Video analysis and video feedback in tennis: Using mobile devices to benefit digital teaching and learning

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ABSTRACT

Video analysis and feedback, especially through the use of mobile learning devices (MLDs), has established itself as a principal coaching instrument in the coaching toolkit. It provides an excellent source of information to learners about their movement, and when used effectively can speed up motor learning. This article provides recommendations on the use of video analysis and feedback based on research on the field of skill acquisition. It also provides a breakdown on the applications and features available in the market.

INTRODUCTION

Mobile learning devices (MLDs) like tablets or smartphones are used ever more frequently in daily life as well as in tennis practice. Video analyses and video feedback are only two of the possible application, and are highly effective didactic instruments in controlling movements in general as well as tennis technique performance in particular (Mohnsen, 2010). The primary goal of video analyses within motor learning processes is to speed the process up, optimize it, as well as make it more effective (Olivier, Rockmann & Krause, 2013). There are various opportunities to apply video analysis in tennis practice, depending on the availability of resources and technical devices (e.g. smartphone, tablet). The two most important opportunities for tennis coaches are video analyses outside of the practice court (record video on court · analyse off court) and direct video feedback on court (recording video on court · immediate feedback for the players). In general the use of video analyses is establishing itself more and more as a feedback method besides traditional ways like verbal feedback or tactile corrections (Mohnsen, 2010). Within the feedback loop, video analyses can be a big help in the targetperformance comparison (Olivier, Rockmann & Krause, 2013). Coaches who use video analysis, including video feedback for the player, (e.g. player sees oneself on the video) have to bear in mind that motor learning (e.g. technique learning) is based on implicit and explicit learning processes and that seeing oneself perform excludes implicit learning.

IMPORTANT FACTORS FOR AN EFFICIENT USE

The efficiency of using video feedback as well as video analyses is determined by several factors.

The perspective of the video footage should guarantee that either the whole movement or a specific part of the movement (to be analysed) can be observed. In addition to that, possible sources of errors should be recognizable. Most of the tennis techniques (e.g. serve, forehand or backhand) should be captured preferably either from the side (see picture 1) or the back (camera is behind the court). Videos from the back show the rotation effort of the player, while watching the movement. To capture the whole movement, the camera has to be a sufficient distance away from the player.

The content of feedback is crucial for the learning process of the player. Mainly negative feedback in the training process is beneficial for short-term error correction but is disadvantageously for long-term learning and automation. In contrast, mainly positive feedback is beneficial for the long-term motor learning of the player amongst other things through the secretion of the "happiness hormone" dopamine (Glimcher, 2011).

Figure 1. Possible camera perspective to capture the forehand stroke.

Furthermore, research has shown that timing and frequency of feedback have a noticeable effect on the learning process (Marschall, Bund & Wiemeyer, 2007). Similar to the use of negative feedback, giving a lot of feedback (high frequency) seems to be more beneficial in the short-term than giving less feedback (e.g. 33% of the feedback). However, from a long-term perspective, less feedback is more effective since the players learn to solve problems by themselves better and are able to keep the amount of errors low in long-term, even though it may take them longer in the beginning.
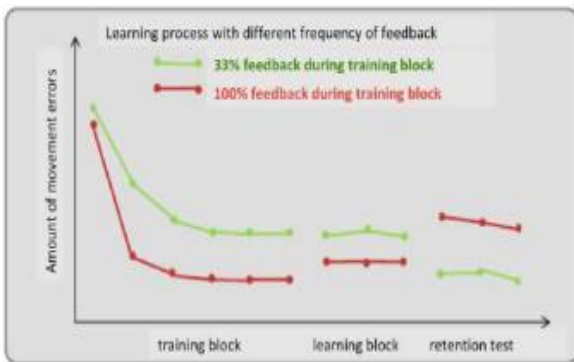

Figure 2. Amount of movement errors over time as a result of either high or low feedback frequency (Marschall, Bund & Wiemeyer, 2007).

Last but not least the timing of feedback is crucial (Olivier, Rockmann & Krause, 2013). When giving (visual/video) feedback, coaches have to keep in mind that the player needs some time to process their movement. At the same time the information about the own movement fades after a certain time. Research has shown that the best time window for coach feedback is between 5 and 30 seconds after the movement. Of equal importance is the timing between the feedback and the next movement of the player. The player again needs time to process the coach's feedback (min. 5 seconds) and needs the possibility to implement it in one's movement after a maximum of 120 seconds.
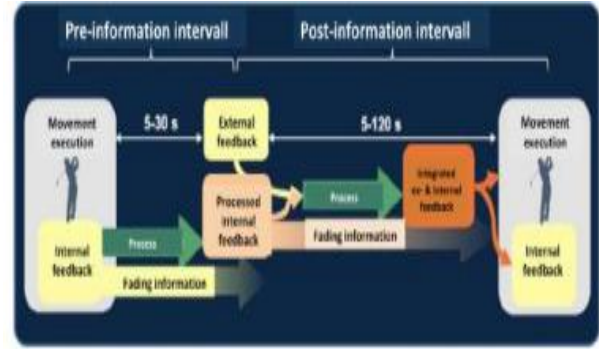

Figure 3. Timing of feedback (Olivier, Rockmann & Krause, 2013).

PRACTICAL APPLICATION

Coaches should never use MLDs for e.g. video analyses and/ or feedback without a purpose or objective. The objective of the practice session should always be the main focus. Video analyses and/or video feedback are highly effective additional tools when used in the right way. Within a practice session coaches should always keep the time in mind. The use of MLD should not consume too much practice time but should rather be embedded in the training (Born et al., 2017). Longer analysis should be done off court immediately before or after a training session.
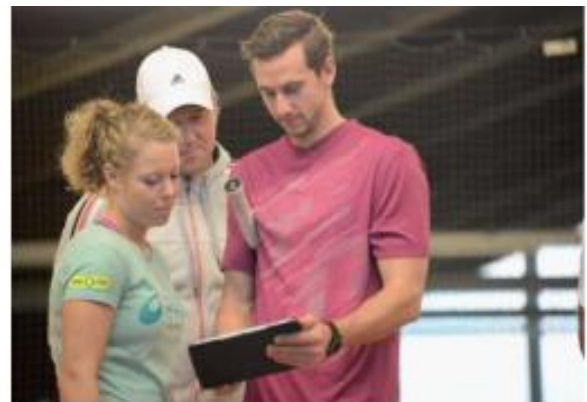

Figure 4. Coach and players gathering around a tablet for video analysis.

There are several applications available for tablets and smartphones that can support and enhance video analyses and feedback like "Coaches Eye" or "Hudl Technique". Both have a very good slow-motion function and coaches can draw, point out and highlight whatever they want by using several features of the applications. In addition, videos can be compared in a split-screen and/or overlay mode. Of all available applications the "Tennis Australia Technique App" (TATA) stands out as it has all of the above features and a variety of prefabricated videos for all age groups. Another very helpful feature in the TATA is the "Preview Delay". The coach may set a delay of 5 to 200 seconds. This feature allows the players to see their

movement techniques immediately after having performed (e.g. player hits 6 forehands, runs to the tablet/smartphone and watches his forehands before playing another set of forehands).

Figure 5. Possible set up of the MLD behind the serving players.

CONCLUSION

The use of MLDs and video analysis is widespread, and the technology has established itself as a legitimate coaching tool. With only more and more use of the technology to be expected, and given the technological era that we live in, recommendations and guidelines for best practice should be established. Research has shown that very regular feedback can improve short-term performance but at the expense of long-term performance, whereas less regular feedback can improve performance longterm but at the expense of short-term performance; it is therefore up to coaches to keep this in mind when designing sessions and implementing video analysis and feedback. Video analysis should also take into account the goals of the session (there should be specific goals related to the video analysis), and the recording should show the key elements of the movement; thus, careful decisions need to be made about positioning the camera to the side/behind the player, the distance from the player, and other elements such as slow-motion and angles. Finally, there are a number of apps which enhance the experience such as 'Coaches Eye', 'Hudl Technique' or 'Tennis Australia Technique App' which offer split screens and overlays where technique

can be compared to models, or annotated.

REFERENCIAS

Born et al. (2017), Embedding tennis-specific teaching videos into long-term educational concepts to improve movement learning and technique performances. Journal of Physical Education and Sport, 18 (1), Art 34, pp. 255 - 261, Deutscher Tennis Bund (2018): https://dtb.campus.tennisgate.com

Glimcher, P. W. (2011). Understanding dopamine and reinforcement learning: the dopamine reward prediction error hypothesis. Proceedings of the National Academy of Sciences, 108(Supplement 3), 15647-15654. https://doi.org/10.1073/pnas.1014269108

Marschall, F., Bund, A., & Wiemeyer, J. (2007). Does frequent augmented feedback really degrade learning? A meta-analysis. Bewegung und Training, 1, 75-86.

Mohnsen, B. S. (2010). Using Technology in Physical Education. 7th edition. Big Bear Lake, CA: Bonnie's Fitware.

Olivier, N., Rockmann, U., & Krause, D. (2013). Grundlagen der Bewegungswissenschaft und –lehre (2. Aufl.). Schorndorf: Hofmann.

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