Video Self-model Training of Punt Kicking

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Differences in skill performance associated with side preference are observed in sports codes where an equivalent level of performance by both limbs is desired. In Australian Rules Football, some players can achieve long, accurate kicks with either foot, but other players typically have significant discrepancies between kicking sides. To improve punt kicking for distance and accuracy, video self-model training was applied to kicks made with the non-preferred foot, using the feedforward method. To show players performing at a level they could not currently achieve with their non-preferred foot, video of self was made with preferred foot kicks mirror-reversed and watched by the participants. Kicks made for distance showed an improvement in relative side-to-side performance from pretest to post-test, that continued at the retention test.

Keywords: kicking, non-preferred foot, Australian Rules Football, video self-modeling

1. Introduction

Video-Self-Modeling (VSM) involves observational learning where the video images that are viewed are the best performances that the individual has produced (Dowrick, 1999). The behavior instances selected for VSM may last for milliseconds (Coulson et al., 2006), seconds (Clark et al., 2006) or minutes (Dowrick and Raeburn, 1995). The positive effects obtained with self-modeling have been variously interpreted as arising from enhanced self-efficacy (Dowrick, 1999), improved self-regulatory, motivational and attention processes (Starek and McCullagh, 1999), and priming of mirror neuron action (Rizzolatti and Sinigaglia, 2008). Both ‘feedback’ and ‘feedforward’ applications of self-modeling can be applied with respect to a particular movement sequence (Dowrick, 1999). Where feedback shows performance that has been produced, feedforward shows images of future success. This means that the learner observes video of themselves performing at a level which is forward of their current capability.

In invasion ball games nominally requiring bilateral motor skills, players may still be observed to demonstrate a side preference and lower-level performance on their non-preferred side (Grouios, 2004). Therefore mirror reversal of preferred-side skills would permit the construction of a feedforward self-model tape for the non-preferred side, whereby the individual could observe themselves producing a skill with their non-preferred limb at a performance level beyond that which they could normally achieve. Previously, this method has been utilised to train non-preferred side short kicks, with Australian Rules Football (ARF) players (Steel et al., 2013). In ARF, kicking for goal may be required from close or far positions that require use of the left or right foot; however, few players are able to achieve the needed accuracy and distance with both feet. To enable data collection indoors in a gymnasium, the previous study used a short punt-kick (15 m to 25 m), rather than the longer kick (50 m or more) that is often used in ARF. Although no significant change in accuracy was obtained, the VSM training resulted in an improvement in the motor pattern used for the non-preferred kicking side. Because short kicks require speed and accuracy, players use a stabbing leg action rather than the high follow-through used when kicking for distance. However, enclosed spaces are not suitable for studying long kicking, or typical of the outdoor environment in which the ARF game is usually played. Therefore, the purpose of the present study was to apply the self-model method in an outdoor context, examining the effects of self-modeling when applied to long kicks on the non-preferred side with two ARF play-
ers. As in the Steel et al. (2013) study, the performance level of the preferred foot provided a control, since any change in non-preferred foot kicking performance can be assessed relative to preferred foot performance by calculating the ratio of non-preferred foot to preferred foot kick distances.

2. Methods

2.1. Participants

Two Australian Rules Football (ARF) players, aged 19 and 25 years, volunteered to take part in the study. Both participants were current players in the Sydney metropolitan competition. Ethics approval for the study was obtained from the University Human Research Ethics Committee and participants gave written informed consent.

2.2. Test Setting and Procedure

Testing was conducted after the completion of the competition season in which the players participated. Testing was conducted on an ARF oval. The testing setup comprised three digital video cameras and target goal posts placed 50 metres from the kicking point (Figure 1). A video camera was placed directly in front of the kicker at 10 metres from the ball contact point, and additional video cameras were placed to each side of the kicking line. The participants, who were both right foot dominant, were instructed to kick a standard sized ARF ball as accurately and as far as possible toward a target of two goal posts placed 50 metres away. The posts defined a region that was 6.4 metres across, the standard width between ARF goal posts. A total of 24 kicks were performed by each participant, 12 with each foot. For each participant, kicks with the right or left foot were randomly allocated, and ‘right’ or ‘left’ was called out to the participant before he began his approach. After each kick, one participant rested while the other participant performed their next designated kick.

2.3. Training Video-Clip Editing

The front-on camera gave the most complete view of the kicking action, so the video footage from this camera was mirror reversed, or ‘horizontally flipped’, and edited into a video training sequence using Adobe Premier Pro CS3 software (Adobe Systems Inc.). The sequence was then recorded onto a DVD for each player to observe for self-model training. The individual DVDs contained footage of that player’s three best right foot kicks selected using the Ball (2008) criteria. These right foot kicks were mirror reversed, and thus displayed apparent left foot kicks (Figure 2). There were no salient features in the bushes and trees that made up the background to the shot, or on the clothing of the players, to suggest that this reversal had occurred. Each mirror-reversed clip was recorded twice on the DVD and the six kicks formed a sequence lasting one minute. Fade transition was used between clips.

2.4. Training Procedure

For self-model training, the participants were instructed to watch their DVD three times a day (morning, afternoon and evening) for two weeks, after which a post-test was conducted, with a retention-test completed six weeks after the post-test. Each session of viewing was recorded in a training diary that was collected at the end of the two-week training intervention. Participants were told that the purpose of the research was to investigate self-
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modeling for kicking for distance with the non-preferred foot, that they would be watching their own kicks, and that they should maintain their current ARF training program with the self-model DVD as the only addition.

2.5. Analysis

Within the sequence of 24 kicks at each test, the ratio of preferred to non-preferred kick distance for adjacent 12 Left-Right pairs was calculated, and contrast tests for linear and quadratic trend across sessions were conducted within repeated-measures analysis of variance.

3. Results

Both participants were right foot dominant and demonstrated a significant right foot over left foot advantage for kick distance at the pre-test. The same longest kick distance of 51 metres from a right foot kick was recorded by both players at pre-test. The pre-test preferred-over-non-preferred foot kick distance advantage was 13 metres for player 1 and 3 metres for player 2, and paired-samples t-tests showed these to be significant, with \( p < 0.01 \) and \( p = 0.02 \) respectively.

Testing was conducted on mornings, over 8 weeks in summer, and the air temperature and humidity on test days rose from pre-test to post-test to retention test. Because football kick distance is affected by weather conditions and players were striving for maximum kick distance with each foot in the same air conditions on a given test day, data were analyzed using the left foot distance converted to a proportion of the distance kicked on the preferred right foot. The mean kick distances for Player 1 were 34.4 m (left) and 47.1 m (right) at pre-test, 32.1 m (left) and 40.8 m (right) at post-test, and 36.1 m (left) and 43.4 m (right) at retention. The mean kick distances for Player 2 were 43.0 m (left) and 46.1 m (right) at pre-test, 40.5 m (left) and 42.0 m (right) at post-test, and 43.6 m (left) and 44.1 m (right) at retention.

Bilaterality of kicking performance over the three sessions showed significant improvement, with player 2 coming close to equality of performance between the two legs. The L: R ratios for player 1 and 2 were calculated for the side-to-side adjacent pairs of kicks in a session, and polynomial trend analysis within repeated measures ANOVAS was applied to these data. The L: R ratios changed over the study from 0.73 to 0.83 for player 1 and from 0.93 to 0.99 for player 2. The linear trend component in this change over sessions was significant, with \( p = 0.01 \) and \( p = 0.04 \) for player 1 and 2 respectively.

Figure 2 Preferred foot image reversed.

Figure 3 Non-Preferred to Preferred foot kick distance ratio for the two players over the three occasions of testing.
However, neither quadratic component was significant ($p = 0.85$ for player 1 and $p = 0.82$ for player 2) (Figure 3). Although the deviation of the kicks from the goal centre lessened over sessions, the improvements of 0.8 and 0.2 metres observed for the two players were not significant ($p = 0.24$ and 0.76 respectively). Further, players were questioned after the final test, both players said that they thought that they had been watching good examples of their left foot kicks, and their diaries indicated they had adhered to the training program of watching the DVD, three times a day for two weeks.

4. Discussion

This study used a video editing application (Dowrick, 2007; Coulson et al., 2006a, 2006b) to present right foot dominant players with an apparently good left side skill performance. The video footage they observed in self-model training was a mirror reversal of right side motor patterns that gave kick distances better than those they had previously produced with their left foot. Repeated observation of this performance was associated with a significant improvement in the L: R ratio for kick distances in the post-observation period in both cases, and this improvement was achieved for both players, from 0.73 to 0.83 for player 1 and from 0.93 to 0.99 for player 2.

On questioning the participants, both said that the coaches of their team verbally approved of good bilateral kicking performance, but did not allocate any training time specifically to non-preferred side skills. Both participants also reported that they had undertaken individual practice of their left foot kick after the viewing period finished, and this is consistent with the continuation of improvement up to the retention-test.

Although the right and left leg kicking actions were visually similar for both players, the maximum and the mean distances kicked were greater with the preferred foot for both players. This was in contrast to our study of the short punt kick for accuracy (Steel et al., 2013), where the VSM produced a significant reduction in the biomechanically disadvantageous use of the right hand to deliver the ball to the left foot. Therefore, in the presence of correct components and correct ball delivery in the current study, we suggest that the motor pattern by which better distances were produced, and thus the pattern viewed by the players during their VSM training, was subtly different rather than categorically different from their less effective pattern. Notably, the feedforward technique circumvents the need for detailed measurement and analysis of the differences between the two sides, as it presents the more effective side’s motor pattern to the player for viewing. The feedforward aspect of this was supported when one of the players reported being impressed with the quality of his (apparent) non-preferred side kicks on his VSM footage.

Self-modeling techniques differ from those of standard observational methods in that they show correct behaviors or movement patterns, excluding incorrect examples. Bradley (1993) has provided evidence suggesting the use of more traditional video-based methods, that show both correct and incorrect technique, are detrimental to learning and thus performance. In sport, video is often used as a method to convey feedback to the participant in the manner discussed by Bradley (1993). That is, many coaches use the video playback to highlight not only the ideal aspects of an athlete’s performance but also those factors which require improvement. However, in their desire to improve players, coaches can be focused on what a player has done incorrectly, and repeat visual models of errors at the risk of the errors becoming learnt (Hughes and Franks, 2008). The method proposed here provides an alternative application of video in sport that avoids reiteration of errors, with particular reference to bilaterality.

5. Conclusions

Finding an efficient method of motor learning to close the gap between the performance of a player’s preferred and non-preferred sides is a goal for coaches in sports where equivalent performance is beneficial. The successful change in the ratio of non-preferred to preferred side distance kicking performance observed here with two ARF players indicates that feedforward VSM is a promising method for training non-preferred kick control in Australian Rules Football players, warranting further investigation with a larger sample size.

General Note

Some data from this study was presented at the 2010, Sports Medicine Australia Conference in Port Douglas, Qld, Australia.
References


Main Works:

Kylie has worked as a Physical Educator and Sport Scientist prior to starting her academic career. She has worked as an academic and researchers for ten years and her research is focused on observation learning techniques, decision-making and biological motion related to team sports.

Brief Biographical History:

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