Differences Between Traditional and Modern Technology In the Acquisition of New Ski Knowledge

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ABSTRACT

Purpose: Video materials have been used as teaching tools for many years. With the development of modern technology, new video devices have appeared that have greatly improved the quality and capabilities of video materials. This study was conducted with the purpose of investigating and comparing the current traditional and modern ways of recording ski elements. In the traditional way of recording, the cameraman stands on the ski slope and uses a camera to record a demonstration of the ski element of the skier moving toward him. On the other hand, the modern way of recording was made with the Gopro 360 max, which allows you to record video while skiing.

Methods: The sample of respondents who evaluated the quality of the traditional and the Gopro 360 max videos for three skiing elements consisted of 149 students (105 male and 44 female) from the Faculty of Kinesiology Osijek. Prior to the video quality assessment test, the performance of the ski elements was explained to the students using traditional and modern video footage. When solving the ski knowledge test, students had the opportunity to watch and use traditional and/or modern videos.

Results: The average score that students achieved on the ski knowledge test was 8.9 ± 2.48 points (74.16 ± 0.21%). When evaluating the quality and contribution of the videos, students rated the usefulness of the traditional method of video recording with an average score of 3.01 ± 1.25, while the modern method of video recording received an average usefulness score of 3.79 ± 1.07. The difference between the traditional and modern video recording was statistically significant at the $p < 0.01$ level.

Conclusion: The obtained results indicate that the way the Gopro360 max records and presents the skiing elements contributes significantly to the quality of the presentation and the acquisition of specific skiing knowledge compared to the traditional recording method.

Keywords: Gopro360 max, ski elements, knowledge test

INTRODUCTION

Skiing is a motor activity in which skiers use a wide range of skiing techniques to successfully overcome various snow slopes (Danijela Kuna et al., 2020). Vanat (2020) estimates that approximately 400 million people (skier visits) visit ski resorts annually. Due to the great popularity of recreational and professional skiing, several authors have studied the health benefits of alpine skiing. Burtscher et al. (2019) found that skiing, especially when practiced daily, can contribute to healthy aging, which is associated with a healthier lifestyle that includes higher levels of physical activity. Recreational alpine skiing promotes strength gains (Finkenzeller et al., 2011; Pötzelsberger et al., 2015) reduces cardiovascular risk factors (Burtscher et al., 2013; Dela et al., 2011) and has a positive effect on the overall locomotor system (Mladenović et al., 2015; Narici et al., 2011; Wojtyczek et al., 2014).

In addition to these benefits, alpine skiing can also lead to musculoskeletal injuries, especially in novice skiers who are three times more likely to be injured (AOSSM, 2008). Stenroos and Handolin (2015) in their longitudinal study found that in the largest Finnish ski resort in 6 years there were 1991 injuries, most of which were lower extremities (42%), subsequently upper extremities (34%), head (15%) and spine (6%). Due to the high incidence of injuries among novice skiers, great attention should be paid to learning skiing techniques.

For successful and high quality teaching of ski school students, a ski teacher must have a wide range of motor skills, ski knowledge, methodological and didactic principles of work, and basic psychological approaches to work with people (D Kuna et al., 2018). In addition to the above, a ski teacher must be a good diagnostician and programmer or know how to recognize the mistakes that occur in skiers who adopt and improve their skiing skills and apply appropriate exercises to eliminate them. Of all sensory modalities, visual perception and memory are one of the most important segments in acquisition of new motor information (Gallace & Spence, 2009). This occurs as a consequence of the totality of information that a person incorporates and stores, the most significant percentage receives it through the senses of sight (Hutmacher, 2019).

Video materials have been used as a teaching aid for many years (Hartman, 2007; Ste-Marie et al., 2016). The use of video material in the teaching process enables monitoring, assessment, and correction of motor performances (Kok & van der Kamp, 2018).

While teaching alpine skiers, the visual and audiovisual content of the demonstration of skiing elements can significantly enhance and facilitate the teaching process. The use of video technology is an integral part of the organized field skiing teaching program for kinesiology students, courses for teachers and demonstrators of skiing, and is often used in ski school programs.

Videos of ski performances can facilitate and speed up the process of teaching and improving specific ski skills by enabling skiers to visually present their performances, and with analysis by expert skiers to obtain accurate feedback on structural analysis of performance and correction of characteristic errors.

The traditional way of filming that is most often used in the process of teaching and improving skiing skills, is the 2D display, which characterizes the shooting of skiers moving toward the cameraman standing on the ski slope, while the 3D display using the GoPro 360 max device depicts

skiers in motion and 360 °. Several papers have used this type of medium in their work (Musculus et al., 2021; Yoganathan et al., 2018). Most works utilizing this type of recording use the collected video materials to form virtual reality. It is believed that the use of video technology contributes to the learning of skiing and that the new way of presenting video materials can have a significantly greater impact. No paper yet has studied contribution of new possibilities of video technology in order to help in learning theoretical knowledge related to the structural analysis of ski elements.

The primary goal of this research is to examine the differences between the contributions of the traditional and modern video presentation of skiing elements during their adoption.

METHODOLOGY

Examinees samples

A total of 149 students from the Faculty of Kinesiology in Osijek participated in the research, of which 105 were male and 44 were female, with an average age of 20.5 years. The criteria for inclusion of examinees in the research was that students did not attend skiing classes organized as part of classes at the Faculty of Kinesiology Osijek. Examinees were informed about the reason for conducting the research, which was anonymous, and before accessing it, they gave their voluntary consent to participate. The research was conducted by the current Helsinki Declaration.

Measuring instruments

Two video devices were used in this study. To collect video material in traditional way, a Panasonic LUMIX FZ1000 camera was used. The resolution for traditionally recording video material was 1920 x1080 pixels with 50 frames per second. GoPro 360 max was used to collect video material in a modern way. The recording resolution was set at 3840 x 2160 pixels with 50 frames per second and the camera was placed on a stick when collecting video material.

Sample variables

The sample of variables in this research encompassed the points obtained by the exam and the subjective assessment of the examinees about the usefulness of different ways of video material in the acquisition of ski knowledge. The exam consisted of questions on the structural analysis of the performance of the snow plow turn, the snow plow bow, and the uphill turn. Questions about structural analysis were formed from a part of the written exam that is conducted as part of Skiing which is one of the Mandatory courses on Faculty of Kinesiology in Osijek. All questions were conducted by lecturer in charge of Skiing class who has extensive work experience in the field of testing theoretical and practical skiing knowledge All three skiing elements belong to the group of basic skiing elements and are an integral part of field ski teaching. Example of one question of exam is presented in figure 1.

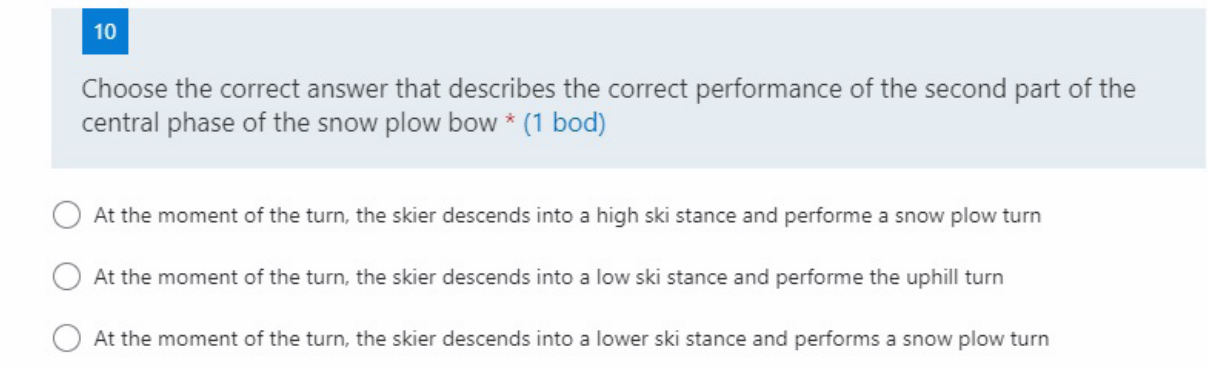

Figure 1. Example of one question about structural analysis

Procedure

In the same snow conditions and on the same ski slopes, performance demonstrations were taken for all three skiing elements in a traditional and modern way. The demonstration of skiing elements was performed by an experienced demonstrator and ski teacher with many years of skiing experience. The traditional way of filming was performed in a way that an experienced cameraman stood in the middle of the ski slope and filmed a demonstrator who performed one skiing element at a time. After filming with Panasonic LUMIX FZ1000 video camera was done, demonstrator took GoPro 360 max and recorded same ski elements. The modern way of filming was performed in a way that the demonstrator held a stick with a GoPro 360 max camera on it while performing the skiing elements. The main difference between these two filming modes is that in the traditional filming mode the demonstrator moved towards the static camera, while in the modern filming mode the camera moved together with the demonstrator.

Tibco Statistica Enterprise (version 14.0.0.15) was used for video editing. After recording, all videos were transferred to the Lenovo IdeaPad L340 (Intel Core i5 9300H processor, 8 GB RAM, and 1920x1080 screen resolution). A Philips 345E2AE/00 external monitor with a resolution of 3400x1440 was used for this research. Video footage recorded with GoPro 360 max was edited in GoPro player which is the official program for editing video footage collected with this camera. After determining the desired part of the video and after processing it, the video materials were exported in MP4 format. The video materials of each element were processed in a way in which they have the same number of turns (4) and duration (15). The uphill turn was the only ski element which was consisted of 1 turn.

Following editing of the video materials, a detailed test to assess the acquisition of ski knowledge with video materials, and through four phases of structural description for all three skiing elements, was entered into the MS teams web form. Students received an invitation by e-mail to participate in the research and were arranged in groups and asked to come and bring their PCs. Each group received an email with a link to access the exam, followed orally by brief instructions for solving the test. At the beginning of the exam, students listened to 10-minute recorded lecture consisting of an audio and visual part with a presentation and description of the structural analysis of skiing elements. The mentioned lecture included a presentation that described the structural analysis of

skiing elements, an auditory explanation, and two videos (one traditionally recorded and the other in a modern way). Afterward, an exam of 12 questions (4 questions per skiing element) followed. When solving the exam, students had the opportunity to use available video materials. Students had 30 minutes to solve questions related to the structural analysis of ski elements with the help of all video materials. After completing the exam, students assessed the usefulness of video material, the difficulty of the exam, the level of their concentration when solving the exam, and the usefulness of video material in the education of beginner skiers.

Data processing

The Shapiro-Wilk W test found that the distribution was not in line with the normal distribution, which is why non-parametric statistics were used to process the data. Basic descriptive parameters: arithmetic mean (M), standard deviation (SD), minimum (Min), and maximum (Max), for each skiing element with the corresponding number of points obtained by the exam, the subjective assessment of, the importance of video material in education and level concentrations while solving the exams of all examinees together and by gender, are shown in Table 1 in percentage values. The scores of the difficulty of the exam ranged from 1 (the exam was very difficult) to 5 (the exam was very easy). Ratings of the importance of the usage of video material in the education of basic skiing elements ranged from 1 (I think that the use of video material is not important in education) to 5 (I think that the use of video material is very important in education). Examinees rated their concentration during the exam with a score of 0 if they could not concentrate at all when solving the exam, to a score of 3 if they could concentrate when solving the exam. The Mann Whitney U test was used to determine gender differences, while the Wilcoxon matched-pairs test was used to identify differences between modern and traditional video collection methods. The statistical significance level was set at $p<0.05$.

RESULTS & DISCUSSION

The vast majority of students, after a short presentation and with the use of video material, achieved a passing score on the exam. These results indicate that the combination of a recorded lecture with the possibility of using video materials was a great help in learning the necessary theoretical knowledge about structural analysis of ski elements. The highest percentage of correct answers was related to the skiing element the uphill turn, while the lowest correct answers were related to the skiing element the snow plow bow. Students were mostly able to maintain concentration while tackling exams they considered to be of medium difficulty. All students find the use of video material useful in teaching basic skiing elements. Most students find videos extremely important for teaching. There was no statistically significant difference between the sexes and the points scored on the exam, the points scored for each skiing element, the difficulty of the exam, the concentration, or the video importance in the skier's instruction.

Table 1. Basic descriptive parameters for all subjects

Variable	All together		Male		Female		p
	N	M ± SD Min–Max	N	M ± SD Min–Max	N	M ± SD Min–Max	
Exam	149	74,16 ± 20,66 16,67–100,00	104	72,94 ± 21,77 16,67–100,00	44	77,08 ± 17,62 25,00–100,00	0,41
Points	149	8,90 ± 2,48 2,00–12,00	104	8,75 ± 2,61 2,00–12,00	44	9,25 ± 2,11 3,00–12,00	0,41
Snow plow turn	149	75,67 ± 26,31 25,00–100,00	104	75,48 ± 26,40 25,00–100,00	44	76,14 ± 26,39 25,00–100,00	0,59
Snow plow bow	149	75,00 ± 27,11 0,00–100,00	104	75,48 ± 27,73 0,00–100,00	44	73,86 ± 25,83 25,00–100,00	0,60
Uphill turn	149	81,04 ± 24,08 0,00–100,00	104	78,81 ± 25,19 0,00–100,00	44	86,36 ± 20,50 25,00–100,00	0,10
Exam difficulty	149	3,21 ± 0,95 1,00–5,00	104	3,22 ± 0,99 1,00–5,00	44	3,18 ± 0,87 1,00–5,00	0,35
Level of concentrations	149	2,10 ± 1,08 0,00–3,00	104	2,15 ± 1,06 0,00–3,00	44	1,98 ± 1,11 0,00–3,00	0,75
The importance of video material	149	4,54 ± 0,72 2,00–5,00	104	4,50 ± 0,77 2,00–5,00	44	4,61 ± 0,58 3,00–5,00	0,88

In comparison with the traditional and modern ways of filming, the students found modern filming more useful when acquiring ski knowledge (p = 0.00). Figure 2 graphically shows the difference between the subjective assessment of the usefulness of traditional and modern methods of recording in the coaching of skiers.

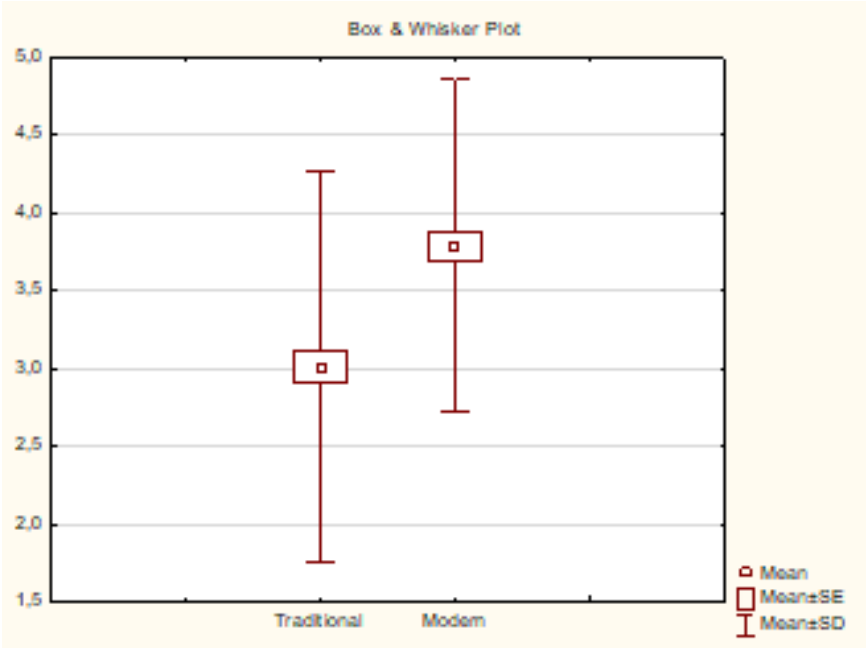

Figure 2. Differences between subjective assessment of the importance of video material in education

A greater benefit of the modern method of recording was found in both male (p = 0.00) and female (p = 0.00) examinees. The statistical significance of the subjective assessment of the usefulness of the traditional (p = 0.38) and modern (p = 0.59) recording video material between male and female examinees was not determined.

The results of this paper indicate that students who did not attend skiing classes and therefore have no notion about skiing and skiing elements, or previous ski knowledge, consider video materials extremely useful for instructing basic skiing elements. The high pass rate on the exam indicates a great contribution to the teaching of skiing elements, and that such a way of transferring knowledge can be great for learning structural analysis of skiing elements. Compared to the traditional and modern way of collecting video material, the modern one proved to be superior. When taking the exam, the students used more video materials recorded with a GoPro 360 camera, and they considered this way of collecting video material to be superior to the traditional one. Gender differences did not exist in any of the observed variables indicating that it was easier for all examinees to perceive the technical segments of each element when the camera moved along with the demonstrator compared to the traditional way in which the demonstrator moved toward a static camera.

This way of theoretical teaching basic skiing elements has proven to be extremely successful, which can result in better quality adoption of basic skiing elements on ski slopes. Combination of traditional way of teaching theoretical ski knowledge with this, modern way, can lead to better transfer of ski knowledge, shorter learning time and increase students' interest in skiing. Accordingly, a better level of adoption of skiing elements would reduce the risk of injuries that are more common in novice skiers (AOSSM, 2008).

CONCLUSION

This research provided innovative scientific knowledge related to the specifics of the education of basic ski knowledge. It has been established that the modern way of displaying basic skiing elements with the help of GoPro 360 ° video material facilitates the process of acquiring ski knowledge, which in the future can improve the entire teaching process of skiing. The obtained results of the study will be able to be practically applied in the programs of the ski school and the seminars for ski teachers and demonstrators. This research provides guidelines for the implementation of future experimental research studies in the training of alpine skiers to obtain the most accurate visual feedback on performance and correction of characteristic errors that occur during the training of alpine skiers.

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