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REVIEW ARTICLE

The Use of Video Self-Modeling to Improve Athletic Performance

Scott Bellini, Ph.D.

Associate Professor, School Psychology, Indiana University, Bloomington, USA.

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Corresponding Author: Scott Bellini, Associate Professor, School Psychology, Indiana University, Bloomington, USA.

Abstract

Video modeling is an empirically validated intervention modality that has been used across various fields to teach a wide array of skills and behaviors. In a video modeling intervention, individuals watch a video demonstration of a specific skill or behavior and then replicate it. This approach can be utilized to teach new skills, enhance performance of existing ones, boost self-efficacy, and reduce performance anxiety in athletes. This article provides a conceptual framework and reviews the current research on video self-modeling (VSM) in athletics. A case study is presented to illustrate the application of VSM in the sport of golf.

1. Introduction

Video modeling is an evidence-based practice used across various disciplines to teach a wide range of skills and behaviors [1, 2]. These include motor behaviors, social skills, communication, compliance, self-monitoring, functional skills, vocational skills, emotional regulation, and athletic performance (2-18). In a video modeling intervention, an individual watches a video demonstration of a skill or behavior and then imitates it. It can be used to teach new skills, enhance the performance of existing skills, improve self-efficacy, and reduce performance anxiety in athletes. This article will provide the conceptual foundation for VSM and review existing research on VSM with athletes, highlighting its potential to enhance performance across different sports by addressing critical elements of skill acquisition and performance. Additionally, the article will include a case study demonstrating a potential application of VSM in the sport of golf.

2. What is Video Self-Modeling?

Video self-modeling (VSM) is a specific type of video modeling intervention where individuals watch a video of themselves successfully performing a behavior. Meta-analytical research indicates that skills learned through video modeling and VSM are acquired quickly, transferred across different settings and people, and maintained for months after the intervention ends [2-9]. VSM is a strength-based approach that emphasizes an individual's abilities rather than their limitations [19]. This is underscored by the fact that VSM interventions are most effective when the individual watches videos of themselves performing successfully and efficaciously, rather than watching their mistakes and failures [2,3]. As such, VSM encourages coaches to highlight the athlete's strengths rather than focus excessively on their weaknesses. This method involves the athlete watching videos of themselves performing targeted behaviors successfully, immediately prior to performance of the behavior, providing the athlete with copious visual examples of their own success.

VSM interventions generally fall into two categories: positive self-review and video feed-forward [2]. Positive self-review (PSR) involves individuals watching themselves successfully performing a behavior or activity that is already within their repertoire. This method is useful for low-frequency behaviors or behaviors that were once mastered but are no longer performed successfully or consistently. For example, if a basketball player is making only 30% of their free-throws, they could be recorded shooting free-throws as part of a PSR-VSM intervention. The video of the free-throw shooting would then be edited to remove any missed shots. The player would

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then watch the edited video (i.e., a video that shows them making every shot) prior to performance. This technique is relatively simple from a technological standpoint but may require extensive footage to capture enough instances of the target behavior.

Feed-forward (FF) is used when an individual has most of the necessary skills, but struggles to perform them in the correct sequence or needs additional assistance in the form prompting or cueing from a coach to perform the skill successfully. For example, a gymnast might be able to perform various features of their floor routine, such as tumbling passes, jumps, turns, and dance elements, but is struggling to put these components together in a smooth, cohesive program. A FF-VSM intervention would involve recording the gymnast performing each element separately, and in any sequence. The video footage would then be edited to show the full routine, with all elements blended together in the proper sequence. FF-VSM using *hidden supports* is also a good option for athletes who need additional assistance or support from coaches to complete skills successfully. *Hidden supports* refer to a technique where prompts and cues are provided to help the athlete perform the skill, but then these supports are edited out (i.e., removed) from the video before the athlete watches it. For instance, a dancer might need to be continually prompted by their instructor to point their feet on jumps. A FF-VSM intervention would involve recording the dancer performing the jumps (including the prompting from the instructor to point their feet) but then removing the prompts from the video during the editing phase. The finished video would allow the dancer to see themselves successfully performing the jumps with their feet pointed correctly without instructor support. The goal of *hidden supports* is to transform the supported skill into an autonomous one. Feedforward requires more advanced technological capabilities than PSR, often to remove prompts, but typically requires less raw video footage to produce.

3. A Conceptual Framework for VSM

The effectiveness of VSM has been explored through various theoretical frameworks, including behavioral, cognitive, and social-cognitive perspectives. Nikopoulos and Keenan [20] suggested from a behavioral standpoint that viewing certain activities or play items on video acts as a motivating operation, enhancing the reinforcing properties of the skills, activities and items shown in the video. From a cognitive framework, Kehle and colleagues [7] proposed that watching edited self-modeling videos showcasing positive and efficacious behavior might change observers' memories of their past actions, replacing recollections of failure with those of success. Lastly, Dowrick [2] conceptualized VSM from a social-cognitive perspective, proposing that children not only learn skills by observing themselves on video (modeling) but also boost their self-efficacy by watching their own successful behaviors. Social-cognitive theory has been applied to various fields, including psychology, education, and athletics, to understand behaviors such as mental health, learning and performance issues. The social-cognitive framework for VSM is most applicable to athletes and will be discussed in the following section.

Social cognitive theory, developed by Albert Bandura [21,22], explains how people learn within a social context. It emphasizes that individuals are active agents who influence and are influenced by their environment. Social-cognitive theory incorporates three important elements that are highly relevant to the field of athletics and athletic performance: *Observational Learning, Self-Efficacy,* and *Reciprocal Determinism*. Observational learning, or modeling, involves acquiring knowledge and skills by watching others and imitating their actions. Self-efficacy refers to the belief in one's own ability to achieve goals and succeed in specific tasks. And Reciprocal Determinism refers to the dynamic, and reciprocal interaction between personal characteristics, behavior, and the environment. For example, the athlete's personality and/or behavior can affect their coach's behavior, which in turn can influence their thoughts and feelings, creating a continuous loop of positive and/or negative interaction between player and coach.

Observational learning, or modeling, is a key component of social-cognitive theory and plays a crucial role in skill acquisition and performance in athletes, and has been consistently empirically validated by research as an effective method in myriad athletic disciplines [23]. In the context of sports, modeling allows athletes to acquire new skills by watching their coaches, peers, or in the case of VSM, themselves, successfully performing the target skill. According to Bandura [21], there are four prerequisites for successful modeling: attention, retention, behavioral reproduction, and motivation. Attention is critical to successful modeling and skill acquisition in general. Put simply, without attention, you will not have learning. That is, if athletes do not attend to the modeled skill, or to the coach's instruction, they will not learn. Factors such as the model's perceived competence, and the observer's interest

in learning and performing the skill, can influence attention. Likewise, observers are more likely to pay attention to a modeled skill when the model shares similar personal attributes with them. The ability to remember the modeled skill after the observation is also critical to successful modeling. This involves encoding the demonstration into memory, which can be enhanced through repetition and mental rehearsal. Behavior reproduction refers to the athlete's ability to replicate the observed behavior, requiring physical capability and potentially guided practice. As such, it's imperative that modeled skills are within the observer's capabilities, or just above their current skill level. Finally, athletes must be motivated to imitate the behavior. Motivation is influenced by numerous factors, such as personal interests, model attributes, perceived competence of the model, and the self-efficacy of the observer. Self-efficacy is an essential element of modeling because an observer is less likely to attempt to imitate a modeled skill if they do not believe they are capable of performing it. Self-efficacy also maintains a reciprocal relationship with all four prerequisites of modeling. That is, self-efficacy influences the observer's attention and retention of the modeled skill (i.e., whether they'll watch and remember the demonstrated skill), and behavioral reproduction and motivation (i.e., their willingness and motivation to reproduce the skill).

Self-efficacy, defined as an individual's belief in their ability to execute actions required to achieve specific outcomes [22], is a critical factor in athletic performance. High self-efficacy is associated with better motivation, persistence, and overall athletic performance [24,25]. Lochbaum and colleagues found that athletes with high self-efficacy are more likely to set challenging goals, persist in the face of setbacks, and perform better under pressure [24]. However, the effect can vary depending on factors such as the type of sport and the level of the athlete. Likewise, Aizava and colleagues demonstrated that self-efficacy and mental toughness are significant predictors of performance, suggesting that interventions to enhance these traits could benefit athletes [25].

VSM provides a potential vehicle to enhance self-efficacy and improve the effectiveness of modeling interventions for athletes. Self-efficacy, for instance, could potentially be enhanced by watching exclusively successful performances on video. By flooding the athlete with images of personal success, coaches can reinforce and bolster an athlete's belief in their abilities which is crucial for maintaining motivation, persistence, and peak performance. Similarly, VSM provides a mechanism to effectively address the four pre-requisites of successful modeling: attention, retention, behavioral reproduction, and motivation. By using self as the model, we ensure that the observer and model share similar attributes, and thus, are likely to relate to the model, and attend to the video [2]. In addition, self-modeling, particularly through the use of hidden supports, also assures that the modeled skills are within the observer's capabilities to perform. Finally, individuals, and youth in particular, are highly motivated to watch themselves on video, especially when they are viewing videos depicting their best performances [2].

4. Research on the Effectiveness of VSM with Athletes

One of the primary benefits of VSM, and modeling in general, is its ability to enhance skill acquisition. VSM has been particularly effective in helping athletes acquire new skills and enhance the performance of existing ones. For instance, Ste-Marie et al. [13] used a feedforward VSM (FF-VSM) procedure to improve various trampoline skills in children. In this study, motor skill acquisition was enhanced when children viewed videos that were edited to show the children performing at a level higher than their current ability. Similarly, Clark and Ste-Marie [12] conducted a study examining the impact of VSM interventions on children's swimming performance. They compared three types of interventions: self-modeling (viewing oneself perform at a higher than current level), self-observation (viewing oneself perform at their current skill level), and physical practice only. The self-modeling group demonstrated substantially better performance improvements than the other groups.

VSM has also been effectively implemented with athletes in numerous other sports. For instance, in one study, golfers who watched videos of their best swings in a PSR-VSM intervention were able to replicate these successful techniques more consistently leading to better overall performance [18]. Middlemas and Harwood [11] explored the impact of a pre-match VSM intervention on elite youth football/soccer players. Conducted over 13 weeks of a competitive soccer season, the intervention involved four players who watched videos of themselves successfully performing key soccer skills. The results indicated substantial improvements in various performance skills (e.g., turns, headers, and tackles) for two of the players. A study by Foltz et al. [17] examined the effectiveness of a FF-VSM on the hitting performance of collegiate field hockey players. The results of the

study indicated significant improvements in shot accuracy. Finally, Amara et al. [16] conducted a study with track athletes that combined VSM with various other instructional modalities. The findings revealed that the modeling group, which incorporated self-modeling, expert modeling, and model superposition, showed significantly better improvement in hurdle clearance compared to expert feedback/instruction alone.

Some of these reviewed studies also measured the impact of VSM on self-efficacy, corroborating the potential for VSM to enhance the self-efficacy of athletes by showing them images of their successful performances. Middlemas [10] noted that athletes who participated in VSM interventions that show only positive performances demonstrated improved self-efficacy and self-confidence compared to athletes who participated in a video feedback intervention that depicted both positive and negative aspects of their performance. In the Middlemas and Harwood study [11], the researchers found meaningful improvements in self-efficacy in youth soccer/football players who participated in a VSM procedure. They also noted that when pre-match self-efficacy increased, so too did the athletes' performance, supporting a reciprocal relationship between self-efficacy and performance. Likewise, in the Clark and Ste-Marie study [12], the self-modeling group showed higher self-efficacy compared to the self-observation and control groups. Finally, Ste-Marie and colleagues [14], and later corroborated by Hiromitsu [15], found improvements in self-efficacy for athletes in a "learner-choice" condition where athletes were given the choice of when to watch their videos.

VSM may also have utility in enhancing the effectiveness of traditional imagery techniques or serving as a supplement for those with low imagery abilities. By watching themselves perform a skill correctly, athletes can reinforce their memory of the correct technique and application of a particular skill. This process can aid athletes in creating a mental image of the desired performance, which can be recalled and replicated during practice and competition via traditional imagery techniques. In fact, previous research with gymnasts suggests that VSM may be particularly beneficial for athletes with lower imagery abilities [26].

5. VSM Case Study: An Example of using VSM with a Youth Golfer

This section will provide an applied example of how VSM could be used to enhance the golf performance of a youth golfer, "John." This proposed intervention involves recording and editing videos of John's successful swings, creating a PSR-VSM video that incorporates positive reinforcement, imagery, expert feedback, and coaching elements. The following section details the steps taken from this novel approach.

Background: John, a 16-year-old high school golfer, has been playing golf for five years. Despite his dedication and regular practice, he struggles with consistency in his swing and often lacks confidence and experiences anxiety during competitions. His coach suggested using a VSM intervention to help improve his performance and build confidence.

Intervention: The VSM intervention was designed to focus on two main areas: swing consistency and self-confidence. The process involved the following steps:

5.1 Recording Successful Swings

Over several practice sessions, John's coach recorded his swings, capturing moments when John executed the swing perfectly, and struck the ball crisply and with precision.

These recordings were then edited to remove John's poor swings, shanks, slices, and hooks, to create a compilation of John's best swings that highlighted his peak form, proper technique, and most successful outcomes.

5.2 Creating the VSM Video

The edited video included slow-motion segments and annotations to emphasize key aspects of John's technique (e.g., proper posture or swing path) to incorporate various coaching elements.

Positive reinforcement messages were added to the video, reminding John of his capabilities and past successes, such as "Great Shot," or "Exquisite Swing."

5.3 Viewing Sessions

John watched the VSM video daily, and immediately before practice sessions and competitions.

After each of these sessions, he was encouraged to visualize himself performing the swings as seen in the video, focusing on the positive outcomes.

5.4 Incorporating Coaching and Feedback

John's coach provided feedback during practice, reinforcing the techniques shown in the VSM video. John was also encouraged to self-reflect on his performance, comparing his current swings to those in the video.

6. Conclusion

Video self-modeling is a powerful tool for enhancing athletic performance. By allowing athletes to observe their successful performances, VSM has the potential to promote skill acquisition, boost confidence, increase self-efficacy, and enhance performance. The theoretical foundations and empirical evidence supporting VSM underscore its potential as an effective social-cognitive intervention for athletes across various sport and disciplines. As research continues to explore the myriad applications of VSM, it is likely to become an increasingly integral part of athletic training and performance enhancement approaches.

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