Human Movement Science 57 (2018) 194–204

Contents lists available at ScienceDirect

Human Movement Science

journal homepage: www.elsevier.com/locate/humov

Full Length Article

Self-controlled video feedback on tactical skills for soccer teams results in more active involvement of players

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ARTICLE INFO

Keywords:
Self-control
Video feedback
Decision making

ABSTRACT

Many studies have shown that self-controlled feedback is beneficial for learning motor tasks, and that learners prefer to receive feedback after supposedly good trials. However, to date all studies conducted on self-controlled learning have used individual tasks and mainly relatively simple skills. Therefore, the aim of this study was to examine self-controlled feedback on tactical skills in small-sided soccer games. Highly talented youth soccer players were assigned to a self-control or yoked group and received video feedback on their offensive performance in 3 vs. 2 small-sided games. The results showed that the self-control group requested feedback mostly after good trials, that is, after they scored a goal. In addition, the perceived performance of the self-control group was higher on feedback than on no-feedback trials. Analyses of the conversations around the video feedback revealed that the players and coach discussed good and poor elements of performance and how to improve it. Although the coach had a major role in these conversations, the players of the self-control group spoke more and showed more initiative compared to the yoked group. The results revealed no significant beneficial effect of self-controlled feedback on performance as judged by the coach. Overall, the findings suggest that in such a complex situation as small-sided soccer games, self-controlled feedback is used both to confirm correct performance elements and to determine and correct errors, and that self-controlled learning stimulates the involvement of the learner in the learning process.

1. Introduction

Allowing learners to control (some) features of their own learning process enhances motor skill acquisition (for a review see Wulf, 2007). For example, conditions in which learners are able to decide upon the use of physical assistance devices (Hartman, 2007; Wulf, Clauss, Shea, & Whitacre, 2001; Wulf & Toole, 1999), the amount of practice (Post, 2011), task scheduling (Keetch & Lee, 2007; Wu & Magill, 2011), video demonstration (Wrisberg & Pein, 2002; Wulf, Raupach, & Pfeiffer, 2005), or augmented feedback (Chiviacowsky & Wulf, 2002, 2005; Chiviacowsky, Wulf, De Medeiros, Keafer, & Tani, 2008; Janelle, Kim, & Singer, 1995) have been shown to result in superior performance compared to externally controlled conditions. Especially self-controlled feedback has been proven to be effective in a variety of tasks, including throwing tasks (Chiviacowsky et al., 2008; Janelle, Barba, Frehlich, Tennant, & Cauraugh, 1997), sequential timing tasks (Chen, Hendrick, & Lidor, 2002; Chiviacowsky & Wulf, 2002), and more complex technical tasks like the basketball set shot or trampoline jumping (Aiken, Fairbrother, & Post, 2012; Ste-Marie, Vertes, Law, & Rymal, 2013). The effects

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https://doi.org/10.1016/j.humov.2017.12.005
Received 7 September 2017; Received in revised form 15 November 2017; Accepted 7 December 2017
0167-9457/

of self-controlled feedback have typically been assessed by comparing the performances of self-control groups to yoked groups that could not control feedback delivery, but instead received feedback each time the matched participant of the self-control group requested feedback. Thus, even though the frequency and timing of feedback was identical for both groups, learners who were able to control feedback delivery generally performed better than those with an externally controlled (yoked) feedback schedule.

Using this design, the effects of self-controlled video feedback were first examined on learning a relatively simple motor task: a non-dominant hand ball throw (Janelle et al., 1997). Whenever requested, participants of the self-controlled video feedback group received video feedback on the last two trials with additional cueing and transitional suggestions by an expert. The self-controlled group demonstrated better throwing accuracy and form scores than the yoked group. Similar beneficial effects of self-controlled video feedback have been found for learning the basketball set shot (Aiken et al., 2012) and double mini-trampoline skills (Ste-Marie et al., 2013). Interestingly, self-controlled learners decrease the feedback requests across the acquisition period (Chiviacowsky & Wulf, 2002; Janelle et al., 1997; Laughlin et al., 2015; Ste-Marie et al., 2013). For example, when learning the basketball set shot the percentage of feedback requests was highest during the first practice block (33%) and decreased as practice progressed through the last block (19%; Aiken et al., 2012).

Examination of when self-controlled learners request feedback when learning a sequential timing task using questionnaires revealed that the majority requested feedback after perceived good trials while no one requested feedback after supposedly bad trials (Chiviacowsky & Wulf, 2002). The yoked learners, with no control over their feedback schedule, mainly reported that they did not receive feedback after the right trials and most of them would have preferred feedback after good trials. Moreover, on average, the timing errors were lower on trials for which the self-controlled learners requested feedback compared to the trials for which they did not request feedback, whereas the timing errors of yoked participants were similar for feedback and no-feedback trials. This demonstrated that the participants were quite good at estimating their errors, distinguishing good from bad trials, and that the participants had a clear preference for receiving feedback after good trials. This latter finding has been replicated in several studies (Chiviacowsky, Wulf, Wally, & Borges, 2009; Chiviacowsky et al., 2008; Patterson & Carter, 2010). Furthermore, it has been shown that feedback after relatively good trials is more effective than after relatively poor trials (Badami, VaezMousavi, Wulf, & Namazizadeh, 2012; Chiviacowsky & Wulf, 2007; Saemi, Porter, Ghotbi-Varzaneh, Zarghami, & Maleki, 2012). Receiving feedback after relatively good trials might create a larger success experience for the learner, which increases motivation which in turn enhances learning (Chiviacowsky & Wulf, 2007). This is, however, in contrast to the guiding hypothesis, which states that feedback is particularly important after poor trials to guide the learner to the correct performance (Salmoni, Schmidt, & Walter, 1984).

More recent studies suggest that the feedback preferences of self-controlled learners depend on the nature of the task and the mode of feedback delivery (Laughlin et al., 2015; Post, Aiken, Laughlin, & Fairbrother, 2016). The majority of studies showing a preference for feedback after good trials involved learning a relatively simple motor task in a laboratory setting (i.e., sequential timing or beanbag tossing) and straightforward feedback on one single aspect of performance (i.e., timing error or radial error; Chiviacowsky & Wulf, 2002; Chiviacowsky et al., 2008, 2009; Patterson & Carter, 2010). However, this preference for feedback after good trials was not found in studies using more complex motor tasks and more information-rich sources of feedback. For example, basketball players learning a set-shot requested video feedback after both good and poor trials (Aiken et al., 2012). In simple tasks the entire trial can be perceived as good or poor, while this is not the case for more complex tasks. Learners could request feedback to review good aspects of a poor trial or poor aspects of a good trial. Similarly, in contrast to feedback on one single performance aspect such as radial error, video feedback allows learners to identify both good and poor aspects of their performance on any trial. For example, when learning a 3-ball cascade juggling task participants requested feedback on the duration of the juggling attempt primarily after good attempts, while they requested feedback on their technique after both good and poor attempts (Laughlin et al., 2015). Post-experiment interviews demonstrated that participants requested feedback both to confirm success and to correct performance aspects. Thus, the complexity of the task and the information-richness of the feedback source seem to influence the feedback preferences of self-controlled learners.

The reasons underlying the beneficial effects of self-controlled learning are not well understood (Post et al., 2016). Allowing the learner to control the learning process may result in better tailoring to the personal needs of the learner (Chiviacowsky & Wulf, 2002, 2005, 2007), or may be more motivating in general (Bandura, 1993; Chiviacowsky & Wulf, 2005; McNevin, Wulf, & Carlson, 2000; Wulf et al., 2005). It has also been suggested that allowing learners to control (some features of) the learning environment satisfies a basic psychological need (autonomy; Deci & Ryan, 2000), and in addition encourages learners to take charge of their own learning process (Ferrari, 1996; Janelle et al., 1997; Wulf & Lewthwaite, 2016; Wulf et al., 2001). This stimulates (i) intrinsic motivation (Sanli, Patterson, Bray, & Lee, 2013), (ii) deeper processing of relevant information (Janelle et al., 1997), (iii) error estimation (Chiviacowsky & Wulf, 2005), and (iv) the use of self-regulation strategies (Kirschenbaum, 1984). Thus, self-controlled learners use self-regulatory processes to more actively search for, choose, and evaluate the correct motor solution (Wu & Magill, 2011), trying various movement strategies to a greater extent than those without self-control (Wulf & Toole, 1999). This more active involvement results in enhanced learning and performance (Zimmerman, 1989). One way to gain insight into the learner's involvement in the learning process might be through the examination of the conversations between learner and instructor during the feedback sessions.

To date, all studies conducted on self-controlled learning have used individual tasks. Whether self-controlled video feedback is also beneficial for learning complex skills that involve multiple persons, such as tactical skills in invasion games, has yet to be determined. The preferences for feedback after good or poor trials in such tasks are not clear yet, nor whether self-controlled learning stimulates the learners' involvement in their own learning process. The aim of this study was to examine the effects of self-controlled video feedback on tactical skills in soccer teams. Highly talented youth soccer players were assigned to a self-control or yoked group, and received video feedback on their offensive performance in 3 vs. 2 small-sided games. The conversations between the players and coach while watching the video feedback were recorded and transcribed to examine the role of the players and the coach, and to