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Increasing the efficiency of motor learning with the help of video analysis

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Abstract

This article deals with the problem of increasing the efficiency in motor learning with the help of video analysis. The text approaches the system providing a feedback in the process of downhill skiing skills acquisition. The platform influencing the movement notion introduces innovative means of the acquisition of essential downhill skiing skills in ski courses organised by the University of Hradec Kralove, the Department of Physical Education (PE) and Sport. This article is focused on the selected results of the survey realised by an enquiring method, which was aimed to find out opinions on a monitored platform among 131 students specialising in PE and sport in 2010–2015. The research results indicate that the use of video analysis in providing feedback has a positive effect on the process of downhill skiing skills acquisition. Positive opinions of the majority of respondents showed that the use of video analysis combined with verbal correction is an effective support within the downhill skiing practice. It is an efficient platform accelerating results in learning downhill skiing technique. However, conclusions also point to some negative aspects that can accompany the use of video analysis in the field of psychology of learning, e.g., feeling of demotivation after the video analysis.

Keywords: Downhill skiing, video analysis, motor learning.

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1. Introduction

The theories of sensorimotor learning, current knowledge and experience of teachers show that motor skill acquisition presupposes systematic teaching process planning. To make the process of acquiring co-ordinate demanding motor skills more effective, there are the following types of sensorimotor learning or their combination: imitative learning – training by imitation of the visual patters, which belongs to the most frequent types of learning, when the movement notion is made by a visual analyser and by a frequent repetition (fixation); instructive learning – training according to the instructions, when the movement notion is based on verbal instructions; feedback learning – training is based on lessons from one's own mistakes, and information provided beyond the terms of mere movement notion, when the most frequently used means is a video record (Linhart, 1982). Such feedback that comes from an external source brings important information, which can improve the quality and success rate of the educational process (Juniu, 2011; Magill, 2001; Schmidt & Lee, 2005; Simatos, 2000; Stratton & Finch 2001).

The use of visual feedback offers improving the efficiency of motor learning, particularly in the first and second phases of motor learning – getting acquainted with the technique of the selected motion, notably based on demonstration and subsequent fixation, realised by a higher number of repetitions in favour of the desired motion pattern (Mekota & Cuberek, 2007). As a means of feedback, it is possible to use a demonstration of good quality straight in the educational process (immediate reflexion) and/or visual documentation by video recording with its subsequent use (presentation and analysis after the practice) with an extension into practical training. The study of Kafkas, Kafkas and Ruzicka (2015) contributed to understand the relative value of visual feedback compared to verbal feedback in motor learning, and it was found out that visual feedback is more effective. In motor learning, Kawasima et al. (2000) also suggested that it is substantial to combine a visual and verbal feedback. Video analysis has been monitored and studied as a significant educational means that can increase motor learning efficiency (Hughes & Barlett, 2002; Pyle & Esslinger, 2013; Raiola, Giugno & Napolitano, 2014; Ronchetti, 2010). The research of Schmidt & Wrisberg (2000) and Watson & Radwan (2001) showed consistently that playing video records as a source of feedback information need not be beneficial. Since the record offers too much information and the student does not know what information to choose as a feedback, it is convenient to use 'cuing' – searching for the key points of a visual record, when the teacher focuses on certain critical points of motion, and thus increases the effect of this type of feedback. The use of video analysis in the process of acquiring motor skills has also a significant effect on motivation and level of concentration on the whole educational process (Coker, Fischman and Oxendine, 2006; Schmidt & Wrisberg 2000; Smith, 2006).

Combination of video analysis (using both visual and verbal analyses) and subsequent realisation of practical training of motor skills can offer a valuable effect in the process of acquiring the selected motor skills both on the level of acquiring essential elements of the followed motion technique and in removing incorrect motion stereotypes.

2. Method

2.1. Layout of the research

Our survey was realised among the students of the Faculty of Education, University of Hradec Kralove, specialising in Physical Education (PE) and sport. They took part in a special form of education – downhill skiing courses in 2010–2015. An enquiring method was carried out, which was aimed to find out opinions on a platform of providing video feedback in the process of motor learning, particularly learning essential downhill skiing skills. The methodological approach of the empirical research is based on quantitative data analysis.

2.2. Respondents of the research

There were 108 students of a bachelor study programme (BA) and 23 students of a master study programme (MA) at the Faculty of Education, University of Hradec Kralove – in total 131 students specialising in PE and sport. There were 36% of girls and 64% of boys, 80% of students specialising in teaching of PE and sport and 20% of students of leisure education specialising in PE and sport.

2.3. Research questions

The following questions were posed to achieve the research goals:

1. How do the respondents evaluate the overall benefit of video analysis for strengthening their own movement notion, as an essential condition for effective downhill skiing technique acquisition and improvement during the course lessons?
2. How do the downhill skiing course graduates evaluate the use of video analysis as a means of motivation to further development of skiing skills?
3. What is the personal impression of downhill skiing course participants, given by skiing technique video analyses of their personal performance?
4. What means of feedback related to video motion analysis do the respondents prefer in the context of subsequent skiing skills development?

2.4. Research structure

The research was conducted in two phases:

1. In the winter seasons of 2010–2015, there were six downhill skiing courses, where the students participated in practical lessons and field video recording, and subsequent group video analysis of essential downhill skiing elements, as a part of evening course sessions.
2. In March 2015, questionnaires were distributed among the course participants and the data were processed.

2.5. Data processing

Data analysis was realised using statistical and logical techniques for description, illustration, discussion and evaluation.

3. Results

Increased demands in acquiring the key downhill skiing skills in the ski courses correspond to the effort of teachers to ensure the students optimal conditions and also provide such forms and means of teaching that enables increasing the efficiency of motor learning. The results of this survey reflect the opinions of graduates of educational ski courses on the use of video analysis, as a significant means of teaching skiing, at the Faculty of Education, University of Hradec Králové, Department of PE and Sport.

The general benefit of strengthening the movement notion by motion video analysis, as a factor to increase the effectivity of the process of acquiring and improving skiing technique, was evaluated within the skiing courses. The participants were graduates in the years 2010–2015, and the evaluation was on the scale 0–10 (0 as non-beneficial; 10 as maximally beneficial). The results were linked to three qualitative groups (Fig. 1).

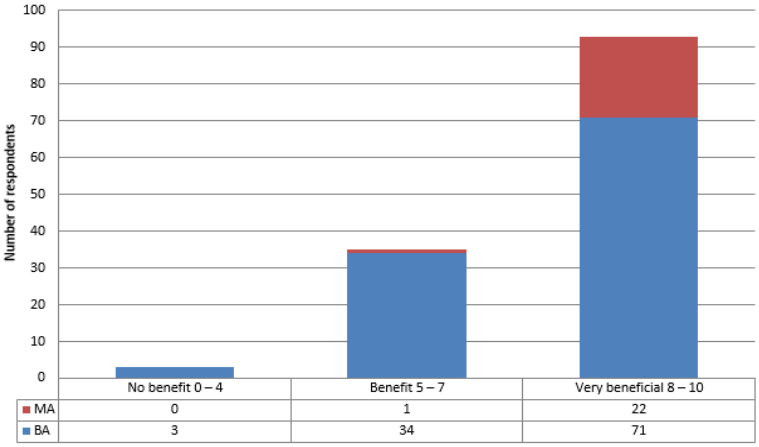

Figure 1. Evaluation of benefit of strengthening the movement notion by video analysis

It can be seen in Figure 1 that only 2.8% of BA students and no MA student, specialising in PE and sport, marked the video analysis of the given downhill skiing skills as 'non-beneficial' (grades 0–4). 31.5% of BA students and 4.3% of MA students regarded the video analysis as personally 'beneficial'. Majority of respondents (65.7% of BA students and 95.7% of MA students) considered the video analysis to be 'very beneficial'. In total, 97.7% of the graduates (BA students & MA students, specialising in PE and sport) expressed a positive opinion on the use of video analysis in the educational process.

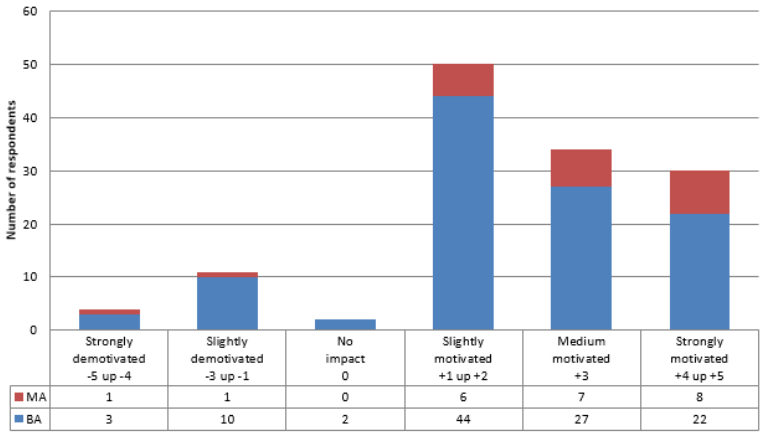

Figure 2. Video analysis as a means of motivation to further development of skiing skills

Figure 2 presents how the graduates of downhill ski courses evaluated the use of video analysis as a means of motivation to further development of skiing skills on the scale of −5 to +5 (the negative extreme of −5 represents maximal demotivation, the value of 0 represents no effect, and the positive extreme of +5 represents maximal motivational effect on the subsequent development of downhill skiing skills). 3.1% of the graduates (2.8% of BA and 4.4% of MA students) felt strongly demotivated. 8.4% of the graduates (9.3% of BA and 4.4% of MA students) felt slightly demotivated. Only 1.5% selected the value of 0 – zero motivational effect. 38.2% of the graduates (40.7% of BA and 26.1% of MA students) felt slightly motivated, and 22.9% of the graduates (20.4% of BA and 34.8% of MA students) felt strongly motivated to further development of their skiing skills. The average value of motivation marked by all the students was 25.9%. All the graduates were students specialising in PE and sport.

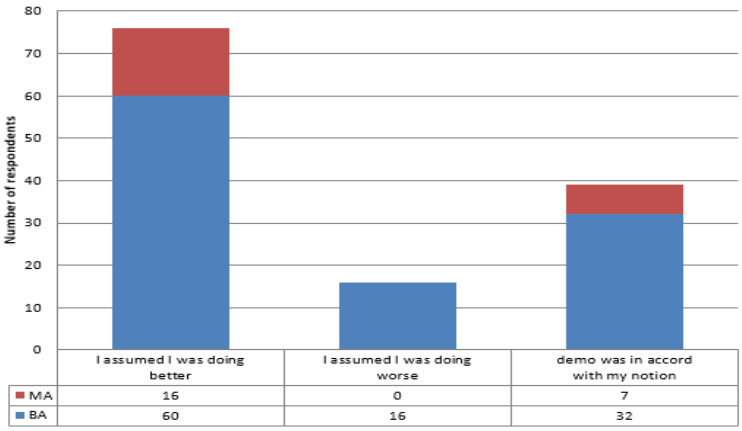

Figure 3. Majority impression of one's personal performance while watching the video analysis of downhill skiing technique

The results concerning the majority impression of one's personal performance while watching the video analysis of downhill skiing technique show (see Fig. 3) that 58.0% of the students (55.6% are of BA and 69.9% are of MA studies) believe that their skiing technique is better than it really is. And vice versa, 12.2% (14.8% of BA and no MA student) underestimated themselves and believed that their skiing technique was worse than it really was. In 29.8% of graduates (29.6% of BA and 30.4% of MA studies), the video analysis did not match to the students' notion.

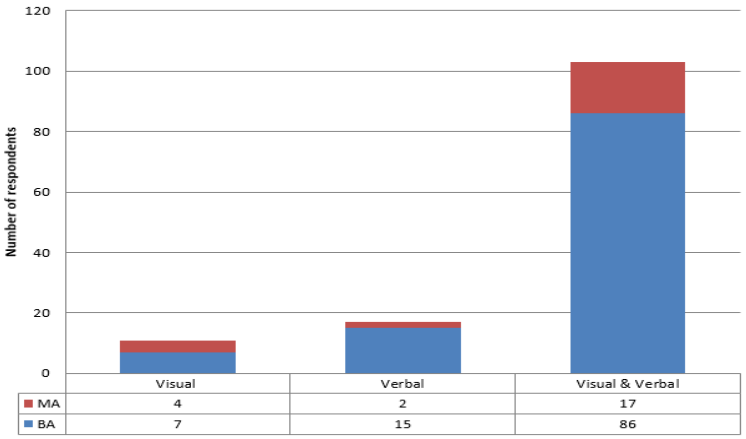

Figure 4. Preferred means of feedback for further development of skiing skills

Figure 4 shows the opinions of the respondents on a preferred means of feedback in relation to the subsequent development of downhill skiing skills within the course lessons. 78.6%, which is a considerable majority of all the respondents (79.6% of BA and 73.9% of MA students), selected visual presentation combined with verbal description of the key points as a preferred means for further development of the desired skiing technique. Minority of respondents preferred separate visual – in total 8.4% (6.5% of BA and 17.4% of MA studies) or separate verbal feedback – in total 13.0% (13.9% of BA and 8.7% of MA studies).

4. Discussion

Downhill skiing is a part of curricula of bachelor (BA) and master (MA) study programmes with specialisation in PE and sport. Practical lessons are implemented within 4-day ski courses and pose a

demanding complex of activities aimed at acquiring essential skiing skills and improving downhill skiing technique. The lessons are realised in blocks, which increases demands on students (intensive educational activities without long-term fixation), along with varying levels of input skiing skills, demands on cognitive processes of individuals, level of fitness and challenging external conditions (snow conditions, uncertain weather conditions, daily regime, etc.). The mentioned reasons are also reflected in the success rate of passing the credit assignments: 44.0% of the participants passed in a regular term in the given academic year, 26.0% in a resit term in the same academic year, whereas 30.0% of the participants (both BA and MA) had to enroll for repeated credit assignments in the following year.

The results of evaluation of improving the movement notion by means of video analysis show a positive response of the participants (see Fig. 1). A vast majority, a total of 97.7% course graduates (BA and MA students specialising in PE and sport), had a positive opinion on using video analysis as a means of education. Only 2.8% of BA students (no MA student) selected separate video analysis of the essential downhill skiing skills as 'non-beneficial'. The results show that the students appreciate video analysis as a useful and convenient means for increasing the efficiency and successfulness of the downhill skiing educational process, namely in the courses (the process of intensive educational activities in a very short period of four training days). The findings are in agreement with Raiola, Giugno & Napolitano (2014). In their research, based on the use of video analysis of one's own motion, combined with verbal analysis, 80.0% of participants improved their movement notion and the technique, which resulted in better motor performance.

The video analysis personally motivated (see Fig. 2) a total of 87.0% of the respondents (86.1% of BA and 91.2% of MA degree, specialising in PE and sport). The findings of this study are supported by the findings of Schmidt & Wrisberg (2000) that there is a significant effect on motivation when using video analysis in motor learning. In the context of the results of individual motivational grades, it is interesting to compare the evaluation of BA and MA students: concerning the effect on motivation for further development, approximately only one-fifth of BA students felt strong motivation, compared to more than one-third of MA students. More than 40% of BA students felt slight motivation compared to approximately one-fourth of MA students. A detailed analysis and discussion of the results may suggest that undergraduate students can use video analysis more effectively, make use of its positive effect, with higher accuracy of their self-estimation and notion and evaluation of their own performance, due to the fact that they had been confronted with video analysis before, in a preceding ski course in the first year. 11.5% of the graduates (BA and MA) felt strongly demotivated by the video analysis of their skiing skills; despite there was a lapse of time between the actual video analysis and the survey. The number is quite high, and the reason can be incomprehension of the value of feedback, lower interest in personal growth or personal aversion to video-recording. About 1.5% of the graduates did not match the video analysis to any personal effect.

A majority of respondents (58.0% of ski courses graduates) believed before the video analysis that the level of acquisition of the monitored downhill skiing skills was higher apart from the reality (see Fig. 3). In a comparison of MA and BA studies, the number was higher in MA students (69.9%) compared to BA students (55.6%). This is slightly surprising, as within the given study programme it was their second ski course with the use of video analysis and they should have expected a similar effect. Concerning the level of their skiing skills, almost 3/4 of MA graduates admitted higher aspiration before the video analysis, which may be explained by carefulness, outspokenness or certain maturity to accept the reality in the undergraduates (fourth grades) compared to the first grades. This can also be supported by the fact that neither of the students selected the option 'I assumed I was doing worse'.

Evaluation of the opinions of the respondents concerning the preferred means of feedback (use of visual, verbal or combined analysis of downhill skiing skills; see Fig. 4), in relation to further development of skiing skills, showed that the most preferred means of feedback was a combination of visual analysis and verbal comments of the key points of the followed skiing technique. The findings of

this study support the research of Campenalla, Mattacola and Kimura (2000) and Kirazci (2013) that both visual and verbal feedback provided at the same time can increase the efficiency of motor learning. Although the study of Rhodes & Anastasia (2012), comparing verbal and visual feedback, reported a slightly higher advantage for the use of visual feedback, in our study there was a slight preference of a separate verbal analysis (13.0% of the respondents), compared to a separate visual analysis (8.4% of the respondents).

General findings of this study demonstrate the importance of an effective inter-connection of the two major components of information transmission (verbal and visual) in the process of sensorimotor learning.

5. Conclusions

The research results indicate that the use of video analysis in providing feedback effectively influences the process of the acquisition of downhill skiing skills. Positive opinions of an overwhelming majority of respondents showed that the use of video analysis, in combination with verbal correction, is an effective support within the downhill skiing practice and it is an efficient platform that accelerates results in learning downhill skiing technique.

Conclusions also point to some of the negative aspects accompanying the use of video analysis in the field of psychology of learning. Such aspect was reflected, e.g., in an increased number of skiing course participants who felt demotivated after the video analysis of their own motoric performance and had to overcome it.

The research results in the selected fields of interest show that motion video analysis is an appropriate support in the process of acquiring essential elements of downhill skiing technique and also in a systematic development of further skiing skills. It can positively influence the quality of the teaching process and help the achievement of better results in downhill skiing course lessons.

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