

THE INFLUENCE OF PRIOR EXPERIENCE AND GENDER ON CHANGES IN SOMATIC, COGNITIVE, AND SELF-CONFIDENCE ANXIETY LEVELS DURING SKI TECHNIQUE LEARNING

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ABSTRACT

The aim of this research was to determine changes in anxiety among students when learning alpine skiing technique with regard to prior knowledge and gender and the level of anxiety on performance evaluation. 130 kinesiology students (74 male and 56 female students) participated in the research. In this study, anxiety was self-assessed using a questionnaire, and it was represented by three levels of anxiety: a) somatic anxiety level, b) cognitive anxiety level and c) self-confidence anxiety level. The respondents were divided into two groups depending on their previous experience in skiing: beginners and advanced, and there were equal numbers of men and women in both groups. Adoption and improvement of alpine skiing techniques was carried out over 10 days. Anxiety was assessed at three control points: a) immediately before learning the skiing technique, b) after 4 days (or on the morning of the fifth day) and c) after 7 days (or on the morning of the eighth day). The t-test $F(1,126)$ was used to examine the difference in the total score between the beginners and the advanced students. The recorded level of anxiety in terms of the somatic anxiety level was higher among the beginners than in the advanced group, although the somatic anx-

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xiety level decreased during the learning of skiing technique in both groups. The same applies to the cognitive anxiety level. The self-confidence anxiety level remained consistently significantly higher among the advanced participants compared to the beginners. Girls are statistically significantly more anxious when looking at the total score and the cognitive and self-confidence anxiety level, but such statistically significant differences were not recorded in the case of the somatic anxiety level. When it comes to the connection between the aforementioned anxieties and the overall grade, lower anxiety correlates with better grades in all cases.

INTRODUCTION

Anxiety is an exaggerated experience of fear that is unfounded, disproportionate to the real danger. Given the presence of fear as a dysfunctional emotion, it significantly interferes with normal life. According to Lebedina Manzoni (2007), anxiety is defined as an emotional state manifested by irritability, tension, psychosomatic disorders, outbursts of crying, aggressiveness, difficulties in making decisions, insomnia and depression. When comparing men and women, women suffer from anxiety more often. Even two thirds of anxious people are women. The reason lies to some extent in upbringing, because women are raised differently than men, but apart from upbringing, hormonal status is also a significant factor for such sensitivity of women. Also, children and adolescents experience great stress, and failure stands out as the most common source of stress among school-age children (Halstead et al., 1993 cited in Vizek Vidović et al., 2014). In situations where there are pressures related to performance and when failure has serious consequences, such as competitions or comparisons among students, anxiety often occurs (Wigfield & Eccles, 1989, cited in Woolfolk, 2016). Emotional reactions have a significant impact on sports performance, and emotion regulation is essential for achieving goals. Optimal performance requires the appropriate emotion of the appropriate intensity at the right time, especially under pressure (Fawver, B. et al., 2019). Test anxiety is one of the manifestations that causes a drop in success in an exam situation. The reason for this lies in the action of two groups of factors: inadequate cognitive processes and increased excitation of the autonomic nervous system (Liebert & Moriss, 1967 cited in Vizek Vidović et al., 2014). Exam-anxious students have a large number of distracting thoughts that interfere with their recall and problem solving. In those moments, their thoughts are focused on the possible negative consequences of failure in the test situation (Vizek Vidović et al., 2014). The negative impact of anxiety on performance was determined at different levels of management, attention, interpretation, but also on the physical (motor) aspect (Nieuwenhuys & Oudejans, 2017). According to Ekornas et al., in 2010, children with determined anxiety showed weaker motor skills and had a poor self-assessment of peer acceptance and physical competence compared to non-anxious children.

Somatic anxiety is negatively related to cognitive status (“digit span test”), while on the other hand self-confidence and somatic anxiety are positively related to speed of motor performance Jones & Cale (1989). The results of these conclu-

sions suggest that somatic anxiety could be an important factor in the variation in motor performance. Anxiety as a factor that can affect the reduced ability of motor visualization (“motor imagery”) is an important factor in the process of motor learning (Kahraman et al., 2018). According to Smith et al., 1988, performance of motor tests in highly anxious conditions, in front of spectators, increases, unlike performance in competitive conditions when it decreases. Runswick et al., 2018 in their research found that anxiety had an impact on cricket players, in a way that they had less good contact with the ball.

Rogers & Paskevich (2021) investigated how experience and fear influence performance in male members of the Canadian national ski team, in World Cup races, using interpretive phenomenological analysis. The results showed that contextual factors (e.g. weather conditions, course profile) and self-confidence strongly influence the experience of fear and that the discrepancy between training and competition makes it difficult to effectively develop fear management strategies. A similar study by Nilsson et al., 2025, which assessed the predictive power of a generalized battery of physiological tests on alpine skiing performance, concluded that the selected tests used in the study show limited generalizability for assessing top alpine skiers, since the predictive value of specific physiological parameters on competitive performance is largely athlete-dependent. In participants whose level of self-control was in decline, the association between anxiety and performance was significant and negative. Increasing the level of self-control can prevent the potentially negative effects of anxiety (Englert & Bertams, 2013). According to Mullen and Hardy (2000), explicitly (cognition during performance) learned motor skills are less sensitive to poor performance in stressful situations than implicitly (automatic performance) learned motor skills. A study by Finkenzeller, T. et al. 2022, which examined the time course of changes in subjective, physiological, and biomechanical indicators during a demanding alpine skiing performance in 22 experienced skiers, showed that subjective feelings of fatigue and anxiety increased as fatigue progressed, while vitality and calmness decreased. The conclusion is that a focus on self-regulation and self-awareness may play a key role, as subjective variables have been shown to be generally sensitive to the physical stress of alpine skiing.

Considering the previous research and all of the above, we pose a question that opens a research problem: how do the levels of somatic anxiety, cognitive anxiety, and self-confidence anxiety change during the process of learning skiing techniques in students with different prior knowledge (beginners and advanced),

and whether gender has an influence on these changes. Based on this, we also hypothesize that beginners will show a statistically significantly higher level of anxiety in all indicators compared to advanced students during the learning process, that girls will have a statistically significantly higher level of anxiety compared to boys, and that overall anxiety decreases over the course of acquiring skiing techniques. In accordance with the problem and hypotheses, the aim of this research is to examine changes in anxiety levels across three dimensions (somatic anxiety, cognitive anxiety, and self-confidence anxiety) during the process of learning skiing techniques among students with different prior experience (beginners and advanced), and to examine differences in anxiety levels with respect to gender.

METHODS

Participants

130 kinesiology students (74 male and 56 female students) participated in the research. 20 students (14 male and 6 female students) attend the Faculty of Educational Sciences in Osijek, and the other 110 students (60 male and 50 female students) attend the Faculty of Kinesiology at the University of Zagreb. This makes up a total of 56.9% of male and 43.1% of female respondents. The average age of the subjects is 21.4 years. The study was approved by the Ethical Committee of the Faculty of Education in Osijek, Croatia.

Measure

The variables in this research represent three dimensions of anxiety: the somatic anxiety level, the cognitive anxiety level, and the self-confidence level. Anxiety was self-assessed using the Competitive State Anxiety Inventory-2 (CSAI-2; Martens et al., 1990), which was adapted by the author for the purposes of this study and shortened to five items for each dimension (Vidranski et al., 2022). The answers to the statements related to somatic anxiety, cognitive anxiety and self-confidence were given on a scale from 1 to 5 (1 – not at all, 2 – a little, 3 – moderately, 4 – a lot, 5 – very much). Items in the self-confidence dimension were reverse-scored, meaning that a response of five represented the lowest level of anxiety and a response of one represented the highest level of anxiety; therefore,

these items were recoded prior to analysis. The result for each anxiety dimension was calculated as the arithmetic mean of the five items, and the overall anxiety score was computed as the mean of the three dimensions.

Since the original CSAI-2 was adapted and shortened, internal consistency was examined on the present sample. Reliability was assessed using Cronbach's alpha coefficients calculated for each subscale. The results indicated satisfactory internal consistency: somatic anxiety ($\alpha = 0.81$), cognitive anxiety ($\alpha = 0.84$), and self-confidence ($\alpha = 0.79$).

Test protocol

The respondents were divided into two groups depending on their previous experience in skiing: the first group consisted of beginners and the second advanced participants. There were 74 beginners (which makes up 56.9 % of the sample), and 56 in 43.1 % advanced participants. In the beginner group, 40.5 % of respondents were girls compared to 59.5 % boys. Similar ratios were recorded in the advanced group: 46.4 % female against 53.6 % male. Adoption and improvement of alpine skiing techniques was carried out over 10 days. Every day a new technique was learned and what was learned was repeated. Classes last four hours with occasional short breaks or one longer break, followed by free time for revision and practice. Each student had to fill in a total of three identical questionnaires because anxiety was assessed at three control points: 1) immediately before learning the skiing technique, 2) after 4 days (or the morning of the fifth day) and 3) after 7 days (or the morning of the eighth day).

Statistical analysis

Descriptive parameters arithmetic mean and standard deviation are shown for total anxiety and its individual factors for all measurements. The t-test was used to examine the difference in the total score between beginners and advanced students. The correlation between individual factors of anxiety and the final grade was tested with the Pearson correlation coefficient. The correlation between physical characteristics and the final grade was tested with the Pearson correlation coefficient. The data were analyzed with the computer program SPSS (Statistical Package for the Social Sciences) 25.0.

Results

TABLE 1. Arithmetic means of the anxiety level in all three measurements.

somatic anxiety level									
	I. MEASUREMENT ±SD	t-value	II. MEASUREMENT ±SD	t-value	III. MEASUREMENT ±SD	t-value	SKOR_SOM ±SD	t-value	t-value
all	2,04±0,98		1,57±0,68		1,42±0,55		5,03±1,81		
beginners	2,33±1,03*	2,85	1,65±0,73	1,10	1,48±0,57	1,00	5,46±1,89*		
advanced	1,66±0,77*		1,46±0,60		1,34±0,51		4,46±1,55*		2,24
cognitive anxiety level									
	I. MEASUREMENT ±SD	t-value	II. MEASUREMENT ±SD	t-value	III. MEASUREMENT ±SD	t-value	SKOR_KOG ±SD	t-value	t-value
all	2,22±0,92		1,93±0,82		1,98±0,92		6,13±2,18		
beginners	2,36±0,92*	1,37	2,05±0,79	1,30	2,07±0,91	0,89	6,48±2,02*		1,43
advanced	2,04±0,89*		1,78±0,82		1,86±0,92		5,68±2,30*		
self-confidence anxiety level									
	I. MEASUREMENT ±SD	t-value	II. MEASUREMENT ±SD	t-value	III. MEASUREMENT ±SD	t-value	SKOR_SAM ±SD	t-value	t-value
all	2,03±0,57		1,85±0,56		1,79±0,57		5,66±1,37		
beginners	2,14±0,54*	1,78	2,01±0,52*	2,70	1,88±0,59*	1,52	6,03±1,26*		2,51
advanced	1,88±0,59*		1,64±0,54*		1,66±0,53*		5,18±1,36*		

*= p<0,05

Table 1 shows the arithmetic means of the mentioned levels in each of the measurements. The degree of anxiety regarding the somatic anxiety level decreased in everyone, which is also visible in both groups, beginners and advanced. Namely, it can be seen that in the first measurement the average value was 2.04, in the second measurement it dropped to 1.57 and in the third measurement it was 1.42. It is clearly visible that the somatic anxiety level decreased during the stages of learning skiing technique. However, it is also evident that at the first measurement there was a statistically significant difference ($t=2.85$, $p<0.05$) between the level of anxiety in beginner and advanced skiing, while at the second and third measurements it almost evened out and was not significant. The variable “SKOR_SOM” was created, which was the sum of the arithmetic means of all three measurements, and it shows that a higher score means higher values of the anxiety level, that is, a greater dimension/quantity of anxiety level. There is a statistically significant difference between the level of anxiety in these two groups of participants in the somatic anxiety level: for beginners it is 5.46, and for advanced students it is 4.46 ($p<0.05$). With the cognitive anxiety level, the same situation occurred as with the somatic anxiety level: the differences are significant only in the first measurement ($t=1.37$, $p<0.05$) and in the created score “SKOR_KOG” for the cognitive anxiety level ($t=1.43$, $p<0.05$). Likewise, it is evident that after the initial values there is a drop in both groups, and then stagnation, although the figures in the third measurement show a slight increase. As well as to the previous two levels, the self-confidence anxiety level remained consistently significantly higher in beginners students compared to advanced in all three measurements, and the same was recorded in the created variable “SKOR_SAM”. In the case of beginners, it is still in a certain decline, but in the case of advanced students, this anxiety level was still in a very slight, almost insignificant increase. In the first measurement $t=1.78$, in the second $t=2.70$, and in the third $t=1.52$, while with the variable “SKOR_SAM” $t=2.51$, of course in all cases $p<0.05$.

TABLE 2. Differences in gender of the anxiety level score and the total score

	SOMATIC ±SD	t- value	COGNITIVE ±SD	t- value	SELF- CONFIDENCE ±SD	t- value	SKOR_ANK ±SD	t- value
male	4,90±1,82	-0,66	5,62±1,78*	-2,14	5,42±1,34*	-1,61	15,94±4,39*	-1,77
female	5,21±1,81		6,81±2,47*		5,98±1,35*		18,00±4,64*	

*= $p<0,05$

Table 2 shows the results of all respondents in three defined dimensions of anxiety with regard to gender. The results show that the level of anxiety in girls is statistically significant when looking at the total score (“SKOR_ANK”, $t=-1.77$, $p<0.05$) and the cognitive ($t=-2.14$, $p<0.05$) and self-confidence anxiety level ($t=-1.61$, $p<0.05$), but such statistically significant differences were not recorded in the case of the somatic anxiety level.

TABLE 3. Correlation between level of anxiety and overall grades

	grade
somatic factor	-0,27*
cognitive factor	-0,22*
self-confidence factor	-0,32*
general anxiety	-0,31*

*= $p<0,05$

Table 3 shows the results of the connection between the mentioned level of anxieties and the total score. The results are in line with expectations. Significance was assessed based on the negative and statistically significant Pearson correlations between anxiety dimensions and exam scores shown in the table 3, lower levels of anxiety are associated with better scores, i.e. increased anxiety is associated with lower scores and exam success.

DISCUSSION

In this research, a questionnaire was used as a measuring instrument for examining students' level of anxiety when learning alpine skiing technique in three factors; somatic, cognitive and self-confidence factor, according to skiing knowledge (advanced and beginners) and gender. The somatic level of anxiety among students decreased during the entire time of learning skiing technique. However, it is also evident that at the first measurement there was a statistically significant difference between beginners and advanced skiers, while at the second and third measurements it almost evened out and was not significant. For the cognitive anxiety level, differences are significant only in the first measurement and in the created “SKOR_KOG” score. Likewise, it can be seen that after the initial values there is a decline in both groups and then stagna-

tion (although the figures even suggest a slight increase, possibly due to the excitement caused by the upcoming exam). It can be concluded that, as far as the cognitive anxiety level is concerned, during the period of learning skiing techniques, there is a decrease in anxiety among the participants. The self-confidence anxiety level remained consistently significantly higher in beginners participants compared to advanced in all three measurements, and the same was recorded in the created variable "SKOR_SAM". In the case of beginners, it is still in a certain decline, but in the case of advanced students, this anxiety level was still in a very slight, almost insignificant increase. Similar results in the somatic and cognitive anxiety level were obtained in their research by Vidranski et al., 2022. The interdependence between individual anxiety level is not completely clearly stated, given the unusual variants of the factors, there is room for them to be manifested differently in different aspects of functioning. Carzoli, et al. (2018) in their research tried to identify the association between cognitive and somatic anxiety level with self-assessed 1 RM (maximum weight of one repetition). What they found was that the cognitive anxiety level was positively and significantly associated with the difference between self-estimated and derived 1RM, while the mentioned association with the somatic anxiety level was not significant, which meant that participants with higher cognitive anxiety level self-estimated their 1RM to be lower than it actually was. Before them, Jones & Cale (1989) identified a functional diversity of anxiety levels. They came to the realization that the somatic anxiety level is negatively related to a person's cognitive status, while self-confidence and the somatic anxiety level are positively related to the speed of motor performance. Based on the findings of the mentioned authors, it suggests that the somatic level of anxiety could be an important source of variations that occur during motor performance. Changes in the uneven improvement of the three anxiety levels indicate the greatest changes in the somatic anxiety level, and the least in self-confidence, which is in accordance with the research of Vidranski et al., 2022. Significant differences between beginner and advanced skiers in the adoption of alpine skiing technique in the first measurement as well as a constant decrease with a statistically significant difference in the newly created variable SKOR indicates a total decrease in anxiety with the adoption of skiing technique, and the reason for this lies in the systematic and methodically guided learning process under the guidance of an expert who controls the working conditions and adjusts all components to the participants. This alone reduces the possibility of injury, the fear of performing

certain elements, and as a result, all components of anxiety are reduced. As determined by Stern et al., (2013) intentional exposure to anxiety can reduce it and thereby improve performance. Also, according to Hordacre et al., (2016) after simulated states of stress and anxiety there was an improvement in performance, in their case an improvement in precision. The attitude of ski beginners, who have no experience in alpine skiing, primarily depends on the information they have gathered from the environment. The fear of injury among ski beginners is most often associated with falling while skiing, falling from the ski lift, bad weather conditions, collision with other skiers or snowboarders on the ski field (Cigrovski et al., 2014).

The results of this anxiety test are interesting if you look at the differences by gender. Female respondents are statistically significantly more anxious looking at the total score "SKOR_ANK", the cognitive anxiety level and self-confidence anxiety level, but statistically significant differences were not recorded in the case of the somatic anxiety level. It follows from the above that boys were less anxious on average than girls, especially regarding the cognitive anxiety level. The explanation of the results obtained in this way is partly supported by the study Stanimirović (2018), which states that somatic symptoms of a panic attack occur more often in women 64.52 % compared to men.

The results of the connection between the mentioned levels of anxieties and the overall grade are in line with expectations, which means that in all cases a lower level of anxiety is associated with better grades, which ultimately means a better performance on the exam itself. So, although the attitude of ski beginners in alpine skiing school is given little attention, it can really influence the level of ski knowledge learned (Cigrovski et al., 2014). It can be concluded that the learning effects will be greater if the student is motivated to learn due to his positive attitude. Namely, fear can really represent a psychological barrier when learning a new motor movement, but also the impossibility of perfecting and practicing an already learned movement (Cartoni et al., 2005). One of the causes of anxiety reduction may be the adaptive processes in the brain that take place during intentional exposure to anxiety. On the other hand, a higher level of motor skill acquisition could reduce overall level of anxiety due to its association with the skill. The purpose and consequence of motor learning is a higher level of acquisition of motor skills. So, with a reversible reaction, one could reduce the level of anxiety to some extent. Furthermore, controlled conditions can reduce anxiety by eliminating irrational thoughts about possible falls and injuries. As

already mentioned, anxiety occurs as a result of the inability to understand and predict life events. Due to their uncertainty, in an attempt to concretize anxiety, people mistakenly associate it with a specific object (situation, disease) (Milivojević, 2010).

CONCLUSION

Based on the conducted research, it can be concluded that there are statistically significant differences between beginners and advanced students in several indicators of anxiety and the overall achievement score. Advanced students achieved a significantly higher overall score compared to beginners, which indicates a connection between greater experience and better performance with lower levels of anxiety.

Beginners showed statistically significantly higher values of somatic and cognitive anxiety levels, while advanced participants' levels of anxiety and self-confidence were consistently higher in all three measurements. These findings suggest that more advanced participants have a greater perception of control and self-confidence during the performance of motor tasks.

With regard to gender differences, it was found that girls are statistically significantly more anxious than boys in terms of overall, cognitive and anxiety levels of self-confidence, while no significant difference was found for somatic anxiety. This indicates the presence of different emotional reactions by gender during the process of learning motor skills.

Analysis of changes between baseline and final measurements showed a decrease in anxiety in all its aspects, with the largest decrease observed in the somatic component, especially among beginners. Furthermore, a negative correlation was found between anxiety and performance – lower levels of anxiety were associated with better results.

Overall, the results confirm that a more advanced level of motor knowledge and experience contributes to a decrease in anxiety and that the learning process has a positive impact on the emotional stability and performance of the participants.

This study contributes to a better understanding of the role of psychological factors, especially anxiety, in the process of acquiring alpine skiing technique in novice and advanced skiers and the influence of gender on these changes. The

study provides empirically based guidelines for designing more effective learning methods that take into account the psychological characteristics of students. Limitations include the subjective nature of the measurement and the short time frame, the sample is limited, which may reduce the generalizability of the results to a wider population, therefore future research with objective indicators and longer follow-up is needed. In the future, it is advisable to expand the research to additional psychological factors and to a wider population of skiers and athletes.

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UTJECAJ PRETHODNOG ISKUSTVA I SPOLA NA PROMJENE U SOMATSKIM I KOGNITIVNIM RAZINAMA TE RAZINAMA ANKSIOZNOSTI VEZANIH UZ SAMOPOUZDANJE PRI UČENJU SKIJAŠKIH TEKSTOVA

SAŽETAK

Cilj ovog istraživanja bio je utvrditi promjene u anksioznosti učenika pri učenju tehnike alpskog skijanja s obzirom na predznanje i spol te razinu anksioznosti pri ocjeni uspješnosti. U istraživanju je sudjelovalo 130 studenata kineziologije (74 studenta i 56 studentica). U ovom istraživanju anksioznost je samoprocijenjena pomoću upitnika, a predstavljena je s tri razine anksioznosti: a) somatskom razinom anksioznosti, b) kognitivnom razinom anksioznosti i c) razinom anksioznosti samopouzdanja. Ispitanici su bili podijeljeni u dvije skupine ovisno o dosadašnjemu skijaškom iskustvu: početnici i napredni, a u objema skupinama bio je podjednak broj muškaraca i žena. Usvajanje i usavršavanje tehnika alpskog skijanja provodilo se tijekom deset dana. Anksioznost je procjenjivana na trima kontrolnim točkama: a) neposredno prije učenja tehnike skijanja, b) nakon četiri dana (ili ujutro petog dana) i c) nakon sedam dana (ili ujutro osmog dana). T-testom je ispitana razlika u ukupnom rezultatu između početnika i naprednih studenata. Viša razina anksioznosti u pogledu razine somatske anksioznosti zabilježena je u odnosu na napredene, iako se razina somatske anksioznosti smanjila tijekom učenja tehnike skijanja u objema skupinama. Isto vrijedi i za razinu kognitivne anksioznosti. Razina anksioznosti samopouzdanja ostala je dosljedno značajno viša kod naprednih sudionika u usporedbi s početnicima. Studentice su statistički značajno anksioznije gledajući ukupni rezultat te razinu kognitivne anksioznosti i anksioznosti samopouzdanja, ali jednako tako statistički značajne razlike nisu zabilježene u slučaju razine somatske anksioznosti. Promatra li se povezanost anksioznosti s ukupnom ocjenom, u svim je slučajevima niža anksioznost povezana s boljim ocjenama.

KLJUČNE RIJEČI:

psihičko stanje, sportovi na snijegu, poučavanje, studenti