THE THINK-ALOUD PROTOCOL: CAPTURING ATHLETES' THOUGHTS AND FEELINGS DURING VIDEO FEEDBACK

Simon Middlemas

INTRODUCTION

For the latest generation of athletes, technology is commonplace. With rapid technological advances, falling costs, better quality analysis software and greater accessibility, it is easy to see why digital video appeals to coaches and practitioners working in sport (MacRae, Miller-Perrin & Tinberg, 2003). Digital video is frequently used, both pre-competition and post-competition, by coaches and athletes to enable them to reflect more accurately on aspects of performance and consider how they might be improved (Liebermann et al., 2002; Williams & Ford, 2008). It has been found that the effectiveness of these briefing and debriefing sessions is influenced heavily by coaches' ability to obtain, maintain and develop a level of trust and respect with athletes (Cushion & Jones, 2006; Potrác, Jones & Armour, 2002). When mutual respect and openness are present within the coach–athlete relationship, athletes report a more positive experience (Nelson et al., 2014).

Athletes' negative responses to video feedback (VFB) – such as anxiety, embarrassment and loss of self-confidence – can lead to players becoming reluctant to give and receive critical feedback during video sessions, resistance to feedback and a failure to learn. More generally, a lack of awareness of how athletes are responding to VFB may itself have negative consequences for player performance (Pensgaard & Duda, 2002). Sport psychology research has enumerated the positive benefits associated with delivering video as a psychological intervention (Ives, Straub & Shelley, 2002). These include an increase in confidence in pre-performance routines (e.g. Tracey, 2011); motivating players returning from injury (Feltz, Short & Sullivan, 2008); functioning as a reflective tool for athletes and coaches (e.g. MacKenzie & Cushion, 2014; Carson, 2008); and working in association with mental imagery (Holmes & Collins, 2001) and music (Bishop, Karageorghis & Loizou, 2007).

Middlemas & Harwood (2017) have identified a number of psychological factors associated with VFB delivery, including self-confidence, focus, motivation, emotional impact, reflection and self-regulation. In this study, coaches and players highlighted the role that critical reflection plays in influencing the effectiveness of VFB, by building players' confidence and ability to think positively. But as one coach noted, it was not an easy task to develop these qualities:

> Talking about and helping educate [the players] about confidence is a good thing, but impacting upon this is a different matter. I don't feel I am able to make enough impact on their thoughts at times in the video sessions, especially with the less confident ones … they get a bit lost in their own thoughts sometimes, and you can tell they will leave the sessions with negative thoughts and having lost confidence sometimes (Mark, international coach).

These studies underline the importance of coaches and practitioners being mindful of the way in which athletes are responding during VFB (Groom et al., 2011; Middlemas & Harwood, 2017; Taylor, Potrác, Nelson, Jones & Groom, 2015). Recent studies have significantly increased our understanding of the psychological variables associated with VFB. However, these studies are based primarily on retrospective, self-report methods. By contrast, some researchers have argued that concurrent methods provide a more comprehensive representation of current cognitive processes, thereby helping shape participants' practice as it is happening (Whyte, Cormier & Pickett-Hauber, 2010).

The think-aloud protocol

The 'think-aloud' protocol (TAP) was developed by Ericsson & Simon (1980) and provides researchers with a method of capturing thought processes *during* activity – in this case, viewing video footage. It is designed to generate direct information about the subject's ongoing thought processes during the period the athlete is engaged in a task (e.g., watching video feedback), and not the thoughts and feelings they were engaging in at the time of executing the skill performance (Jaspers, Steen, van den Bos & Geenen, 2004). A growing body of research has been amassed which has shown that when individuals are asked to simply "verbalise what is going on through their heads," without trying to explain or describe it, they are able to accurately capture their thought process without affecting performance Jaspers, Steen, van den Bos & Geenen, 2004; Whitehead et al., 2016). However, researchers have highlighted the importance of following recommended methodological procedures (e.g., Ericcsson & Simon, 1980) when employing the TAP within a research setting.

Few studies, however, have employed the think-aloud protocol in association with VFB research. In an exploratory study, Clark, Ste-Marie & Martini (2006) used the TAP to examine the thought processes that unfolded when children viewed a self-modelling video of their performance when learning to swim. The results showed that most of the children's verbalisations were self-evaluative in both a positive (Descriptive Positive) and negative (Descriptive Negative) direction, as well as related to future skill improvement (Prescriptive). Ram & McCullagh (2003) studied the effects of a video self-modeling (VSM) intervention on the performance of intermediate-level volleyball players, employing a think-aloud protocol to explore the participants' responses to the intervention. No consistent trends were found in the general content of verbalisations across participants, and the elements of the self-modelling tape to which the participants attended varied widely. However, the authors reported that all the participants verbalised surprise and shock when seeing themselves on video for the first time.

Given the paucity of research devoted to athletes' responses to VFB, and the limitations of retrospective approaches to capturing athletes' psychological responses, the present study aims to examine athletes' thought processes and emotions during video feedback using a think-aloud protocol.

METHODS

Participants

The ten participants in the study were recruited from one professional football academy in the English Championship League. They were all either first- or second-year full-time scholars (i.e., players who are also studying). A range of experience within the academy football system (years, $M = 6.4$, range 4-8) and playing positions were included. Five of the players had been part of a youth international squad (under 16-19 level), and two had made their senior professional debut at the time of the study.

Data Collection

A think-aloud protocol (Ericsson & Simon, 1984, 1993) was employed to capture the thought processes engaged in by the participants while they watched self-modelling videos. To ensure procedural replication, the TAP was employed once with all participants (using an unrelated skills video of an expert model of a tennis skill). Following the unrelated skills video (week one), the participants viewed two other videos ¬– one containing raw video feedback of their football performance (in week 2), and the other a positive self-review video of their football performance (in week 3). These were developed for each player from data stored on their performance from the beginning of the competitive season (four games).

Video Self-Modelling (VSM) is a process whereby athletes learn from images of their own adaptive behaviour as seen on videotape. It allows individuals to view themselves being successful, acting appropriately, or performing new tasks. In a positive self-review (self-model) video, the athlete uses only positive images of the self as a model for improvement.

Video Feedback (VFB) essentially involves showing an athlete a video clip of his or her performance of a skill or behaviour. In this study, it involved the athlete watching raw, unedited footage of their on-field skills and behaviour, without adulteration or emphasis.

During replay, participants were instructed to "Verbalise what you notice on the videotape and how the videotape makes you feel." The instructions were purposefully vague so as not to bias the players' responses. The players were encouraged to continue verbalising throughout the duration of the video; prompts such as "Remember to keep talking" were given by the researcher if the players were quiet for ten seconds or more. In line with previous studies (Clark, et al., 2006), the TAP was employed on alternate clips so as to eliminate potential confounding by the verbalisations. In line with previous research (Clark, Ste-Marie & Martini, 2006), a verbalisation was defined as any statement that the player made that referred to a single idea (e.g., "I need to control the ball better with my right foot"). The players' verbalisations were captured using a digital dictaphone (an Olympus DS Digital Voice Recorder) and transcribed verbatim by the author.

Data Analysis

The results of the application of the TAP were transcribed verbatim, and a line-by-line analysis of the data was conducted to identify meaningful themes. Although, where possible, new themes were elicited from the data, the researchers were guided by findings reported in previous VFB research in this area (Clark et al., 2006; Ram & McCullagh, 2003).

RESULTS

The results for the think-aloud protocol are displayed in Table 1 and Figures 1 and 2 (below). The analysis revealed eight themes devised to categorise the thoughts and feelings that the participants experienced whilst watching the video interventions: (i) Description of self, others, or playing context; (ii) Evaluation of others; (iii) Positive evaluation of self; (iv) Negative evaluation of self; (v) Skill improvement; (vi) Positive psychological response; (vii) Negative psychological response; and (viii) Miscellaneous. Six of these themes focused on self-review, one on others (e.g., teammates and opponents), and one theme was marked as uncategorised. These are displayed in Table 1, along with an explanation of the theme and an example of each one. Overall, Table 1 shows that the greatest percentage of verbalisations fell into the Pos. Self-evaluation (17.7%), Self-observation (17.8%), Neg. Self-evaluation (13.8%), and Prescriptive (15%) themes, with these themes representing the majority (64.3%) of the verbalisations generated.

Focus of verbalisation	Description	Example	URV	VFB	PSR
1. Description	Descriptions of what they see themselves or others doing. Includes own movements, actions, state of the game (score, approx. time), conditions of the pitch, weather (no evaluative information)	"I'm running towards the touchline; the defender is tracking me"	36%	24.8%	18.7%
2. Evaluation (others)	Evaluation of what they see other doing; includes others' movement, tactics, mistakes	"The pitch is poor quality, so hard to control the ball"	32%	14.9%	4%
3. Positive evaluation (self)	A positive evaluation of their own football performance, focused on the executions of specific components being performed	"Good height on jump for the header"	0%	6%	13.5%
4. Negative evaluation (self)	A negative evaluation of their own football performance, focused on the executions of specific components being performed	"Poor first touch with left foot"	0%	15.6%	7.9%
5. Skill improvement	Statement regarding what they need to do to improve their football skill performance in future attempts (focused on the executions of specific components being performed)	"I need to drive my foot through the ball during that type of pass"	13%	17.4%	24.2%
6. Positive feelings	Statements indicating positive emotions experienced retrospectively	"Good focus on that header"	0%	2.5%	15.9%
7. Negative feelings	Statements indicating negative emotions experienced retrospectively	"That touch was embarrassing"	10%	10.9%	4%
8. Uncategorised	Unrelated statements: appearance, quality of video replay, unrelated questions	"The slow-motion replay helps me pick up small details"	10%	7.9%	11.9%

Table 1. Verbalisation Themes.
Key:URV= unrelated video. VFB= video feedback. PSR= positive self-review (self modelling)

The findings reveal that that there were clear differences observed in the players' thought patterns in response to different types of video intervention (video feedback v self-modelling video). When verbalising their thoughts, the players spent more time *describing* their performance than anything else – e.g., "I'm running towards the touchline, the defender is tracking me" or "I am taking a corner on the far side of the pitch". There was a higher frequency of such descriptive thoughts when watching video feedback (10) as opposed to video self-modelling (4.7). When the players engaged in self-evaluation of their actions on video, it was generally more negative than positive in focus. This was particularly pronounced when the players were watching video feedback, which as noted above was unedited. The players' verbalisations were more positive in focus during positive self-review, but the frequency was low in both types of video feedback, suggesting that the players struggled to identify or verbalise positive thoughts regarding their performance. Skill improvement ¬– statements of what players need to do to improve their football skill performance in future games – was a marked theme in both forms of video feedback. By identifying aspects of performance that can be changed to improve performance, this could be considered positive in focus.

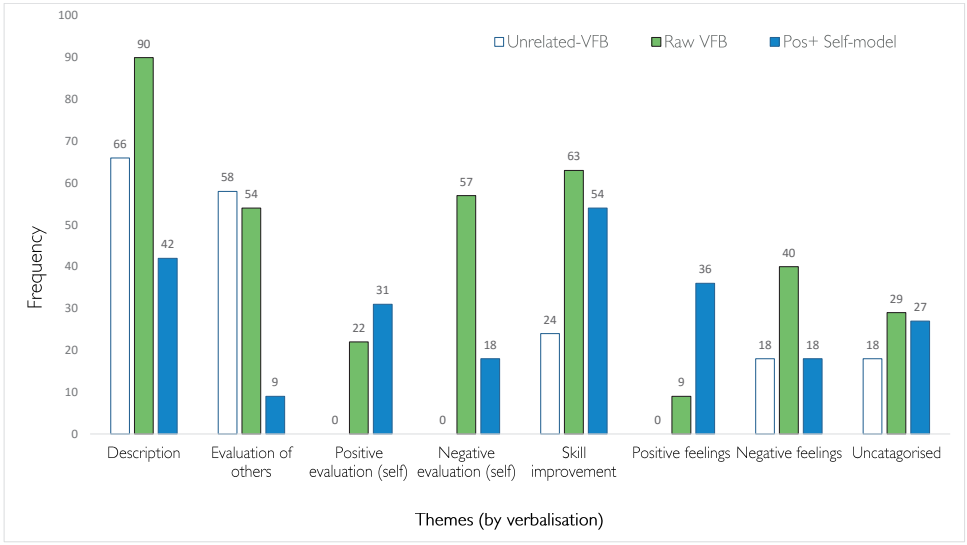

Figure 2. Total frequency of verbalisation for each of the video feedback themes

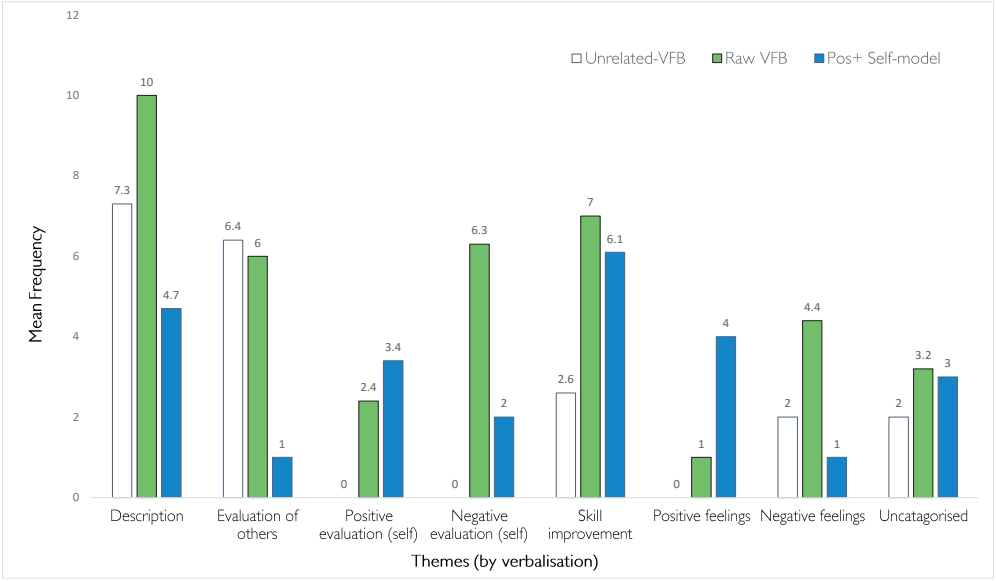

Figure 3. Mean frequency of verbalisation for each type of video feedback

DISCUSSION

A think-aloud protocol was employed in this study to tap into the thoughts and feelings of elite youth footballers *during* their viewing of their video intervention. The data analysis revealed a number of themes including description, skill-improvement, feelings, and self- and other-evaluation. Watching video replay of their performance encouraged the players to articulate what was happening on the field and to identify areas for skill improvement. In this, the video can be seen as a valuable tool for learning and performance evaluation (REF). Further analysis of the findings by video type revealed that there were differences in the way the players responded to video feedback as opposed to the self-modelling video. Although the players were more positive in their self-evaluation when performing during the self-modelling video than during the video feedback, they did not spend a great deal of time identifying positive aspects of their performance in either setting.

However, the players were highly critical of their performance during video feedback. This tendency for young elite players to be critical of their own performance has been reported elsewhere (Groom & Cushion, 2005; Groom et al., 2011; Middlemas & Harwood, 2014, 2017). In a study by Middlemas & Harwood, elite youth football coaches suggested that this negative self-evaluation (and in turn, their fear of being criticised by others) made players less receptive to video replay. For one coach, this was part of a wider issue with self-image and confidence in adolescent footballers, which video can help some players overcome:

> You know the ones who struggle with esteem will also struggle with feedback, and will take things too personally, too emotionally, be too critical. The video can help them get past these issues ... it can be the difference between them coping in the pro's, and it's definitely a factor in how they respond within the academy (Youth international football coach).

Interestingly, during the self-modelling video the players spent less time evaluating their performance in a negative way than during video feedback. This is to be expected, as video feedback presents both positive and negative aspects of performance, rather than just the positive aspects of performance (in the self-modelling tape). However, this remains a valuable finding, given the challenges identified by coaches in developing the confidence levels of young athletes during video replay/ performance analysis (Groom & Cushion, 2005; Middlemas & Harwood, 2017). The findings suggest that the self-model may focus the athlete's attention on adaptive perceptions of behaviour. While this form of video did not encourage high levels of positive self-evaluation, neither did it encourage a high amount of negative evaluation. It could be argued that by over-focusing players' attention on error correction and detection, video feedback may have a more corrosive effect on their confidence levels. A more balanced approach – including time focused solely on adaptive behaviours – may help players to maintain or recover confidence prior to their next performance and longer-term.

In contrast to previous studies, the players did not experience the same 'shock' and 'surprise' as other participants when viewing themselves on video. This was probably due to the level of familiarity the players had reached in using video feedback to review their performance. In contrast to the participants in the Clark et al. (2006) study, they focused little on the shock and surprise of viewing themselves on videotape. The players recruited for the present study were experienced in receiving video feedback, and may have moved beyond the self-presentational issues (such as shock) that many people face when viewing themselves on video for the first time (Ram & McCullagh, 2003). The players also verbalised positive emotions more often when watching the self-modelling video than when watching video feedback. This focus on positive emotions during replay supports previous research in sport (e.g., Clark and Ste-Marie, 2007), which suggests that self-modelling videos increase levels of positive affect by enhancing learners' feelings of satisfaction with their performance. Researchers have long recognised that observational learning (of which self-modelling is a form) can have a positive effect on performance, through enhancement of psychological responses such as the motivation to change or perform a behaviour, better coping with fear and anxiety, and improvements in self-confidence and self-efficacy (Starek & McCullagh, 1999; Dowrick, 1999).

PRACTICAL RECOMMENDATIONS

The findings of this study suggest that coaches and practitioners should consider questions of context and purpose when choosing whether to use video with athletes. Video feedback – presenting both positive and negative aspects of performance – may be best suited to the post-performance debrief, where typically the player has time ahead of them to reflect on performance. In the debrief, emotions can be running high following performance success or failure, and the role of the video is to evaluate performance and identify areas where the athlete or team has achieved their goals or, conversely, to identify where they need to improve. By contrast, the self-modelling video is perhaps better suited to influencing pre-competition emotions and thoughts, helping the athletes achieve an ideal psychological state. Researchers have supported the use of video as a pre-competition preparation tool in elite football (Groom et al., 2011; Middlemas & Harwood, 2017). Given that pre-competitive emotions can persist and fluctuate over the course of a week (Hanton et al., 2004), the coach or practitioner needs to consider the right time to deliver this intervention – immediately prior to performance, or possibly earlier in the week to set the tone for training and preparation. A self-modelling video, set to music and accompanied by motivational messages, may provide a powerful means for achieving a performance-facilitating emotional state (Baumgartner, Lutz, Schmidt & Jäncke, 2006; Tracey, 2012). Thus, the best time to introduce this intervention may well be dependent on psychological factors, such as the individual's psychological needs following performance, his confidence levels and the optimum performance state of the team and individual; but also on practical factors, such as the time in-between games, the time available for video feedback/performance analysis work, and the support services available to the coach in preparing these interventions.

CONCLUSION

Given the exploratory nature of this study, caution is required when drawing generalisations from its findings. The results suggest that there may be differences in the way that athletes respond to different forms of video feedback. In line with previous studies in sport and education, the think-aloud protocol was seen as a valid tool for collecting representative and realistic cognitive thought processes as detailed by the participants (Fox et al., 2011; Whitehead et al., 2016). Future researchers may benefit from focusing on other participants in the video replay/performance analysis process, including a comparison between how coaches and athletes think and respond to video intervention. Future research directions include the comparison of coach and player verbalisations, and exploring how these verbalisations may differ within a post-match and pre-match context. A better understanding of how video influences thought processes can help practitioners to support coaches and athletes more effectively in their preparation for performance.

Simon Middlemas is a principal lecturer and research coordinator at the Otago Institute of Sport and Adventure at Otago Polytechnic. He completed a PhD in sport psychology and performance analysis in 2014, focused on the use of video feedback in the psychological preparation of elite youth football players and coaches. For the past decade, Simon has worked as a sport psychology consultant within elite and development sport, for the English Institute of Sport (EIS) and as a private consultant, with clients such as GB Swimming, GB Volleyball/Beach Volleyball, England Netball, the British Equestrian Federation and the English Football Association. He completed a Graduate Diploma in Tertiary Education in 2015.

Correspondence to: Simon Middlemas, College Te Oha Ora, Sargood Centre, Otago Polytechnic, 40 Logan Park Drive, Dunedin 9016, New Zealand. Email: Simon.Middlemas@op.ac.nz

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