‘Think Aloud’ as a facilitator of self-regulation in golfers

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Abstract

Think Aloud (TA) has been used as a tool to promote self-regulation and reflection within coaches, yet it has not been employed within the same context to support athletes. The aim of the present study was to understand golfers’ perceptions of using TA at two time points: immediately post performance and after a six-to-eight-week reflection period. Six golfers (5 males, 1 female; age: *M* = 30.8 years, *SD* = 14.8; handicap: *M* = 6.92, *SD* = 3.9) used TA during the performance on six holes of golf and listened back to their TA audio. Using semi-structured interviews and subsequent thematic analyses, we generated four themes: increased awareness, awareness of how behaviour influences performance, disruption of thought processes and performance, and application to coaching. Preliminary evidence provides support for TA as a potential tool to promote self-regulation in golfers which could be used to inform coaching interventions.

Keywords: Reflection, perceptions, performance, golf

Introduction

Learners who self-regulate are defined as "metacognitively, motivationally and behaviourally active participants in their own learning process" (Zimmerman, 1986, p. 308). Self-regulated learners generate their own thoughts, feelings, and actions to attain their learning goals, which in turn, facilitates the problem-solving process and improves effectiveness of learning. Given the demands placed on athletes (e.g., Sarkar & Fletcher, 2014), self-regulation plays an important role in one's development when striving for goal attainment (Jonker et al., 2011). Zimmerman's (1986, 2006) self-regulation model includes three cyclical phases. Firstly, the forethought phase concerns how the individual approaches a task and consists of planning and analysis strategies (e.g., goal setting). Secondly, the performance phase occurs during a task and is concerned with the use of self-control strategies (e.g., self-instruction, imagery, attention focusing). Finally, the self-reflection phase occurs after each performance bout and is concerned with deliberate efforts to adapt one's performance in a systematic manner (e.g., casual attributions). This process of self-evaluation is argued to facilitate causal attributions about one's success and failures.

Reflection is argued to be a sub-facet of metacognition and can be defined as an individual's ability to apply previous experiences to improve future performances in a goal-directed manner (Peltier et al., 2006; Zimmerman, 2000). Metacognition is particularly important as it enables one to evaluate their own thinking and can be defined as "the awareness of, and knowledge about one's own thinking and consists of planning, self-monitoring, evaluation and reflection" (Jonker et al., 2010, p. 902). Zimmerman (2000) posits that learners can direct their reflection to the result (self-judgement) or to an objective (self-reaction). Specifically, self-judgement comprises of sub-processes referred to as self-evaluation and causal attributions (e.g., an athlete's assessment of their own performance),

while self-reaction comprises of sub-processes referred to as self-satisfaction and adaptive inferences (e.g., an athlete's emotional and cognitive response to their attributions).

Zimmerman (1986, 2006) began developing his theory in education settings and researchers have applied its principles to sport. Athletes who have developed high levels of self-regulation compare self-observed performance against goal attainment, previous performance of themselves and of others or contribution to performance of the team (i.e., self-evaluation). They calibrate their causes of success and failure to their self-observed performance (i.e., causal attributions) and feel satisfied or dissatisfied during reflection by their performance (i.e., self-satisfaction). Athletes with high self-regulatory skills also modify their decision making and behaviour accordingly to adopt more proficient learning and self-regulation strategies to improve in the future (i.e., adaptive inferences; Zimmerman, 2000).

Despite the importance placed on developing self-regulation in athletes, relatively few studies have considered how athletes can develop their own reflection processes. Clearly and Zimmerman (2001) examined differences in self-regulatory forethought and self-reflection in adolescent basketball players. Findings showed that expert basketball players set more specific goals, displayed higher levels of self-efficacy, made more strategy attributions, and selected more technique-oriented strategies than non-experts and novices. Experts were also better able to relate their success and failure experiences meaningfully by using appropriate strategies to modify future performances (i.e., strategy attributions). More recently, Tan et al. (2016) investigated the effects of a guided reflective diary on elite archery accuracy and the factors facilitating and hindering the usage of a guided reflective diary. Elite archers reported that completing a reflective diary enhanced motivation, helped them forward plan, and enabled them to understand their feelings during shooting. Nevertheless, the process of keeping a reflective diary was also perceived as time consuming and repetitive in nature. It is therefore important to ensure that the methods used to promote self-regulatory skills are

efficient and athletes are challenged regularly to limit the negative impacts associated with repetition. Collectively, these findings highlight the importance of self-reflection, the factors that impact reflection efficacy, and ultimately, the processes underpinning the development of self-regulation. Researchers and practitioners should therefore consider the available reflection methods when striving to develop self-regulatory skills within athletes.

One method that has been previously used within practitioner (e.g., coaching and nursing) settings to promote reflection is Think Aloud (TA: Ericsson & Simon, 1993; Whitehead et al., 2016a). TA involves an individual verbalising his/her/their thought process continuously as they are performing. Ericsson and Simon (1993) proposed three levels of verbalisations. Level 1 verbalisation is simply the vocalisation of inner speech where the individual does not need to make any effort to communicate his/her/their thoughts. Level 2 verbalisation involves the verbal encoding and vocalisation of an internal representation that is not originally in verbal code. Level 3 verbalisation requires the individual to explain his/her/their thoughts, ideas, hypotheses, or motives.

Previous research within the sport psychology literature using TA has predominantly adopted the technique to collect in-event cognition (Kaiseler et al., 2012) and decision-making data (Whitehead & Jackman, 2021). For example, TA has been used to collect data of stress appraisals and coping in trap shooting, golf and tennis (e.g., Calmeiro et al., 2010; Kaiseler et al., 2012; Swettenham et al., 2018), expert-novice differences in planning strategies in golf (e.g., Whitehead et al., 2016b), pacing in endurance sports such as running and cycling (e.g., Whitehead et al., 2018) and decision making and anticipation (e.g., Whitehead & Jackman, 2021).

Despite the appeal of using TA to capture in-event cognitions, it is important to consider the reactivity that TA may elicit within a participant when engaging in the method. Reactivity refers to instances where participants may modify their behaviour as a result of being

measured or observed. In the case of TA research, the process of verbalising thoughts throughout the duration of a task may increase positive behaviour or increase negative behaviour (Double & Birney, 2019). Although Fox et al. (2011) found that level 2 verbalisations are nonreactive, Double and Birney (2019) highlight this potential issue where participants might attend to internal cognitions in a way that they would not have without thinking aloud. Nevertheless, thinking aloud could facilitate metacognition and possibly reflection during the performance of the task. Within Whitehead et al.'s (2018) study, some cyclists reported becoming more self-aware, and in turn, they felt that it helped their performance. Research is therefore needed to explore whether TA informs the self-regulation cycle.

The use of TA has been used as a reflective practice tool in a range of domains. For example, Banning (2008) adopted TA as an educational tool to develop and assess clinical reasoning in undergraduate nursing students. It is proposed that the process of thinking aloud facilitated the nurses to ''verbalise their thought processes and rationale for the types of questions that they ask during a history or physical examination and for the diagnostic examination and for the diagnostic hypotheses that they consider'' (Lee & Ryan-Wenger, 1997, p. 102). Conversely, Whitehead et al. (2016a) asked sports coaches to verbalise their thoughts during their live coaching sessions and partake in reflection by listening back to these verbalisations and by reflecting with their peers. Findings revealed an increased perceived self-awareness in coaching practice and a perceived improvement in communication and pedagogical practice. The evidence appears to suggest that practitioners developed self-regulatory skills and developed a sense of self-awareness of their own knowledge and thinking in relation to their context of practice. The facilitation of the meta-cognitive process (Banning, 2008) may aid self-reflection and discovery of ineffective thought processes.

A growing body of literature supports the importance of self-reflection in developing self-regulatory skills (e.g., Zimmerman, 1986; Jonker at al., 2010; Brick et al., 2015). Previous research has predominantly examined how coaches learn to reflect and how coaches stimulate reflection in athletes. Subsequently, there is potential to examine how TA may facilitate the process of self-regulation in golfers. Given the inherent limitations in using retrospective methods to facilitate self-reflection (Bernard et al., 1984), we sought to advance the knowledge base by examining the use of TA as a tool to promote self-regulation. Although TA was originally intended to capture naturalistic thought processes for research purposes, it is important to note that we employed TA to facilitate reflection. Therefore, the aim of the present study was to understand golfers' perceptions of using TA at two time points: immediately post performance and after a six-to-eight-week reflection period.

Method

Philosophical position

This study was underpinned by a realist ontology and constructivist epistemology. Ontological realism assumes that a reality exists, but that it is independent of the conceptions researchers have of it (Sayer, 2000), while epistemological constructivism posits that knowledge is theory-laden and fallible (Wiltshire, 2018). In accordance with to our philosophical stance, we recognise that knowledge can be refined, revised, or refuted (epistemological constructivism) and that the views reported by participants reflect real properties and events experienced by the participants, independent of the research (ontological realism). We adopted a qualitative approach to understand the subjective behaviours and beliefs of participants in terms of their use of TA as a reflective practice tool (Samdahl, 1999). We believe that our findings can be applied with reference to naturalistic generalisability, where readers may be able to take their own meaning from the findings (Tracy, 2010; Smith, 2018).

Participants

Using personal contacts of the second author, we approached participants via email. The second author had existing rapport with the participants due to her professional involvement at the golf club where the data was collected and participants regularly attended (Smith & Sparkes, 2016). Purposeful sampling was used to capture a broad skill level of golfers (Braun & Clarke, 2013; Sparkes & Smith, 2014). Similar to sample sizes used in previous research that have captured perceptions of TA to facilitate reflection (e.g., Whitehead et al., 2016a; Swettenham & Whitehead, 2021), participants were six golfers from a golf club in the South of England (5 males, 1 female; age: M = 30.8 years, SD = 14.8; handicap: M = 6.92, SD = 3.9). We recruited two high skilled golfers (handicap ≤ 5.4), two intermediate skilled golfers (handicap 5.5 – 12.4) and two low skilled golfers (handicap ≥ 12.5). Participants had an average of 11.2 (SD = 4.9) years competitive playing experience, played at least once per week and had played an average of 12.2 (SD = 10.5) competitions in the 12 months prior to participation. All participants identified as white British. Institutional ethical approval and informed consent were obtained prior to participation.

Materials

TA training video

Participants were instructed on how to TA using a training video developed by Birch and Whitehead (2019). The video consisted of visual and verbal instructions and provided participants with an understanding of how TA works so that participants could competently perform the technique. In line with Ericsson and Simon's (1993) guidelines, example instructions included "think aloud involves you saying out loud everything that you are thinking as you are performing the task." Given that we aimed to examine level 2 verbalisation, we used instructions to promote level 2 verbalisation and deterred level 3 verbalisation (e.g., "I don't want you to try to plan out what you say or try to explain to me

what you are saying"). It is important to note that we instructed participants to refrain from thinking aloud during skill execution to reduce possible interference with motor movement (Schmidt & Wrisberg, 2000). The remainder of the video comprised of three different hypothetical golf scenarios (tee shot, fairway shot, green side shot) that required participants to think aloud their planning strategies. The TA training video was 4:14 minutes in duration (see Birch & Whitehead, 2019).

Procedure

We conducted a pilot study using one intermediate skilled male golfer (handicap of 7, 13 years competitive playing experience) who completed the full procedure. The participant was confident that the TA training enabled him to understand how to competently TA and that three practice holes enabled him to apply the technique on the golf course. The participant also stated that the equipment (e.g., microphone) did not hinder his performance.

Interviews were conducted as a method to explore participants perspectives, experiences, emotions, and personal meanings of experiences of TA (Smith & Sparkes, 2016). Data collection was completed by the second author, who had a high level of golf knowledge and experience. It may be inferred that the quality of information gained from the interviews was enhanced by the researcher's involvement in data collection. Additionally, the existing rapport between the researcher and participants during the on-course TA may have allowed for more honest and authentic verbalisations from the participant. Finally, the second author was familiar with TA in that they had previously completed traditional TA training (Ericsson & Simon, 1993), golf specific TA training (Birch & Whitehead, 2019), and completed six holes of golf using TA as part of their familiarisation to the procedure adopted.

Participants viewed the TA training video using an Apple iPad and Sony MDR ZX660AP headphones. During the training exercises, the researcher ensured the participant was competently thinking aloud in accordance with Ericsson and Simon's (1993) guidelines.

Participants then completed three holes of golf while thinking aloud to apply the learned principles of TA. Feedback was given in instances where the participant deviated from the previously outlined instructions (e.g., 'you are not required to explain your thoughts while thinking aloud'). Data collection did not take place until the researcher was satisfied with the quality of verbalisation which was classified as when the participant no longer needed prompting to verbalise all their thoughts, the participant's thoughts were characteristic of level 2 verbalisation, no level 3 was evident (although impossible to fully determine), and the participant did not verbalise their thoughts during shot execution.

Participants then individually completed six holes of golf on their home course whilst thinking aloud. The researcher walked behind the participant and there was no communication beyond reinforcing the need to TA (Nicholls & Polman, 2008). If the participant did not verbalise their thoughts for 20 seconds, the researcher would state the phrase "please think aloud." In an effort to facilitate authentic performance cognitions, participants were told they were competing against each other with the lowest nett score (total shots taken minus handicap) winning a £30 pro shop voucher. Research by Baumeister and Showers (1986) has used similar means to facilitate competitive state emotions and research by Nicholls and Polman (2008) deemed six holes to be sufficient to gather authentic in-performance cognitions in golf. To manage this competitive element, the researcher recorded the participants' scores on each hole, calculated the participants' nett scores and updated a leaderboard of the nett scores. To maintain a consistent level of pressure experienced between participants, the researcher did not reveal the participants' competitors scores until after they had completed the six holes. To ensure confidentiality, names and handicaps of competitors were not shared to the participants when scores were conveyed.

Immediate and follow-up interviews

Immediately following the completion of the six holes of golf, participants completed the immediate interview in the clubhouse. Participants were then sent an audio file with their TA from the six holes of golf and were required to listen to their verbalisations. Follow-up interviews took place at the golf course clubhouse six-to-eight-weeks after the six holes of golf. During this six-to-eight-week period, participants were not instructed to continue to use TA, but were not restricted to do so if they desired. During this period, participants listened to their on-course TA recording and reflected on their experience.

To examine participant experiences of using TA and listening back to their audio verbalisations, we conducted semi-structured follow-up interviews. The follow-up interviews were conducted with the aim to increase the richness and depth of data captured by offering a personal insight into participant experiences (Newton & Burgess, 2008). Using Page and Thelwell's (2013) guidelines, an interview guide was developed based on the aims of the study and previous research that has used TA as a reflective tool (e.g., Whitehead et al., 2016a) to help facilitate the gathering of rich, in-depth data (Smith & Sparkes, 2016). Example interview questions for the immediate interview included 'what aspects of TA have been specifically useful/not useful for you?' Example follow-up interview questions included 'can you tell me about your experiences of reflecting upon your use of TA?' Probing questions (e.g., can you provide me an example?) were used to glean more in-depth understandings of participant experiences in both interviews. Immediate and follow-up interviews ranged from 11 mins 15 secs to 19 mins 33 secs and 13 mins 48 secs to 20 mins 36 secs in duration, respectively.

Data analysis and research credibility

All audio interview files were transcribed verbatim. Interviews ranged from five to eight pages of A4 1.5 spaced text and between 2465 - 3409 words. We conducted a thematic analysis to explore participant perceptions and beliefs regarding TA (Braun & Clarke, 2019).

To ensure credibility and trustworthiness a team approach to analysis was employed with the aim of promoting critical reflexivity rather than consensual agreement (Braun & Clarke, 2019; Smith & McGannon, 2018). We engaged in a reflective thematic analysis process (Braun & Clarke, 2021) and began by reading all transcripts of interviews (immersion in the data) in Nvivo 10 (step 1). Once complete, we developed a list of codes from the first two sets of interviews. To further emphasise credibility, the initial codes were reviewed as a team and considered (step 2). Collaborative coding is supported by Saldana (2013) as it allows a "dialogic exchange of ideas" (p. 34) that support interrogation and discussion from multiple perspectives. Following this critical review, codes were amended and definitions of codes were established. At this stage, all authors engaged in peer debriefing through formal meetings (Creswell & Miller, 2000) and discussed the aim of the study and how interpreting the data related to both our own biases as researchers and our interpretations of the interviews. One discussion concerned the third author's biases towards using TA as a self-reflection tool and this discussion enabled the remaining authors to challenge some of these initial codes. At this stage, we generated 25 codes. We agreed that these codes would be condensed into four main themes, however, a discussion on the agreement of these themes included changes of theme names. Specifically, 'becoming aware of lack of focus' was changed to 'increased awareness,' 'reinforcing positive behavior' was changed to 'awareness of how behavior influences performance,' and 'recognizing negative behavior' was changed to 'disruption of thought process and performance.' The theme 'application to coaching' remained the same. We felt these updated theme names better represented the data and the aims of the study.

The codes were then adopted as a starting point to analyse the remaining transcripts. Once all interviews were coded, the second author searched for themes across all codes (step 3). Once more, these themes were reviewed by the third author (step 4). In light of the

potential limitations of inter-rater reliability, an external and independent researcher acted as a critical friend to ensure data collection and analysis was plausible and defendable (step 5; Smith & McGannon, 2017). This step was continued during the peer review phase. During this stage themes were reviewed and through a team discussion, the main theme names were modified, and sub-themes were identified. Therefore, we developed the results via an iterative process of theme generation. These additional sub-themes provide the reader with more detail and insight into the findings of the interviews conducted. Following this final stage of refining and naming of themes, we generated our findings (step 6) which are presented in the following section.

Results

We present the themes and sub-themes that were generated from the data. An increased awareness of golfer's thought processes relative to their performance was present throughout all interviews. Within this increased awareness emerged many more specific themes, such as being aware of drifting and losing focus and an awareness of overthinking. In addition, participants were able to articulate how they became aware of their thoughts impacting their performance. More specifically, golfers recognised the presence of positive routines and how their emotions or negative reactions may have influenced their performance. Although TA was reported to have positive benefits, we generated a theme relating to the disruptions of thought processes and performance. This theme linked to how some participants found it difficult to verbalise thoughts following less successful shots and how TA disrupted putting performance. Finally, participants reported the potential benefits of TA within a coaching context and recommended specific suggestions for a coach using TA to gain an understanding into a golfers/client thought processes.

Increased awareness

Increased awareness refers to how participants became aware of different elements of their thought processes. Specifically, within this theme, being aware of drifting through the use of TA and being able to prevent this was evident. In addition, participants reported being aware of their overthinking and how TA had helped them to understand their own thought processes.

Drifting

The term drifting refers to when a participant recalled thoughts relating to past experiences, projected thoughts into the future and/or thought about irrelevant cues. The participants in this study reported that they became aware of this drifting and as a result were able to reverse this process. Participant four explains below:

> When I hit the pitch left, I was pretty pissed off about it, but by the time I had got to the next chip I had verbalised that I was pissed off about it, but I can do a little chip up and putt her in and it will still be a par … I think it helped me see that something that I do struggle with is how I often drift off and find myself not thinking about shots at all and that's when I can cock up (P4, immediate interview).

Again, this idea of not being focused on the present performance was also reported by participant six who explained how he realised that he was not fully focused on his performance. Nevertheless, he recognised this within the interview and explained how he was able to reflect as a result of using TA:

> This (TA) has actually made me realise that there's a process that I need to go through every time and to keep that focus really. I've realised that I need to work on my concentration and every ball you go to hit you have to approach in the same manner and just try and make sure you get that process of talking through what you're planning on doing and don't get distracted like I do when I'm playing in a

competition … I think that is something that I need to do when I'm playing in a competition, it's worth focusing in on it (P6, follow-up interview).

This theme was also evident in participant one, who reported how her mind wandered. Nevertheless, using TA enabled the participant to be more focused on her game:

I find that my mind wanders and that is kind of the same with golf. When it is in your sub-conscious your mind wanders and does other things, but when you're having to actually say it out loud your mind is focused on the words you are saying so I can see that would be useful. (P1, immediate interview).

Awareness of overthinking

This theme represents participants experiences of having too many thoughts during performances, which was perceived to have a detrimental impact on performance. Participant one articulated how using TA raised awareness of the number of thoughts present during performance:

The most interesting bit (about TA) is that I think I need to improve on the most is the preshot. …You know I think there's a couple times where I say 'make a full turn' and talking about the backswing. In my own head that means about five things … There's way too much stuff going on in my head. Rather than doing all the analytical bit, pick the shot and then go right 'commit to hitting the shot' (P1, immediate interview).

Participant one reinforced this idea of overthinking in her follow-up interview, where she recognised how TA could help herself understand how much she should be thinking during her performance. In the following quote, participant one is referring to how TA could help understand this: "Sometimes not having too many thoughts can be a good thing, but I think there's a balance to be had and actually knowing where you've got too many thoughts or not enough thoughts could be quite helpful."

Participant two echoed the notion of having an optimal number of thoughts in that he reported how he sometimes get into a loop of overthinking. Although participant two did not report any immediate change or improvement in performance, they became aware of the effect or danger of overthinking:

> I realised (through using TA) the dangers of how sometimes I'm overthinking. I have this tendency to think about my own thinking and it can be a dangerous loop for me to get into. I think that it (TA) highlighted this for me even more (P2, follow-up interview).

Awareness of how behaviour influences performance

This theme refers to how participants not only became aware of their thought processes, but also how being able to articulate their thoughts impacted their performance. A range of sub-themes were identified, namely, following a set thought process, reflecting on emotional instability, and learning from TA.

Following a set thought process

Participants reported that using TA enabled them to be more aware of some of the more positive processes that they followed. The theme of following a set thought process refers to how some participants became aware of the pre-performance routines or thought processes that they perceived as being positive to their performance. Participant one reported how TA allowed them to illuminate their methodical thought process:

> It (TA) made me aware of the processes I go through. For example, before the shot I would go through the same thing of; 'ok what's the wind doing?' 'Where's good to go on this hole?' 'Where's a good miss?' 'What kind of shot shape do I want?' 'What club am I hitting?' 'Is it the right club?' Going through it quite methodically definitely helped me see how I'm quite methodical (P1, immediate interview).

The perceived benefit of being aware of one's thought processes was also evident in the follow-up interviews:

> Yes, I think it (TA) reinforced what I think I do; 'what's my yardage?' 'What club am I going to use?' 'Where am I going to aim the shot?' 'Am I going to have to take more club or less club because it's uphill or downhill?' I think it reinforces that I actually do that even though I'm not sure in my normal process that that's a conscious thought but it was quite reassuring that I do go through that process (P1, follow-up interview).

Participant four echoed this perceived benefit in that TA reinforced the process or routine that he followed: "So that's the good bit in confirming that I think I've got a fairly good routine and reinforcing that has helped me understand and confirm my own process" (P4, immediate interview).

Reflecting on emotional response

The theme of reflecting on emotional response refers to how using TA enabled participants to identify negative emotions during performance. Participant three explains how listening back to his TA audio file reinforced some of his original thoughts about his behaviour on the course and allowed him to see how he could improve his performance as a result:

> Listening back to it (TA) was really useful as well. I can learn what makes me angry and … eliminate that from my game and don't let it bother me too much. Hearing on a scale of how angry I get and I will be able to remember the shot I am sure. So yeah, measuring my temperament and what my limits are (P3, follow-up interview).

Furthermore, participant five reflected on how he is hard on himself and he acknowledged how he needed to be more positive and focused on his good performances:

> Generally, when you're playing on your own or whenever it may be, you do focus on the bad because that's what needs improving … Being a bit kinder to myself when I do hit a good shot can be really useful and maintain a positive mind-set. That is something that I need to do more as I am very hard on myself as I found throughout the TA (P5, follow-up interview).

In his follow-up interview, participant three explained how he felt embarrassed after listening back to his audio file, due to his language and swearing. Nevertheless, he was able to reflect on this and consider how he has become calmer as a result:

> I used to be quite well contained but it sort of built up and built up and built up so if I ever did have a bad hole it ruined the rest of my game and I'd swear a lot. Whereas now I try and be a lot calmer and when I walk off the green I can go onto the next tee with no worries because I have got it out. So, yeah quite embarrassing (listening back to TA) would be the best way to describe it (P3, follow-up interview).

Furthermore, participant four reinforces how he developed awareness of their emotional responses to performance and how they might be able to rationalise this in future performance:

> As I was speaking aloud it made me more aware of the situation, almost aware of the emotional response I was giving to it. The main thing was making me aware of the current situation rather than losing my head over a shot (P4, immediate interview).

Disruption of thought process and performance

The use of TA itself was reported to cause some disruption to thought processes, and in some participants, to performance. Specifically, it was reported that verbalising unsuccessful shots and performances was sometimes difficult and some participants may employ an avoidance focused coping strategy of ignoring this perceived negative

performance. In addition, putting performance seemed to be most affected, especially when participants first started to use TA during this skill.

Difficulty verbalizing and evaluating negative performance

It is important to note that participants acknowledged the process of TA to be challenging at times. For example, participant six reported the potential difficulties of verbalising his thoughts after a bad shot. Although this highlights how TA has potentially changed the focus of his natural attention, the following quote provides evidence of how this illumination of negative behaviour has been used to improve his thoughts process:

> Something that I found particularly difficult when thinking aloud was verbalising everything even when I'm hitting a bad shot. If it is something that is an unforced error and it's not necessarily the fact that my swing was bad, I just didn't hit the shot that I wanted to and it was just a one off maybe. I would maybe overlook it but where I'm verbalising everything I'm kind of focusing more on the bad shots which actually turned out to be really positive because I'm really focusing on those shots and making sure that I don't do them again and making the same mistakes again (P6, follow-up interview).

Participant four also explained the potential difficulties of verbalising less successful performance. This links to the emotions that are elicited following both positive and negative outcomes. Participant four, perceived the negative emotions following an unsuccessful performance to be a potential issue when using TA:

> If someone was playing bad I think it would be harder for them to say their true thoughts. I would probably struggle with it a bit more because you know you get emotional when you play badly or you miss a putt. (P3, follow-up interview).

Potential distraction to performance

This theme refers to some participants reporting how TA could possibly act as a distraction to their performance, especially when verbalising thought processes while putting. For example, participant two reported how he initially thought more about TA and less about his putt, which resulted in a negative outcome: "especially with the putts at the start, it affected me quite badly, because I was focusing more on speaking aloud at times rather than my actual shot" (P2, immediate interview).

One participant reported being distracted during putting performance due to his putting routine being visual and how having to verbalise his thoughts directed his attention away from the visual cues he would usually use when putting:

> I am visual with putting. I'm like 'that is the spot I want to hit it on', and if I'm talking to myself I'll almost forget where that spot is and if I don't look at it again, I have to keep looking at the spot until I'm like that is exactly where I want to hit I now. If I keep talking I put myself off where I'm trying to aim. Even though I'm saying where I want to aim it, I've lost that visual connection with my reference point. So as a result, on putts, I found it a lot more difficult (P4, follow-up interview).

The potential issue of TA being a distraction during putting is an important consideration for how TA is employed and in what environment. For example, the evidence may suggest that TA is best used in practice conditions only, given that it might be detrimental to competitive performance.

Application to coaching

All participants recommended the use of TA as a useful coaching tool. Although this is only from the perspective of the golfer and not the coach, participants reported how the coach could use TA to understand, monitor, and challenge the golfers thought processes. Participants stated that coaches could use TA to better understand their player's thoughts, and in turn, be able to implement appropriate coaching interventions as a result. Specifically, the

sub-themes of gaining an insight into a golfer's thought process and coach intervention were identified.

Gaining an insight into a golfer's thought process

Our participants reported how TA could help the coach to gain an insight into what the golfer is thinking:

> I could see how actually articulating (TA) is actually quite useful from a coaching perspective, because if you're actually articulating what you're thinking your coach knows whether you're actually going through a routine to your thinking which is actually quite important and whether you're actually thinking in the correct way (P2, follow-up interview).

Participant four also provides support for the use of TA in coaching, specifically when making the coach aware of the golfer's thoughts relating to course management and focus:

> If you've got an athlete that you feel has poor course management, is thinking the wrong thoughts or is losing their head at some point in the round then you can use think aloud to assess what they are thinking and see where you might be able to change it (P4, follow-up interview).

Coach intervention

Through providing an awareness of thought processes, it was suggested that this could lead to a range of possible coaching interventions. Participant two explains the potential benefits of using TA as a remote coaching tool, where a coach could gain insights into their golfer's thought process and then suggest relevant coaching points:

> I think it (TA) gives a coach … an idea of the routine that you're going through and it would enable them to help you by making suggestions by saying you're doing this, how about if you try and do x, y and z. I can see that it would have benefits. Good things that you're doing, bad things that you're doing, things that my help. Also, if

you've got too much going on in your head or perhaps not enough going on in your head (P2, immediate interview).

Participant five explains how using TA could enable the coach to identify when an athlete's thoughts may disrupt their performance and allow the coach to challenge the player and interrogate their thought processes at certain points of their game:

For coaching it is a positive thing because the coach can pick up on 'why were you thinking that there?' 'Why were you thinking this here?' When you hit a bad shot and you let it get to you. … I think from a coaching perspective the coach can turn around and say 'why do you think that way?' 'Why are you so harsh on yourself?' (P5, follow-up interview).

Discussion

The aim of the present study was to understand golfers' perceptions of using TA at two time points: immediately post performance and after a six-to-eight-week reflection period. Using Zimmerman's (1986, 2000) self-regulated learning theory as a guiding framework, we were able to provide an original contribution to the literature by elucidating how using TA might promote self-reflection, and ultimately, self-regulation in golfers.

One major finding from the present study is that TA appears to have developed an increased level of self-awareness in golfers. This finding is represented by both the increased awareness and awareness of how behaviour influences performance theme. According to Zimmerman (2000), reflection is a sub-component of metacognition that relates to awareness of and knowledge about one's thinking and learning. The golfers in the present study appear to have developed their ability to evaluate their own thinking by a process of self-reflection. In line with Zimmerman's (1986, 2000) self-regulated learning theory, it appears that using TA facilitated self-judgment as reflected by participants being aware of the consequences of their thoughts and behaviours. The process of self-evaluation was facilitated as golfers

appeared to compare their self-observed performance against goal attainment, and in turn, calibrate the causes of success and errors to their self-observed performance (causal attributions). For example, close inspection of participant four's quotes suggest that he attributed performance errors to controllable processes that may sustain motivation as he implies that developing a strategy to manage drifting may lead to future success (Zimmerman, 2002).

Despite the findings of the present study suggesting that TA developed self-awareness through reflection, participants did not report using TA as a reflective tool between the immediate and follow-up interviews. Subsequently, participants did not engage in the sub-process of adaptive reactions as there was an absence of effort to adjust one's method of learning. Individuals who judge their success and failure as opportunities to learn may develop a more adaptive attribution style, which in turn, may enhance emotional control (Zimmerman, 2000). Given the absence of adaptive reactions, caution should be taken when interpreting the findings regarding the extent to which an improvement in self-regulation was identified. Notwithstanding, these collective findings illustrate the reported benefits of TA and its capability to facilitate increased self-awareness through the process of self-reflection.

Golfers reported that TA could be used by the coach to better understand their golfers thought processes, and in turn, implement coaching interventions. These interventions could cover a variety of areas such as pre-performance routines (e.g., monitoring pre-event anxiety symptoms), performance strategy (e.g., pacing strategy), and psychological strategies aimed at responding to stressful situations (e.g., monitoring attentional control strategies). Researchers (e.g., Swettenham et al., 2018; Kaisler et al., 2012; Whitehead et al., 2016a) have supported the notion that TA could be used as a performance enhancement tool by coaches and sport psychologists. To date, only one study has explored a sport psychologist's use of TA to improve emotional control in a tennis player (Moffat et al., 2021). Therefore, more

552 research is needed to develop a better understanding of how practitioners may employ TA
553 within their practice.
554 One suggestion could be to focus on how coaches challenge athlete learning. Hansen
555 and Anderson (2014) suggest that challenging an athlete's reflection may enhance more
556 reliable learning experiences. Hansen and Anderson (2014) present the concepts of the coach
557 being the sense-giver and the athlete being the sense-maker, where the coach's role is to
558 stimulate athlete reflection through intervening in the sense-making process. This process of
559 sense-giving is where the coach challenges the way the athlete perceives and interprets
560 training advice (Jones et al., 2012). Sense-giving interventions involve giving direction to
561 athletes via training plans, observing and interacting with the athlete, encouraging the athlete
562 to reflect on their training, and asking challenging questions (Hansen & Anderson, 2014).
563 Using TA may provide an additional method of sense-making for the athlete where they are
564 able to not only self-reflect, but also have their TA challenged by the sense-giver (coach).
565 Given that self-regulated learners are eager to challenge established behavioural patterns
566 (Zimmerman, 1986, 2000), using TA alongside the sense-giving process may provide a
567 fruitful means of developing highly valuable self-regulatory skills in athletes. Further
568 research is therefore warranted to examine the collaborative use of TA in developing self-
569 reflection, and possibly self-regulation, in athletes.
570 As can be seen from the themes, golfers reported both positive and negative
571 perceptions of using TA. Participants reported that thinking aloud helped identify problem
572 areas (e.g., drifting) in their game. Being able to identify drifting of focus and concentration
573 is a key component of successful performance in that drifting into the past or the future may
574 inhibit performance (Wilson et al., 2006). Therefore, being able to identify this drift through
575 the use of TA is an important finding for the present study. Despite participants not reporting
576 using TA between the immediate and follow-up interviews, they did, however, consider

applying what they had learned to competitive environments. For example, participants reflected on how they could apply the use of TA to competitive environments, where this drifting could be identified to improve their focus. The six-to-eight-week reflection period and the process of listening back to one's TA were also perceived positively by participants. Participants reported the benefits of listening back to their TA and the collective findings encompassed by the increased awareness and awareness of how behaviour influences performance themes highlight the value and positive perceptions of golfers using TA.

Despite the reported benefits of using TA, some golfers revealed concerns about using TA in that it caused disruption in thought processes and performance, especially after executing poor putts. The theme of disruption of thought process and performance highlights the prevalence of reactivity from thinking aloud during performance. This evidences how metacognition occurs where participants are potentially becoming more aware of their thoughts and decision-making by virtue of TA directing attention towards the conscious process. Indeed, a recent review of reactivity to measures of metacognition argued that TA may cause reactivity whereby participants may attend to internal cognitions in a way they would not have ordinarily done and may be compounded by the nature of their verbalisations being recorded (Double & Birney, 2019). Although metacognition has been associated with positive developmental (e.g., Lior, 2004; Theodosiou & Papaioannou, 2006) and performance benefits (e.g., Jonker et al., 2011; Nietfeld, 2003), it may also promote conscious control of movement that is argued to potentially hinder skill execution. According to Masters' (1992) theory of reinvestment, automated motor processes can be disrupted if the performer tries to consciously control skill execution. Research (e.g., Pijpers et al., 2005; Wan & Huon, 2005) has generally supported the contention that consciously controlling movement hinders performance in conditions of high anxiety. Given that participants in the present study used

TA under simulated competition conditions, reinvestment theory could explain the discomfort experienced.

Nevertheless, this element of reactivity and leading participants to attend to internal cognitions becomes somewhat of a double-edged sword. By becoming aware of these thought processes, golfers may increase his or her understanding of how their cognitions impact their practice, and in turn, potentially develop self-regulatory skills to facilitate more effective learning (Zimmerman, 1986, 2000). Conversely, directing one's attention towards cognitions that underpin skill execution can potentially hinder performance. Stephenson et al. (2020) found that coach's use of TA during practice enabled them to become more aware of their own cognitions and coaching behaviours, yet TA also became a distraction from the task of coaching and thus negatively impacted overall coaching performance. Despite the overwhelming body of literature supporting the use of TA as a valid and reliable means to capture in-event cognitions (for a review, see Fox, Ericsson, & Best, 2011), the present study highlights the need for researchers and practitioners to acknowledge the potential for reactivity when using TA as self-regulation tool. This also leads to considerations about the learning of TA and that it is a skill. Initially, participants may become distracted as they are in the cognitive phase of learning (Fitts & Posner, 1967). Consequently, researchers should consider the length of TA training to overcome such impacts.

Although this is the first study to consider the use of TA as a tool to facilitate self-regulation within athletes (golfers), it is important to acknowledge the limitations of the study and consider how future research may develop this area further. We understand that reflection is more than just listening back to your thoughts. Future research may consider how the wider social environment and development of the individual athlete plays a role in how they reflect and engage in the TA process. Using TA in isolation also means that participants are only able to self-correct, which may result in an individual only knowing what they know or not

knowing what they don't know. Howell (1982) termed this phenomenon unconscious incompetence. This may explain why participants acknowledged the importance of using TA collaboratively with their coach. Research within coaching has emphasised the role of guidance or a critical friend in enhancing reflections (Szedlak et al., 2019). Furthermore, using TA through a collaborative process with other coaches has also been suggested in previous research (Stephenson et al., 2020). Future research should therefore consider triangulating methods (e.g., performance measures) and gaining perceptions of others (e.g., the coach).

Due to the exploratory nature of the present study, participants were instructed to listen to and reflect upon TA audio using an open and unstructured process. We acknowledge the benefits of structured reflection approaches and encourage researchers to harness frameworks (e.g., Gibbs' reflective cycle; Gibbs, 1988) to facilitate deeper reflections. We also acknowledge that caution should be taken when interpreting the findings regarding the extent to which an improvement in self-regulation was identified. We encourage researchers to analyse TA content and/or harness follow-up interviews more explicitly to assess changes in self-regulation to further shed light about the use of TA as a tool to promote self-regulation in athletes.

Furthermore, it is important to consider and acknowledge how reactivity, metacognition, and reflection are also very individualised processes, where some individuals may benefit from reporting on their metacogntition, while others may be impaired and some do not react at all. This was evidenced by Whitehead et al. (2018) where some cyclists reported perceived benefits of using TA "it helped me pace myself better" (p.106), whereas others reported negative reactivity "it slowed me down" (p.106) and others reported no reactivity "I was probably as per normal" (p.106). The absence of any long-term follow-up interviews and the lack of questioning surrounding participant's effort to adjust one's method

of learning limit the scope of the study to reveal the wider implications of using TA to develop the broader self-regulation process. Therefore, we encourage researchers and practitioners to examine how TA could be used longitudinally and how the content of TA may change with the potential development of self-regulation skills.

Conclusion

The aim of the present study was to glean golfers' perceptions of using TA, and ultimately, to advance understanding of its use as a tool to promote self-reflection and self-regulation in golfers. Talented athletes are more likely to self-reflect during athletic performance in comparison to lower-level peers (Jonker et al., 2011). Therefore, it is important that research and practice considers how best to facilitate this process within the athlete population. More specifically, using TA may help athletes to better understand how they think and feel within real-time performance in comparison to retrospective reflections such as diary methods (Tan et al., 2016). Although the present study does pose methodological questions for research using TA as a data collection tool for capturing naturalistic cognition, TA offers a potential tool to promote self-regulation for golfers and other athletes who wish to self-evaluate their in-situ thought processes. Researchers are encouraged to examine the use of TA as a self-regulation tool to further support or challenge these preliminary findings.

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