



Personality Traits in Swedish High School Alpine Skiers – A Comparison between Injured and Uninjured Skiers

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Abstract

Objective: Prevention of alpine ski injuries is less studied when it comes to psychological aspects. The aim of the present investigation was to study if there were any relationships between some personality traits and alpine ski injuries. Additionally, find out if gender could be a significant factor in these relationships.

Methods: 298 alpine skiers (139 males, 159 females) at a Swedish ski high school completed the Swedish universities Scales of Personality (SSP). SSP is a self-report personality inventory containing 91 items divided into 13 subscales regarding e.g. stress susceptibility, impulsivity and sensation seeking behavior. Three groups of skiers were analyzed those without any injuries, with one injury, and with two or more injuries.

Results: Injury rate was significantly related to stress susceptibility ($p=0,046$) with higher values for the uninjured skiers and the lowest values for the group with higher injury rates (for both males and females). No significant relationships were found between adventure seeking, impulsivity, and anxiety proneness and injury rate.

Conclusion: Stress susceptibility seems to be a preventing factor in alpine skiing injuries among skiers 16-20 years old.

Keywords: Adolescents; Alpine skiing; Competitive skiers; Personality characteristics; Sports injury; Stress

Introduction

Personality is an important area in sport psychology as attempts are made to understand, explain and predict levels of sporting involvement and success as well as to prevent injuries in sport [1,2]. Sports-related injuries are a major problem for competitive athletes. An injury affects the athlete both physically and psychologically and leads to compromised health [3]. In alpine skiing, there is limited research on the influence of injuries with respect to personality characteristics and gender. Earlier research on skiing injuries has been focused on physiological aspects and inappropriate equipment, while very limited research deals with psychological risk factors [4]. It is, however, important to take as many aspects as possible into consideration when studying the complexity behind injuries in competitive alpine skiers. To find out if personality traits differ between skiers may help the coach to prevent at injury-risk situations for an alpine skier.

Only a few decades ago psychosocial factors and other personality characteristics have not been considered to be risk factors for sports-related injuries. Williams and Andersen developed a multicomponent theoretical model of stress and injury [5,6]. This stress-injury model shows how an athlete's past experience of stressful situations (e.g. demanding practices, crucial competitions etc.) contribute - interactively or in isolation - to a stress response. Individuals with a history of several stressors and a personality that have a tendency to worsen the stress response will be more likely to find situations as stressful and display greater physiological activation and attentional distraction [6]. The severity of the consequential stress response, caused by increased stress reactivity of individuals, is a proposed mechanism behind the increased risk of injury [2]. A comprehensive model of the relationship between stress and athletic injuries has to consider personality characteristics [2].

Kleinert [7] studied the significance of an athlete's personality

traits in relation to the occurrence of an injury. The result showed a significant connection between stress and injury risk [7]. For instance, individuals with high anxiety and mistrust may evaluate more situations as stressful and therefore experience eminent stress responses contrary to individuals with a reversed outline, which might lead to an increased risk of injuries [8]. Relationships between personality traits to risk factors in sports, stress and coping with stress have been especially studied. Less emphasis to the role of other personality traits and variables of sport injury risk, such as mistrust, adventure seeking and cognitive trait anxiety has been investigated.

There are several factors affecting an athlete's reaction to an injury [9]. Johnson [9] has explained an injured athlete's personality trait as a psychosocial load with negative thoughts and defensive thoughts, which can affect an athlete's return to sport. Personality traits are unique for each individual [10] and "one of the major tasks for a scientific psychology of traits is to distinguish internal properties of the person from overt behaviours, and to investigate the causal relationships between them" [11]. Furthermore, an individual's behavior varies from situation to situation as well as an individual's thoughts and emotions [12,13]. For one athlete an injury can be seen as a failure and for another athlete as liberation. Because of the high risk of injury in competitive

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alpine skiing [14,15], it is important that the coaches work with their skiers to develop strategies that help the athletes to manage skiing without getting injured.

Gender differences have been less studied. Taylor investigated psychological factors such as self-confidence and somatic and cognitive anxiety in athletes of different sport disciplines [16]. He found these factors to be important in terms of how the athletes performed within their sport disciplines, and that these relationships appear to be uniform among several different sports. The three psychological variables were predictive of sports performance. The interaction indicated that a specific balance of moderate levels of self-confidence and somatic and cognitive anxiety were necessary for optimal performance. However, it differed in regards to if the sport discipline was characterized by a mixture of motor skills of different levels. No significant differences were noted within each gender in terms of the relationship between psychological factors and performance, although differences between genders may exist [16,17]. Males scored higher on standard measures of self-esteem than females, but the difference was small [17]. Furthermore, gender differences have been found in relation to personality characteristics of those athletes that participated in a “risk sport” (e.g. rock climbing and abseiling) [18]. Females showed higher degree of stress before the activity than males.

Athletes often have high, even perfectionistic demands on themselves and their performance [19]. If a skier has high demands on himself (or herself) and the actual resources available are lower than the demands, the skier can experience a high load of stress that can lead to emotions of anxiety [20]. Stress can prevent an athlete to successfully return to sport and also generally increase the risk of injury or re-injury [21]. A review [6] reported a positive relationship between life stress and sport injury in 27 out of 30 studies. It has also been proposed that athletes who start competing after a severe injury may experience increased competition anxiety [22]. Stress factors identified by coaches among injured athletes include fear of re-injury, worry of failure or not reaching the same competitive level, and social pressure to return to sport [22].

An earlier study has shown [15] that it is likely that alpine skiers get injured during their academic period at a Swedish ski high school. Most of their injuries are represented by knee injuries. Westin et al. [15] demonstrated that almost 50% of all the skiers during their four year academic period were afflicted by one or more severe injuries. In another study interviewing 2121 world cup skiers and snowboarders, 705 injuries were recorded [14]. One severe injury can end a skier's athletic career, so studying different aspects of this phenomenon seems to be very important in order to prevent alpine ski injuries.

The main aim of the present study was to investigate possible relationships between personality characteristics and injury rate. Another aim was to find out if gender could be a significant factor in these relationships.

Materials and Methods

Ethical permission

The study was approved by the Regional Ethical Review Board in Stockholm (Dnr 2006/833-31/).

Participants

To be included in this investigation the skier must have started his/her studies at one of Sweden's alpine ski high schools (3 or 4 academic years). The skiers were given both verbal and written information and

thereafter they gave their consent to participate in the study. Prior to the study the skiers filled out a demographic questionnaire about previous injuries.

Swedish universities Scales of Personality (SSP) was completed by a total of 469 alpine ski high school students in Sweden [23]. Out of 469 skiers 298 were included (139 males, 159 females) in the analysis. Excluded were 171 skiers out of the 469 who completed the SSP. The reason for being excluded was that they had not completed their studies at any of the Swedish ski high schools. The skiers ranged in age from 16 to 20 years (mean 17.2).

Evaluation instrument

Personality characteristics were measured using the SSP, which is a self-report personality inventory developed to study a number of different personality traits [23].

SSP contains 91 items divided into 13 subscales. In each subscale seven items were represented. The subscales are measuring personality traits that can be related to three factors: *anxiety-proneness* (somatic trait anxiety, psychic trait anxiety, stress susceptibility, low assertiveness), *extraversion* (impulsiveness, adventure seeking, detachment, embitterment, social desirability) and *aggression-hostility* (verbal aggression, physical trait aggression, trait irritability and mistrust). Each item was rated on a four-point response scale from ‘Does not apply at all’ to ‘Applies completely’.

The SSP is standardized on a representative random sample from the general Swedish population (aged 20 ± 64 years) [23]. SSP has been found to be stable over time and the reliability in terms of “internal consistency” for the SSP was measured by Cronbach's α and the value of the different personality traits ranged from 0.59 to 0.84. Intraclass correlations (ICC) were 0.17 to 0.43 [23].

Procedure

The skiers answered the SSP at the start of the study. If an injury occurred, the skier filled out a standardized injury report regarding injury localization, type of injury, and if the skier has had any previous injuries. A researcher was in regular telephone contact with the coaches to ensure that injury and the number of days absent from skiing were reported. The study started in 2007 and data was collected between 2007 and 2012 at 10 different ski high schools in Sweden (Gällivare, Tärnaby, Östersund, Järpen, Sollefteå, Malung, Uppsala, Torsby).

When the data collection was completed. The skiers were divided into the following three groups: skiers without any injuries (n = 122), skiers with one injury (n = 96), and skiers with two or more injuries (n = 80) (Table 1).

A severe injury has been defined as absent from sport more than 28 days [24]. According to Fuller et al. [24], the definition of an injury period and the severity of an injury (regardless of body part) is the period immediately after an injury has occurred until the athlete has been recovered meaning that the athlete is able to return to his or her previous level of activity without any symptoms [24].

| Groups | Total number of skiers (%) (n=298) | Males (%) (n=139) | Females (%) (n=159) |
|------------|------------------------------------|-------------------|---------------------|
| No injury | 41 | 45 | 37 |
| 1 injury | 32 | 32 | 33 |
| > 1 injury | 27 | 23 | 30 |

Table 1: The amount of skiers with no injury, with one severe injury and two or more severe injuries (total n=298).

Power calculation

Provided two groups with 122 and 80 subjects (effective $n = 96$), respectively and a significance level of 5 percent an effect size of 0.43 can be detected with a power of 0.85 [25]. The effect size corresponds to a mean difference in a personality scale of 4.3 (T score) between the group with no injury and the group with more than one injury.

Statistical analysis

The data was analyzed with Statistical Package for Social Sciences (SPSS 22.0). All variables were analyzed using descriptive statistics (frequencies, mean and standard deviation). The raw mean scores were transformed to a T-scale, which by definition has a mean of 50 and a standard deviation of 10, for males and females separately. Thus, the mean score for a single scale is set to 50 for males and 50 for females with a standard deviation of 10 in both groups.

Differences in gender distribution between the injury groups were analyzed with the Pearson χ^2 test. The level of significance for all analyzes were set at $p \leq 0.05$ (two tailed).

Differences in the personality variables were analyzed with two-way (injury group * gender) analysis of variance (ANOVA). If there were no significant interaction effects between injury level and gender, the analysis were run as a one-way analysis of variance. Moreover, if age was significantly related to a personality variable, age was included as a covariate in a two-way analysis of covariance (CovANOVA). Post hoc tests were performed using the Tukey HSD test controlling for multiple comparisons.

Results

Personality differences between groups

None of the differences between injury levels interacted with gender implying that the differences were valid for both genders, and a one-way analysis of variance were run for all analysis of differences between injury levels.

A significant group difference was found in the personality variable Stress Susceptibility [$F(2, 293) = 3.11$; $p = 0.046$], with higher values, according to the Tukey HSD test, for the group without any injuries compared to the group with two or more injuries (Figure 1 and Table 2). The difference was not dependent of gender [$F(2, 290) = 1.43$, $p = 0.233$]. None of the other differences attained a significant level. However, weak but significant correlations were found between age and Somatic Trait Anxiety ($r = 0.13$, $p = 0.028$), and Trait Irritability ($r = 0.20$, $p < 0.001$). Thus, these analyses were run as two-way CovANOVA with age as a covariate. No significant differences were found between these two personality and injury level (Table 2).

Differences in the personality profile were found between alpine skiers and the normal controls. Alpine skiers showed higher values in Stress Susceptibility, Adventure Seeking, and lower in Mistrust when compared to normal controls (Figure 1 and Table 2).

Discussion

The aim of the present study was to evaluate personality characteristics in comparison with injury rate. Between three groups of alpine skiers (skiers without any injury, skiers with one severe injury, skiers with two or more severe injuries) only one significant group difference was found. The skiers without any injuries were more prone to stress susceptibility. Unexpectedly, no other variable showed a significant difference. Interestingly enough, the groups did not differ in adventure seeking, i.e. being more prone to take risks.

Stress can be both positive and negative for the outcome. A certain degree of stress can improve the concentration in order to perform at the highest level during a competition [26]. Positive stress can be a possible explanation for why the group without severe injuries showed higher scores on stress susceptibility compared to the group who had experienced severe injuries. Positive stress might help the alpine skiers to load up and be alert and energetic. The uninjured group showed increased susceptibility to stress, which is similar to the result of a study

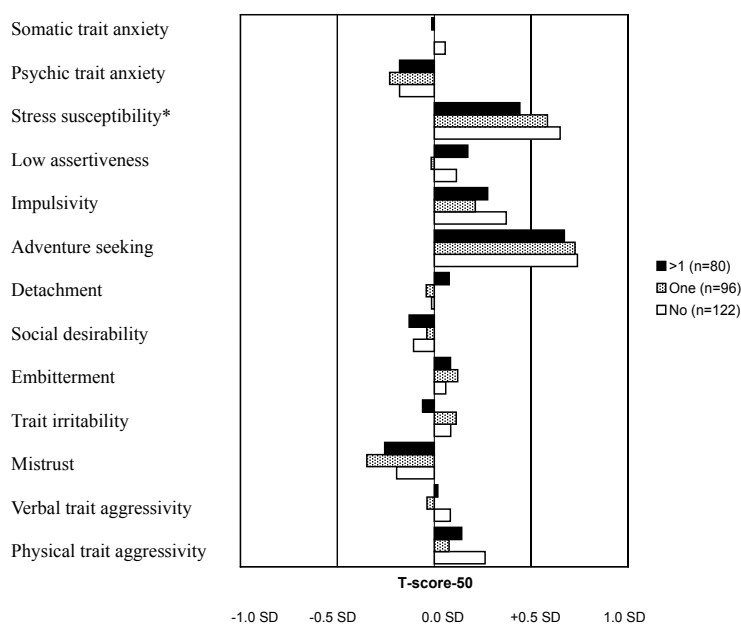


Figure 1: The results of the 13 personality variables are reported for each group; the group with no injury (No), the group with one severe injury (One) and the group with two or more severe injuries (>1) $n = 298$. * $p < 0.05$.

| Personality trait | No injury Mean value (95% CI) | One severe injury Mean value (95% CI) | Two or more severe injuries Mean value (95% CI) | p-value |
|-----------------------------|-------------------------------|---------------------------------------|---|---------|
| Somatic trait anxiety | 50.6 (49.2-51.9) | 50.0 (48.5-51.5) | 49.9 (48.3-51.4) | n.s. |
| Psychic trait anxiety | 48.2 (46.6-49.8) | 47.7 (46.0-49.4) | 48.2 (46.5-49.9) | n.s. |
| Stress susceptibility* | 56.5 (55.4-57.6) | 55.8 (54.6-57.0) | 54.4 (53.3-55.5) | 0.046* |
| Low assertiveness | 51.1 (49.8-52.5) | 49.8 (48.3-51.3) | 51.7 (50.1-53.4) | n.s. |
| Impulsivity | 53.7 (52.3-55.1) | 52.1 (50.4-53.8) | 52.8 (51.1-54.4) | n.s. |
| Adventure seeking | 57.4 (56.1-58.7) | 57.3 (55.9-58.6) | 56.7 (55.4-58.0) | n.s. |
| Detachment | 49.9 (48.6-51.1) | 49.6 (48.3-50.9) | 50.8 (49.6-52.0) | n.s. |
| Social desirability | 48.9 (47.5-50.4) | 49.6 (47.8-51.4) | 48.7 (46.8-50.6) | n.s. |
| Embitterment | 50.6 (49.1-52.1) | 51.2 (49.5-52.9) | 50.8 (49.2-52.5) | n.s. |
| Trait irritability | 50.8 (49.2-52.5) | 51.1 (49.2-53.0) | 49.4 (47.4-51.4) | n.s. |
| Mistrust | 48.1 (46.5-49.6) | 46.5 (44.9-48.1) | 47.4 (45.7-49.2) | n.s. |
| Verbal trait aggressivity | 50.8 (49.2-52.5) | 49.6 (47.7-51.5) | 50.2 (48.3-52.1) | n.s. |
| Physical trait aggressivity | 52.6 (50.9-54.3) | 50.8 (48.7-52.8) | 51.4 (49.4-53.5) | n.s. |

Table 2: Mean value (95% CI) for SSP. For each group; no injury, one severe injury and two or more severe injuries. Comparison was calculated with one-way analysis of variance (ANOVA) and post hoc tests were done using the Tukey HSD test.

by Levi [26]. Williams and Andersen [5], in comparison to Levi's study presented different results and reported that high levels of stress might lead to injuries [6]. Also, Rogers and Landers have reported stress susceptibility to be a strong predictor affecting the injury outcome. Competitive young skiers might experience stress in situations when they are not getting enough support from their environment. For young people (16-18 years of age) who are engaged in competitive sports, it is well established that the most important role models during the psychosocial development, consists of coaches, peers and parents [27]. Uninjured skiers may possibly be affected by fear of getting injured since they have seen what an injury to his/her team mates might implicate. In many cases, an injury occurred as a result of a series of more or less verifiable elements. The individual assessment of a more stressful situation may increase the risk of injury, and thereby influence various psychological factors [6]. However, higher sensitivity to stress may help skiers to be more careful in risk situations.

When it comes to personality differences regarding gender, researchers [28] have not reported any differences between males and females in terms of how they function as human beings when looked at 122 personality traits. In the present study, gender differences, although not significant, were found regarding the personality traits; detachment, social desirability, mistrust and psychic trait anxiety. Males showed lower average rate in these attributes compared to females in each group. Female skiers showed a higher average rate in low assertiveness in the group with more than one severe injuries compared to their male counterparts. To the best of our knowledge this has not been reported in earlier studies. Both males and females showed similar average rates regarding stress susceptibility. However, Glover & Hill demonstrated that males and females may react differently to stress. Males have a higher tendency to behave aggressively, while females have a higher tendency to be more anxious and depressed.

Competitive alpine skiing requires focus, risk taking and many

years of training with high motivation. A life as a successful alpine skier is well structured and the demands on the skier are high, which means that the skier must sometimes push the limits and take risky decisions on the slopes [29]. For personalities seeking challenges skiing with these requirements can be a first choice. This is shown by the high degree of the personality trait adventure seeking in this group of high school alpine skiers when compared to the general population.

When discussing personality and sport, stress appears mainly as the most common standard term, while other variables have been difficult to find. Only a few studies has been identified where they have used the SSP instrument [8,30]. One study was performed on junior soccer players, where the aim was to develop psychological predictors in order to reduce injury risks among young soccer players [8]. Negative life stress, somatic anxiety, suspicion and ineffective coping were the strongest predictors of new injuries. The authors implemented an inventory for the soccer players who developed coping strategies, resulting in decreased injury rates [8]. One reason why SSP has not been used in previous studies within sports may be that the personality test SSP is relatively new and has therefor only been used in a minority of studies. Psychological factors such as mistrust, love of adventure and psychic trait anxiety have not yet been tested systematically in other studies within sports medicine.

The present study represents a homogeneity of the sampled group. By restricting the sample in an athletic level (junior alpine skiers), a given sport category (skier), a given age range (16-20 years) means that the results can be generalized to this particular limited population. The current study should contribute to high internal validity and the group should be representative for high school alpine skiers (16-20 years), because the skiers participated under the same conditions and sample criteria. Alpine skiing also represents a part of organized sport worldwide, which means that the results of the study should be meaningful and appropriate in its real context.

The choice of using the SSP method is based on the instrument's stability. It is stable over time. Also, it's partly developed by scientists at Karolinska Institutet and has been used in the represented research group in a number of scientific articles. Since the outcome of SSP is stable over time, the results should not be affected if a skier had a severe injury or not. SSP has been evaluated among people aged 20-65 years and as well its reliability as its validity has been demonstrated to be good [23]. In this study, all adolescents are aged 16-20 years, which possibly can influence the outcome. It would, therefore be interesting to perform similar reliability and validity studies in this age group in order to find out whether SSP also is stable in this agegroup. A question is whether the result could have been different if the study was done on competitive skiers of a broader age range or at the age 20-30 years, for instance. SSP, which has not previously been used in a similar study, has particular specificity for vulnerability factors that could influence cognitive abilities. The instrument should therefore adapt well to this purpose.

However, the debate remains regarding if the SSP questionnaire is stable over time. In one personality study, researchers evaluated the personality aged 21-96 years and found that after the age of 30 years there were no major changes in personality, despite the fact that a human normally experience transformative events through life [31]. This has been criticized by other researchers, who argued that an individual's personality is stabilized first at the age of 50 years. Roberts and DelVecchio maintain that personality is relatively stable over time. It has been shown [32] that personality can change in adulthood over time and mostly before the age of 30 years. On the other hand, the researchers argued that personality is to some extent genetic and therefore stable [32].

When analyzing the result, it is important to consider that the participants may have answered based on what they think the environment expects. There might be social perceptions within the skier about how one should be as a person and as a skier, and how one should act in certain situations. This means that the answers might not be completely decent. One of the scales of SSP measured social conformity. The female skiers (in the present study) are within the normal range, while the male skiers are slightly more towards the lower side. In contrast, all the skiers are in the range of higher scales in the categories; stress susceptibility, adventure seeking and impulsiveness. Thus, they respond like a stereotypical skier to fit into the social environment required for a skier. To see if the SSP is reliable, some of the questions have a minus sign in front of shell shortening (SS), which means it is reverse scoring, revealing if the skier has answered the form randomly.

Limitations of the present study were that the skiers answered several questionnaires at the same time and not only the SSP. For this reason, it is possible that the participants may have had impaired concentration which in turn might have influenced the validity. A definition related to the general population is lacking and thereby weakening the credibility. No information was available about the general population group, as for example, if the population represented athletes, information about occupation, if anybody was injured at the time or has had previous injuries.

According to the findings of the present study, there are psychological factors defined as regards the difference in personality traits of alpine ski high school students who did not have any injury, one severe injury, and more than one severe injury. A notable finding was that uninjured skiers showed higher sensitivity to stress than injured skiers. It may be important to inform the skiers and their coaches about psychological

risk factors that exist to clarify an awareness of the situation in order to reduce the risk of injury in competitive alpine skiers.

Hitherto, our research group has not found any studies on competitive alpine skiers, highlighting possible problems of personality traits, combined with severe injuries. More studies are needed to evaluate the relationship between skiers and personality factors linked to suffer a sports injury and thus be able to set safety outcome of this study. It would have been interesting to make a comparative study between the senior and junior level of alpine skiers to see which stressors that distinguish them from one another and also to study how stressors' are changing simultaneously the skier's improvement of skiing ability. To gain a further understanding, it would be interesting to do in-depth interviews with a qualitative approach in this area. It could provide greater insight and understanding of the stressors impact on the skiers. In addition, it would have been of interest from a gender perspective to interview males and females in order to try to understand possible gender differences in terms of personality characteristics. The three skier groups, without any injury, with one severe injury and with two or more severe injuries were compared to a general population. Moreover, it would also be interesting to compare the groups with uninjured skiers as the norm group and compare with severely injured skiers.

Conclusion

In conclusion, significant differences were found between three groups of alpine skiers, uninjured skiers, skiers with one severe injury and skiers with two or more severe injuries, when it comes to the personality trait stress susceptibility. The uninjured skiers were more sensitive to stress than the two other groups. Based on the present study, stress susceptibility could be an injury preventing factor in alpine skiing in adolescent skiers aged 16-20 years in Sweden. This information and knowledge may be helpful for coaches when coaching young alpine skiers.

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