to move on. Additionally, no fields are required. While not every field needs to be required, many of them are important enough that JavaScript should be used to stop a user from going forward until they have filled out a certain minimum set of responses for each page.

ENCOURAGING COMPLETION OF THE SURVEY

Perhaps the single most difficult part of this project was getting users to take the survey, and once they have begun taking it, to get them to complete it. A sizeable portion of the users filled out only a portion of the survey. It is likely that most, if not all, of these incomplete answers are the result of users losing interest.

The progress bar was successful to some extent in mitigating this effect. This conclusion is drawn based on the users who tested the survey. Without some sort of indicator of progress, it is likely that many more of the respondents would have failed to complete the survey.

As stated in the results, 22 participants contributed meaningful responses. Many more entries appeared in the database, but users had filled out either irrational responses or no responses at all. The meaningful entries are presented in the Appendices.

In order to get more users to complete the survey, it would help to shorten it further. Some questions which are of lesser interest could be eliminated. It would also be helpful to make even more questions conditional.

DATA COLLECTION

The one researcher who has worked with the data so far had no difficulty using the web based tools to view user's responses. The tool she used was 'SQL Buddy', a free application written in PHP. She was able to export the data to a spreadsheet and evaluate it from there. She did not attempt to use the scripts written to generate graphs,

in part due to an insufficient amount of data collected. Since she does not have a computer science background, it is reasonable to assume that future researchers would also be able to use SQL Buddy to extract results.

THE FORUM

Since no real users signed up for the forum, it was not useful in creating a community around the web site or generating traffic. This result is not surprising, since getting an initial group of users is the hardest part of making a forum. Since so many forums already exist to serve skiers and snowboarders, it is unlikely the forum will see any usage without direct encouragement from a researcher.

ADVERTISING

While only $2.74 in revenue was generated, I would consider the advertising to be successful. Relatively few users have used to the site so far, so it is expected that little revenue would be generated. Now that the advertising is in place, more revenue will be generated as the site gets more traffic under the guidance of future researchers.

ENABLING MODIFICATION BY FUTURE RESEARCHERS

It is unlikely that a researcher could make a significant modification to the web site without having knowledge of PHP, HTML, JavaScript, and mySQL. There is little that can be done to get around this. ‘What you see is what you get’ (WYSIWYG) editors are often used to enable individuals with little web development background to maintain websites. Unfortunately, such editors are generally only capable of handling HTML.

Since all of the pages of the website are generated with PHP, these editors cannot be used.

This is one area where Survey Monkey is more effective than this web site. Users of Survey Monkey do not need any web development experience to use the tool, so any researcher could make changes easily at any time. Survey Monkey is also easier to extract results from if a user is unfamiliar with mySQL databases. While these points do weigh in Survey Monkey's favor, it lacks customizability and the inability to create conditional questions weigh heavily against it.

OBJECTIVES OUTSIDE OF THE SCOPE OF THIS PROJECT

GATHERING A SUFFICIENT NUMBER OF RESPONSES

Enough users responded to the survey to say with confidence that it is an effective means of gathering data. Unfortunately, less than two dozen responses were gathered. Of these, a large portion only responded as a favor to the researchers. There are a few factors at play in this small response size. The survey was not released until late in the season. This left less time than desired for users to provide responses. Since it is now live, it will be useable for the entire winter season in future years.

Insufficient promotion was also at fault. A flyer was created to promote the site, but it was not widely distributed. The promotion that was most successful was talking to the WPI ski team, and posting on Facebook.

RESEARCHERS CAN USE THE SITE TO TEST THEIR OWN HYPOTHESIS

The site was successfully used to test a researcher's hypothesis. The hypothesis that helmets would not be completely effective at preventing concussions was confirmed. Three respondents reported having concussions, and two of these reported they were wearing helmets. These two instances of concussions occurring despite the individual wearing a helmet indicates that while helmets may prevent some injuries, concussions can still occur.

5. CONCLUDING REMARKS

This project was successful in developing a web based survey to collecting skiing and snowboarding injury information. All of the desired features were implemented. The site can be accessed at http://www.hurtskiing.com.

A subsequent IQP completed by Michelle Maurice will make a more extensive analysis of the results gathered. Other students will continue where this research has left off in the following ski seasons.

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7. APPENDICES

APPENDIX A - SKI / SNOWBOARD FORUM RESEARCH

QUESTIONS:

What different categories do other forums use?

How do they structure these categories into different groups?

How effective is their method (Are people actually using it?)

TETON GRAVITY RESEARCH FORUM

http://www.tetongravity.com/forums/forumdisplay.php?f=3

Has just one forum with hundreds of threads

This is effective in the sense that there are hundreds of threads

SKI.COM FORUM

http://www.ski.com/COMMUNITY/Default.aspx?TabId=56&AspxAutoDetectCookieSupport=1

Has the following sections:

- Discussions - This section seems effective and is well populated
    - General
    - Classified
    - Shop Talk
    - Take Kids!
- States – Contains only a handful of posts
    - Mountains are listed within them
- Continents/Countries
    - Almost no posts in these categories

SNOW FORUM.COM

http://www.snowforum.com/

Contains the following sections:

- Lounge Area - non snow related
- Chat - anything snow related

- Resorts
- Travel/events
- Snow reports
- Technique, tips, tricks
- Equipment reviews / questions
- Snow Movies
- Jobs
- Classifieds
- FAQ

This board is well visited. All categories are seeing use, and they have over 3000 members

TALK SKI

http://www.talkski.com/ski-forum/

Contains the following categories

- General Ski Chat
- Ski Equipment
- Fireside Bar - non ski topic
- Ski Jobs / Advice
- Resorts and snow reports
- Snowboarding chat
- Introductions
- Ski Marketplace

This board is also heavily used. All categories seem active.

EPIC SKI

http://www.epicski.com/forum/

Contains the following categories

- Community
    - Plan trips
    - Trip reports
    - Epic Ski events
    - Community announcements

    - auctions and special events
    - euro zone - European skiers
    - special deals for members
- Ski Forums
    - General
    - Gear discussion
    - Gear Reviews
    - Ask the boot guys
    - tuning and maintenance
    - backcountry and cross country
    - snow sports video, photography, etc
- Ski Training
    - Instruction coaching
    - technique and analysis
    - ask a ski pro
    - racing and competition
    - Beginner zone
    - Patrol Shack
    - Fitness, injury, recovery
    - Adaptive snow sports?
- Snowboarding
    - general
    - gear
    - technique
- Mountain Forum
    - family skiing
    - resorts/conditions/travel
    - food and drink
- Classified
    - gear swap
    - classifieds
- Site Feedback

Very Effective site, most categories populated

CONCLUSIONS

Making an overly granular sub sections results in a less useful forum

Forums with a lot of users often have lots of categories

Sites add more specific categories as their user base grew.

Based on these observations, I will start with broader categories, and adjust as necessary. The initial categories used are will be:

- General
    - Welcome!
    - Fireside Chat
    - Resorts & Snow Conditions
    - Pictures & Videos
    - Comments & Suggestions
- Injuries
    - Ski Injury Stories
    - Snowboarding Injury Stories
    - Recovery & Medical Discussions
- Skiing
    - General
    - Gear Discussion & Reviews
    - Tuning and Maintenance
    - Tips & Pointers
- Snowboarding
    - General
    - Gear Discussion & Reviews
    - Tuning and Maintenance
    - Tips & Pointers
- Instructors
    - General
- Racing & Competition
    - General
    - Recreational
    - USSA : United States Ski & Snowboard Association
    - FIS - Federation Internationale de Ski
- Classified
    - For Sale
    - Wanted

The following appendices contain the responses gathered to the survey. They are presented exactly as they were received, with no edits except to remove empty rows. Empty rows occur when a respondent took the survey, but may not have filled out any information on a given page.

APPENDIX B – WHERE DID RESPONDENTS HEAR ABOUT SURVEY?

- facebook
- facebook
- facebook psia
- facebook group (psia region 3)
- PSIA facebook
- PSIA facebook
- Michelle Maurice facebook
- michelle maurice
- the lovely Michelle Maurice :]
- togg race
- Dr. Richard Kavey
- Friend - Chris Brown

APPENDIX C – RESPONDENT DEMOGRAPHICS

age	gender	weight	height	vehicle	frequency	ability	fisrank	instructor	instructorlevel	yearsskiing	skiertype
15	female	120	65	ski	1-10	intermediate	no	no		5	recreational
16	female	98	62	ski	21+	expert	no	no		13	recreational
54	male	190	73	ski	11-20	expert	yes	yes	psia level2, level 1		instructor
19		155	69	board	21+	expert	no	yes	0	10	instructor
12	male	100	63	ski	21+	expert	yes	no		9	racer
59	male	198	70	ski	21+	expert	no			10	recreational
47	male	215	74	ski	21+	expert	no			36	recreational
63	male	185	731	ski	21+	expert	yes	no		55	instructor
42	male	170	66	board	21+	expert	no	yes	2	38	instructor
43	male	128	5	ski	21+	expert	no	yes	l 2	26	instructor
41	female	120	64	ski	21+	intermediate	no	no		35+	recreational
31	male	250	72	ski	21+	expert	no	yes	2	28	instructor
0	male	132	70	board	21+	expert	no			6 years	instructor
14	male	121	69	board	11-20	intermediate	no			4	recreational
22	male	160	70	ski	21+	expert	no			18	instructor
29	female	185	5	ski	21+	expert	no	yes	2	14	instructor
47	male	150	5	ski	21+	expert	yes	no		44	racer
43	male	175	72	ski	21+	expert	yes	no		38	instructor
17	male	130	70	board	21+	expert	no	no		5+	instructor
13	male	105	62	ski	21+	intermediate	no			9	recreational
47	male	160	67	ski	21+	expert	no	yes	1	40	instructor
42	male	215	75	ski	1-10	beginner	no	no		2	recreational

APPENDIX D – SITUATION IN WHICH INJURY OCCURED

partofseason	timeofday	fatigue	warmuporstretch	snowconditions	periodofday	trailtype	traildifficulty
middle	twilight	verytired	no	racecourse	lastruns	alpine	blue
middle	midday	startingtotire	yes	packed	middleruns	moguls	black
beginning	twilight	startingtotire	yes	mixed	lastruns	alpine	blue
beginning	twilight	verytired	no	racecourse	lastruns	other	green
end	midday	startingtotire	no	packed	lastruns	jump	black
middle	morning	startingtotire	yes	packed	middleruns	alpine	blue
noanswer	noanswer	noanswer	noanswer	noanswer	noanswer	noanswer	noanswer
middle	morning	fresh	no	powder	firstruns	backbowl	triple
beginning	morning	fresh	no	packed	firstruns	alpine	green
noanswer	noanswer	noanswer	noanswer	noanswer	noanswer	noanswer	noanswer
beginning	twilight	startingtotire	no	mixed	lastruns	alpine	blue
middle	midday	fresh	no	packed	middleruns	alpine	green
noanswer	noanswer	noanswer	noanswer	noanswer	noanswer	noanswer	noanswer
middle	midday	startingtotire	yes	packed	middleruns	alpine	black
middle	morning	fresh	no	powder	firstruns	alpine	black
middle	midday	startingtotire	yes	mixed	middleruns	alpine	blue
middle	night	startingtotire	yes	racecourse	lastruns	GS	black
middle	morning	fresh	yes	packed	firstruns	alpine	blue
end	midday	fresh	no	mixed	firstruns	jump	blue
middle		fresh	no	packed	firstruns	jump	blue
end	midday	startingtotire	yes	mixed	middleruns	alpine	green
middle	night	fresh	no	packed	middleruns	alpine	blue

APPENDIX E – INJURIES

Injury list	Injury Type list	helmet	Other Injury type	Location of injury	Injury description
knee	dislocation	yes			Coming down the moguls, I missed a pole plant and subsequent turn. I got launched over the top of one of the moguls and fell to my left, hitting my left leg on the top of another mogul. I slid for about 30 ft, all the time being bumped into moguls. Equipment stayed on, but somewhere in there I hit my knee hard enough to dislocate it.
lowerleg	fracture	no	spiral fracture of the right tib fib		Skiing on Saloman snow blades with non release bindings. No crowd on trail. Snow was mixed with some piles in trail. Making a right hand turn when tip of snow blade stuck in a pile and twisted and broke the right tibia and fibia at the boot top. Was still standing on the left leg and had to throw myself down the hill to prevent putting any more stress on the right leg.
head neck	concussion	yes			
knee	sprain	yes	hit from behind by out of control skier, knee buckled and went out from under me		was hit from behind by out of control skier, I tore the ACL in my knee a few years ago and still wear a brace on that leg (Don Joy Brace). It acted like a "seatbelt", if I hadnt had it on, I believe the injury would have been much worse.
head	laceration	no	scalp laceration		Hit a rock hidden under powder snow, ski caught, pitched forward and fell, ski windmilled on safety strap and hit me on the head causing laceration.
shoulder	dislocation	no			trying new flatland trick
knee	tear	no			beginner hill, a lesson slid into me hooked my ski and slowly twisted my knee around before i could get away from them
wrist	fracture	yes			Caught an edge, fell backward, put my arms out stiff and jammed wrist
head nose neck spine	concussion	no			caught and edge after going off a jump and trying to avoid a skier who had fallen in front of me, caught edge and took a high speed face plant

knee	tear	no			This injury was from earlier 1998-1999. I was not as strong of a skier. The blue squares at the point where like a double black. I believe i may have caught a edge.
knee	sprain tear	yes		right knee. Possible ACL tear, Possible tendon damage. Radiologist, Surgeon, and practiconer all have diferent perception of injury.	Was in control and suddenly went off race line for no apparent reason, tried to recover and immedaitly fell. Spun backwards and landed on my back. While sliding down the hill the back of my ski dug into the snow and hyperextended my knee. Still not sure whether my knee failed in the race turn, causing the crash, or wether the damage occured after the fall as my ski dug into the snow.
knee	tear	no			Was messing around at moderate speed (20mph), looked uphill to spot my companion, hit a patch of ice and went down. Tried to come right back up onto my skies, but caught an edge which redirected me towards the woods. Went off trail into the woods feet first and in an attempt to stop muself set a very agressive edge and my right knee blew.
head neck shoulder	laceration	yes			
head	concussion	yes			I caught and edge while spinning off the lip of the jump.
lowerleg	tear	yes			Ski went straight down into soft spring ski on other side of small jump. Leg pulled straight out of binding without any twisting motion. Tore gastroc muscle 4 cm.... My theory was the lack of twisting meant the binding did not release with expected DIN?
lowerleg	fracture	no			on trail, all alone, caught an edge, crash caused boot fracture of the fibula, binding did not release(bindings set to tight for my ability)