USING OF DARTFISH VIDEO ANALYSIS IN PHYSICAL EDUCATION

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Abstract

This entry is drawn like exploration of facts. Data was primarily obtained from foreign publications, where I found them at the databases. This entry briefly shows possibilities of using program Dartfish in physical education and in lessons of sports specialization at sport schools. While technology is most often blamed for the decrease in physical activity in our society, technology can also be used to help students develop and refine motor skills. Using of Dartfish video analysis could become a modern way how to teach complex kinetic figures easily. Study of the movements with program Dartfish is an amusement for contempory students and it can urge students to a deep research. This entry can show that learning and retention of motor skills with using of program Dartfish is improved by quantity and quality of feedback during and after execution of such skills.

Introduction

An important tool in extending observational power of human movement is the use of videotape replay, especially a slow-motion replay. Video replay may be most useful in providing information to the analyst that is unavailable to real-time observation. Videotape can capture fast elements of the movement that are unobservable by the naked eye.

Many of the early studies of videotape in teaching motor skills focused on its use as visual feedback. Reviews of these early studies found that video replay used as a feedback to performers is not significantly different from regular practice and teacher-augmented feedback in improving motor skills (Rothstein, 1980). People seeing themselves perform in a videotape replay do not appear to perceive spontaneously important aspects of their movement to improve their performance. Recent studies have begun to show that video replay may have some benefits, due to the observational learning or modeling of the performer's behavior, beyond intrinsic feedback (Knudson and Morrison 2002; Hatten and Christensen, 2008; Harris 2009; Saremi 2010). If the video analysis is used correctly it may have benefits to the qualitative analysis of motor skills (Rothstein, 1980; Knudson and Morrison 2002; Bertram and Marteniuk and Guadagnoli, 2008; Hatten and Christensen, 2008). A major advantage of videotape replay is that it shows high-speed details of the movement that are not available to real-time observation. Video-recorded performances also have a virtually unlimited and slow-motion replay potential to increase observational power. Computer programs can even extend and enhance these replay advantages of the videotape.

1 Aim of this work

Brief prezentation of opinion of the problems concerning the using of the video analysis conducted by program Dartfish in physical education. Data was primarily obtained from foreign publications, because in Czech there was not enough information. It is a summary of accessible relevant piece of knowledge and uptil now carried out research connected with the usage of visual technology in physical education.

2 Methodology of literary background research

I follow a more detailed description using video analysis conducted by program Dartfish in physical education in this literary background research. It was gathered primarily from foreign publications which I searched in the online databases, such as for example PubMed, Ebsco, SportDiscus and other. The key words and combination of the key words which I searched by databases was: Dartfish, motor learning, feedback, video analysis, physical education, visual technology, visual motion analysis, videotape replay. I was also interested in the previous research, which was a view of the dilemma of using visual technology in sports and which were the explored benefits of the video analysis for coaching.

3 Description of the Studied Problem

3.1 Knowledge from different sports

Slow-motion filmography has been used in sports tele-broadcasting since 1939 as a way to examine movement; for years coaches have used film to teach athletes how opposing teams play and how their own team plays. Everything from swimming to golf was filmed in slow-motion to illustrate general technique, but only in the last 20 years technology has really advanced enough to break down movement to show specific actions responsible for overuse injuries or winning form (Saremi, 2010). This trend is perhaps due to the fact that the computer software required to conduct video analysis is becoming evermore cost-effective and user friendly and also new software has been developed, for example Dartfish. Combine this with the lowering costs of digital video equipment and laptop computers, the result is a rapidly emerging opportunity for coaches in all sports to record the performance of their athletes in both the practice and competitive environments (Bertram, Marteniuk, Guadagnoli, 2008).

The body of evidence in the area of video analysis and its effectiveness in motor learning has produced some interesting, even somethimes contradictory, findings. At the oldest research Emmen et al (1985) compared the performances of novice tennis players following training sessions in which certain players had access to video feedback while the others did not. The authors found that after a series of five training sessions, those who received some form of video-mediated instruction showed no advantage in either form or achievement scores over players who had practised without the use of video. In a similar study, Van Wieringen et al. (1989) divided a group of intermediate tennis players into two instructional groups. One of the groups received two practice sessions per week for 5 weeks during which instruction was provided on the tennis serve. The second group was provided with the same amount of practice and instruction; however, their training sessions were supplemented by viewing video replays of their prior serves and discussing them with their instructors. The results of this study showed that while there were improvements in the video training group, the magnitude of the improvements were no greater than that of the individuals that had traditional instruction. Outside the domain of sport, video feedback has also been studied as a means of teaching surgical techniques (Backstein, Agnidis, Sadhu, MacRae, 2005). A recent investigation studied surgical residents who were given practice and expert instruction on a novel surgical procedure. In addition to traditional teaching methods, half of the participants in the study also reviewed videotaped recordings of their practice sessions and were able to discuss them with the instructor. Following a total of nine practice sessions over three weeks, no differences in skill acquisition were found among those who got to review videotaped performances and those who did not.

In contrast, other recent published works have demonstrated that video feedback can significantly improve the learning of motor skills. For example, Guadagnoli et al. (2002) found that skilled golfers who received video feedback during practice did improve the quality (i.e., combined distance and accuracy) of their shots. The improvements were not immediately apparent, but measurable gains in performance were noted when the participants were brought back two weeks following their training sessions (Guadagnoli et al. 2002) Hodges et al. (2003) likewise found favorable evidence for video feedback in a bimanual coordination task. These authors found that people were better able to reproduce a rhythmical upper-limb movement when they combined physical practice with the viewing of video replays after each trial, suggesting that video feedback may provide important timing cues to the learner. While it appears that video feedback can, under certain conditions at least, be of use to the learner, it remains unclear as to precisely how and when it should be implemented. One important reason for this uncertainty is the lack of understanding in exactly what video information affords the learner.

The question of why novice performers do not seem to respond (or respond quickly at least) to video analysis is worth discussing. A possible solution comes from a cornerstone of motor learning theory that the acquisition of a skill happens in stages (Gentile, 2008. During the early stages of learning, the novice performer is experiencing a period of intense cognitive problem solving. Not only are they attempting to understand the goals of the task at hand, but they are also attempting to assimilate all of the internal proprioceptive information that is developing throughout the course of the swing with their own internal reference of correctness. During this time, it would seem wise to ensure that the learner has sufficient time to process even the most elemental features of the skill. This is true for beginners in any skill, but particularly those such as the golf swing that require such precise coordination between so many movement segments with such a minute margin of error. Coaches must be mindful that the novice learner is simultaneously attempting to assimilate a tremendous amount of internal feedback with external instruction coming from the coach – be that in the form of simple demonstrations, instructions, or video replay. In the case of golf and another fundamental movement skills needed for lifetime of physical activity and physical education, this cognitive load is, of course, compounded by the frustration the novice experiences through the perceived task 'failure' in the sense of inconsistent ball contact and flight. With this knowledge in mind, it is perhaps not surprising that heaping video feedback on the learner at this point can be detrimental to the learning process. Afinal word of caution on the topic is that even though we have suggested that verbal feedback is effective for novice performers, the exact nature of the verbal feedback (Goodwin and Meeuwsen, 1995), as well as how often to provide it, must be carefully chosen at this point, and indeed throughout the learning process.

3.2 Visual technology in physical education

One challenge in physical education is using technology in a meaningful way, so that it enhances learning and achieves desired learning outcomes. While technology is most often blamed for the decrease in physical activity in our society, technology can also be used to help students develop and refine motor skills. Research has shown that learning and retention of motor skills is improved by the quantity and quality of feedback during and after the execution of such skills. Unfortunately, our eyes and brains cannot process information fast enough to see all the details associated with quick and complex body movement. The use of video cameras has helped in this area; however, their use within a physical education environment has been limited. Due to innovations in technology, leading-edge motion analysis software such as Dartfish has been developed to analyze movements better. (Harris, 2009). High school, college, and professional coaches, in a variety of sports regularly use videotape analysis to assess, demonstrate, and motivate their players (Siefried, 2005). Over the years other academic disciplines (i.e., science and language arts) have shown that video technology can improve student learning. The use of performance-based assessment (authentic assessment) has been promoted for quite some time in both the academic classroom and the physical education classroom (Lund, 1997). One purpose of using authentic assessment is to measure students' higher-order thinking by having them apply what they have learned in the classroom and analyze it (Doering, 2000). The use of video tape, in combination with program Dartfish, in the assessment and learning process have been promoted by physical education researchers and recently used more often by physical education practitioners (Kimball, 1996). Dartfish is a software program that allows users to upload video into a product that allows one to utilize video in a variety of ways. The software allows users to draw or make comments on the video itself with the integrated drawing tools. The software allows users to have sound integration, frame by frame visualization, categorization of video to more easily access parts of clips, and overlay features that allow for two different clips to be compared side by side. The software also provides users a way to upload video easily to the internet or send by e-mail. (Hatten and Christensen, 2008).

Quality physical education and physical activity programs are critically important in this age of sedentary lifestyles due to technological advances. Physical education specialists delivering meaningful content and appropriate instruction must be the norm in the educational system in order for children or young adults to have a positive physical activity experience that will lead them to a lifetime of physical activity (Masurier and Corbin, 2006). In order for this to take place physical educators must also keep up with the cutting edge technology that may enhance either the end product (student) or the catalyst (teacher) that is providing the learning experiences that will connect to the learner. Technology such as Dartfish, can prove invaluable for students and pre-service teachers in motivating them to expand their understanding of physical activities and elicit higher quality practices (Siefried, 2005). Whatever the content, the use of authentic assessment can prove to be valuable in the documentation of learning in the physical education environment (Doering, 2000). Utilizing video analysis which can be uploaded to the internet can provide a new mechanism to help create opportunities for students to review personal performances for reflection, self-evaluation, and goal setting. A master physical educator will be one that strives to create as many creative learning environments for their students as possible. The utilization of software such as Dartfish in the short term, allows students to better analyze their performance. In the long term, for those that strive to become physical education specialists, the evolving technology will prove invaluable in their evolution as a master teacher of physical education. The authors Hatten and Christensen (2008) recommend that anyone interested in providing their student's meaningful learning experiences to consider utilizing software such as Dartfish to aid them in the analysis of movement.

In observing several physical education classes and collecting feedback from the teachers and students, it became evident that Dartfish allowed teachers to move from a traditional behaviourist teaching approach to a constructivist approach and to create an environment where students can be active learners (Harris, 2009). Upon viewing the Dartfish creations, the athletes immediately began to ask questions and analyze their own movement. Upon questioning them on the value of such a tool in coaching, they all agreed that it would be a critical tool in analyzing and teaching sport skills (Hatten and Christensen, 2008).

3.3 The evolution of slow-motion

High-speed photography is more sophisticated than just speeding up the camera or slowing down the projector. For example, instant replay is not the same as StroMotion from Dartfish because with instant replay, normally recorded footage is replayed at a slower speed. Also known as high-speed imaging, slow-motion (or freeze motion) videography depends on the way a camera captures a single image on a frame of video and then advances to the next frame. Without getting too technical, the development of video technology and specialized cameras provides another tool for slow-motion capture analysis. We can use a Casio® EXILIM EX-FH25 high-speed digital camera, which captures 1,200 frames per second. This digital camera isn't expensive, cost approximately only 9000 Kč (360 €) presently. Standard videos capture 30 frames per second; high-speed imaging captures 500 frames per second. Therefore, standard speed video shows 1,800 frames for one minute of activity; high-speed video shows 30,000 frames for one minute of activity. When the high-speed video is slowed down and viewed at 30 frames per second, you see a smooth continuous breakdown of the motion, as it occurred, within milliseconds. This is the benefit of using a high-speed camera instead of slow-motion video filmed on a standard camcorder. The fastest motion analyzer in existence today provides 7,000 full-resolution frames per second.

3.4 The rise of Dartfish

SimulCam technology, developed in Switzerland by Dartfish (then known as InMotion Technologies, Ltd.), was first used for televised sports in 1999 as a distal imaging enhancement. After the 2000 Summer Olympics, where Dartfish was used by NBC, the U.S. Olympic Committee quickly realized the value of such technology in training athletes and partnered with Dartfish to develop video training programs for member associations. StroMotion, launched in 2001, allowed users like ABC and ESPN to analyze movement digitally, frame by frame. According to the developers, it "summarizes in one single picture, the different phases of an athletic movement," to see details never before available to the public. Other advances, such as the one bought by Fox TV, included the "ball tail effect," where StroMotion was used on the ball to show spectators the different throws made by pitchers. By 2004, 30 percent of all athletes in the Summer Olympics employed sports analysis software during training. In 2006, approximately 60 percent of all Olympic competitors used Dartfish software to analyze movement, and the National Collegiate Athletic Association, U.S.A., selected Dartfish as their official software supplier. Now Dartfish and other software companies offer high definition video and imaging devices, available worldwide for media broadcasters and athletic corporations alike. Computer analysis of digitally captured motion is the wave of the future for all trainers and therapists in diagnosing and retraining their clients.

Conclusion

Visual technology and using Dartfish video analysis have a powerful impact on the learning environment, it engage students in the learning process, encourage higher-order thinking skills and be meaningful to the students. A quality physical education program allows students to develop fundamental movement skills needed for a lifetime of physical activity and also provides learning experiences that encourage students to question, analyze, reflect, communicate, and apply theories and concepts to motor skill development. The right using Dartfish video analysis and another visual technology have to respect cornerstones of motor learning theory. Very important is to know when use and not to use video analysis in physical education. For the novice is video analysis suitable only like inspiration, abreaction and like motivation. For the advanced students and athletes have video analysis great meaning in the area of timing of motion.

"SEE. LEARN. SUCCEED." These three words represent the philosophy and values behind Dartfish. If, in our physical education classes, students can become better observers of movement and understand the theories and concepts of movement, they will develop better movement skills. In turn, these students will have the skills and confidence needed to lead physically active lifestyles (Harris, 2009).

Acknowledgements

The project was supported by Czech Republic´s Ministry of Education, Youth and Physical Education MSM 0021620864.

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VYUŽITÍ VIDEOANALÝZY ZPRACOVANÉ POMOCÍ PROGRAMU DARTFISH V HODINÁCH TĚLESNÉ VÝCHOVY

Tento příspěvek je koncipován jako rešeršní studie. Data pro tuto studii byla získána zejména ze zahraničních publikací. Publikace byly vyhledávány převážně pomocí internetových databází. Příspěvek stručně ukazuje možnosti využití programu Dartfish ve školní tělesné výchově a v lekcích sportovních specializací na sportovních školách. Zatímco je technologie často obviňována za pokles fyzické aktivity v naší společnosti, může také pomoci studentům rozvíjet a zkvalitnit jejich motorické dovednosti. Využívání videoanalýzy zpracované pomocí programu Dartfish se může stát moderní metodou, jak se snadno a rychle naučit složité pohybové vzorce. Studování pohybu s programem Dartfish se pro současné studenty stává zábavou a může podnítit studenty k podrobnějšímu zkoumání pohybu. Tento příspěvek ukazuje, že učení a uchovávání motorických dovedností se při využití programu Dartfish zlepšuje s kvantitou a kvalitou zpětnovazebných informací během a po skončení daného cvičení.

VERWENDUNG EINER MIT HILFE DES PROGRAMMS DARTFISH ERARBEITETEN VIDEOANALYSE IM SPORTUNTERRICHT

Dieser Beitrag ist als Recherchestudie konzipiert. Die Daten für diese Studie wurden vorwiegend aus ausländischen Publikationen gewonnen. Die Publikationen wurden hauptsächlich mit Hilfe von Internetdatenbanken herausgesucht. Der Beitrag zeigt kurz die Möglichkeiten der Nutzung des Programms Dartfish im Sportunterricht und in den Lektionen der sportlichen Spezialisierung an Sportschulen. Während der Technologie oft die Schuld am Rückgang der körperlichen Aktivität in unserer Gesellschaft gegeben wird, kann sie Schülern auch helfen, ihre motorische Geschicklichkeit zu entwickeln und zu verbessern. Die Verwendung der mit Hilfe des Programms Dartfish erarbeiteten Videoanalyse kann ein modernes Verfahren werden, wie man leicht und schnell komplizierte Bewegungsmuster lernt. Das Studieren der Bewegung mit dem Programm Dartfish wird den heutigen Schülern Spaß machen und kann sie zu einer ausführlicheren Erforschung von Bewegungen anregen. Dieser Beitrag zeigt, dass sich das Lernen und Beibehalten der motorischen Geschicklichkeiten bei der Verwendung des Programms Dartfish mit der Quantität und der Qualität der Rückkopplungsinformationen während und nach dem Ende der betreffenden Übung verbessert.

WYKORZYSTANIE ANALIZY WIDEO OPRACOWANEJ PRZY POMOCY PROGRAMU DARTFISH NA LEKCJACH WYCHOWANIA FIZYCZNEGO

Niniejszy artykuł ma charakter opracowania przeglądowego. Dane do opracowania pozyskano przede wszystkim z literatury zagranicznej. Publikacji wyszukiwano przede wszystkim przy pomocy internetowych baz danych. Artykuł zwięźle przedstawia możliwości wykorzystania programu Dartfisch na szkolnych lekcjach wychowania fizycznego oraz na zajęciach specjalizacji sportowych w szkołach o profilu sportowym. Chociaż postępowi techniki często przypisywana jest przyczyna obniżenia aktywności fizycznej w naszym społeczeństwie, to może także studentom pomóc w rozwijaniu i doskonaleniu ich zdolności motorycznych. Wykorzystanie analizy wideo opracowanej przy pomocy programu Dartfisch może stać się nowoczesną metodą łatwego i szybkiego uczenia się skomplikowanych wzorców ruchowych. Studiowanie ruchu z programem Dartfish staje się dla współczesnych studentów zabawą, mogąc ich zachęcać do bardziej szczegółowego analizowania ruchu. Niniejszy artykuł pokazuje, iż uczenie się i utrzymanie umiejętności motorycznych przy wykorzystaniu programu Dartfisch poprawia się wraz z jakością i ilością zwrotnych informacji otrzymywanych w trakcie i po zakończeniu danego ćwiczenia.