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How Do Coaches Operationalise Long-Term Technical Training in Elite Golf?

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Running Head: LONG-TERM TECHNICAL TRAINING IN ELITE GOLF

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Abstract

Long-term training is a common approach within the applied setting for components of physiology and strength and conditioning, for example. However, less is known about the reality of training across similar timescales from a technical perspective. Taking the highly-technical sport of golf, current research rarely considers coaching technique beyond a single-session, nor with the aim to understand the *reality* for, or challenges faced by, coaches working at the elite-level. Accordingly, this qualitative study explored the goals, structure and methods of coaches' long-term technical work with players at macro, meso and micro levels. Findings revealed, (a) coaches attempted to undertake technical refinement with players but without a clear systematic process, (b) there is little coherence and consistency across the levels of work, (c) the process and timescales of technical work is considered unpredictable and uncertain and, (d) long-term planning is seen as subservient to meeting players' immediate performance needs. These results highlight the complexity of long-term technical work at the elite level and the need for coaches to develop both a sound and clear rationale through a more comprehensive case conceptualisation process, as well as a greater alignment to the scientific literature, in order to advance future practice.

Keywords: decision making, professional practice, skill development, technical refinement

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Within professional sport, coaches strive to promote peak athletic performance at key events, often across yearly and/or quadrennial cycles. Indeed, this level of planning is highly embedded within strength and conditioning for instance, where, through the utility of structured progressions, training is intended to induce desirable adaptations to optimally support sport-specific functioning; a process termed 'periodisation' (Bompa, 1983). Emerging evidence also suggests that such planning approaches can usefully inform work with athletes beyond the physiological, such as the delivery and development of mental skills (Blumenstein & Orbach, 2020), optimisation when performing and learning risky skills with a high emotional load (D. Collins et al., 2018) and training new tactics in team sports (Tamarit, 2015). There are several advantages to long-term planning in this regard. Firstly, the variety of athletes' needs will differ in how long they realistically take to implement, therefore, this needs consideration against other performance factors. Secondly, it promotes a necessary focus and motivation to achieve improvements. Thirdly, it can proactively help address known and meaningful challenges, such as demanding performance conditions or a transition due to aging. However, not all support disciplines have explored long-term planning in detail or from an applied perspective, such as technical, or skill development, specialists (Farrow & Robertson, 2017). Therefore, this paper focuses on the applied demands and practices of coaches working within the highly technical sport of golf, to better understand what is happening at the elite-level.

As already identified, periodisation is commonly used when planning long-term interventions (Lorenz & Morrison, 2015; Plisk & Stone, 2003). Whilst there are multiple definitions of periodisation, physiology-based literature explains it as essentially a systematic method to control a training response by varying the load in preparation for performance (Mujika et al., 2018). When there is a known and pre-determined 'peak' to work towards, this

process is considered more efficacious than using a random approach or overusing a single method (Plisk, 2004). Accordingly, a key principle of periodisation is the division of time into cycles of various training goals. Micro-cycles refer to the shortest duration and represent what will be achieved within a single or small number of training sessions, typically lasting for about a week. Combining these micro-cycles to realise a specific component of the overall intention is called a meso-cycle; that is, a 'phase' within a more complex process and lasting in the region of weeks or months. Finally, the conceptualisation of different meso-cycles over a long-term timescale of many months or year(s) is called a macro-cycle. Importantly, implementing periodisation in this way relies on coherence to address the underpinning mechanisms of a particular training need. Examples of where periodisation has been reported within the literature include cycling (Rønnestad et al., 2014), kayaking (García-Pallarés et al., 2009) and swimming (Pyne, 1996). Interestingly, these sports typify the literature in that they mainly feature continuous/cyclic and/or open skills, but notably under-address closed, self-paced and discrete skills such as in golf, nor do they relate to a technical perspective. Despite its intuitive sense, periodisation has been criticised. For instance, linear and generalised templates do not cater well for sports requiring multiple peak performances per year rather than once every 4 years, nor does every athlete respond biologically in the same way (see Kiely, 2018). In principle however, these ideas can still be useful, but must be critically considered against complex contextual and individually specific demands. Whether, or how, these ideas reflect elite-level technical golf coaching, therefore, remains a necessary area of research to better support the transition from training to competition (Orr et al., 2021).

A scarcity of periodisation research in this context *could* be due to perceived theoretical incoherence. For instance, traditional information-processing approaches to motor learning explain that once a movement has been learnt, the athlete is in a final autonomous stage, whereby there is limited need to attend to the execution (Fitts & Posner, 1967). From

an ecological approach, technique is self-organised based on unique perception-action couplings *emerging* from the interaction of task, organismic and environmental constraints; in other words, technique is continually adaptive and should not be prescribed (Davids et al., 2013). Therefore, from these fundamental perspectives it is unclear *what* needs periodising at the elite level. However, applied research and practice tells us that being able to achieve and maintain effective technique is challenging during elite athletes' performance. Indeed, even at the top level, technical issues can manifest as regressions or losses in the execution process which, could be due to how the movements are practiced (see Day et al., 2006) or when protecting against an old injury (see D. Collins et al., 1999). Although 'lost move syndrome' and technical blocks are rare, athletes must prepare to maintain specific confidence and trust in their technique (Beaumont et al., 2015), know how to recover when debilitative technical thoughts take over and interrupt the execution (Montero, 2015), manage the transition between successful subconscious (e.g., flow) and conscious (e.g., focus on 'core' action components) performance states (Bertollo et al., 2016), be capable of adapting their technique for less familiar situations (Toner & Moran, 2015), prevent bad habits or interference caused by previous coaching experiences from creeping in (Carson & Collins, 2014; Huys et al., 2009) and make small but long-term permanent and pressure resistant tweaks or refinements to their movements in response to a range of internal and/or external factors (Carson & Collins, 2011). So, contrary to fundamental theory, efforts to ensure effective technical execution are a constant feature of high-level performances (see Carson & Collins, 2020). Consequently, working to achieve these exemplar outcomes requires consideration of processes and associated timescales governing skill execution control, or what Carson and Collins (2016a) call the 'motoric dimension'.

Whilst periodisation has historically been a tool to plan for a specific major event (i.e., the Olympic Games), elite level golf is unique due to players competing up to 35–40

weeks per year and in many instances, during what is normally seen as the off season (i.e., October–March; EuropeanTour, 2021). Indeed, each week players are confronted with a variety of conditions and course layouts as they tour the globe between events, placing a high demand on technical precision, reliability *and* adaptability. In professional golf, there is huge earning potential where, for less established players, earning enough money to maintain playing rights for the following year is often a high priority. Therefore, *every* week is important and puts pressure on the need for effective technical execution. This provides unique challenges for the support team of not just *what* technical work to undertake, or *how* this work will be implemented, but *when* this will occur within such a congested schedule. Timing therefore is critically important. At present, however, the dearth in research to better understand such demands and working practices limits the ability to make evidence-based inroads for enhanced support provision. Against a variety of athlete needs, planning must consider 'what' and 'how' outcomes can be delivered and, for the best chance of getting these two right, know 'why'.

Within golf, much research has concerned micro-level interactions. For example, Toner et al. (2012) examined coach behaviour during a reflective account of a single coaching session. More recently, Orr et al. (2021) examined the nature and rationale of attentional cues used by coaches with elite players during a single coaching session. In contrast, Schempp et al. (2004) studied expert coaches working with beginners during a single session. Carson et al. (2013) interviewed elite players and coaches and surveyed high-level golfers to understand the longitudinal processes employed and nature of technical refinement in already well-established golf skills. Whilst these exemplar investigations have merit, there are clear limitations, particularly relating to longer-term and *broader* mechanisms, practices and challenges needing to be addressed in the real-world of elite-level golf.

Therefore, the purpose of this study was to explore the nature of and underpinning rationale for elite-level coaches' long-term technical work with their players. More specifically, it aimed to explore the goals, structure and methods on a macro, meso and micro level and the rationale for the approaches taken. Ultimately, we wanted to develop an initial account of elite coaching practice in long-term technical work to inform other coaches and their support practitioners; and against which opportunities for a realistic 'next step' progression in this underexplored area across the coaching and research community could also be considered and identified.

Methodology

Research Philosophy and Design

Reflecting the applied nature of our aims and purposes outlined above, and the goal of developing practically meaningful knowledge, this study was driven by a pragmatic philosophy. While other paradigms require researchers to focus more on ontological and epistemological matters first, pragmatism has, as its central focus, the research question. In this way, the epistemological position and methodological choices of researchers thereby emanate from the applied issue that they wish to understand and significantly, have a positive impact on; rather than from a rigid, pre-defined position. Importantly, pragmatism also considers that the researcher has biases and prejudices which, when appropriately managed, can be used to support practically meaningful insights (Morgan, 2007). In this sense, this study was supported by all of the authors' own experiences of working within elite golf (Corbin & Strauss, 2008). The first and second authors are accredited golf coaches by The Professional Golfers' Association (PGA) of Great Britain and Ireland and the third author a chartered Sport and Exercise Psychologist with significant experience of working in the sport (Giacobbi Jr. et al., 2005).

Driven by the study's purposes, and reflecting the principles of pragmatism, a decision was made to work at the interpretivist end of the epistemological continuum (Chowdhury, 2014). Using an interpretivist lens allows researchers to focus on gathering rich data on the experiences, practices and rationale of those involved. Accordingly, a qualitative research strategy was also thereby employed (Jupp, 2006) because this research aims to generate a map of the world as perceived by participants and is well suited to work that aims to understand what people believe and do, as well as why they believe and do it (Strean, 1998). More specifically, semi-structured interviews were selected as a suitable approach to collect data on coaches' practices—plus the rationale for these—in relation to long-term technical work with their players.

Participants

Data were collected from 10 male PGA Professional golf coaches. Each coach was purposively selected through personal contacts of the lead author based on the following selection criteria, (a) a minimum of 10 years coaching experience (M = 21.2 years, SD = 5.3), (b) status as UKCC level 3 qualified or above and/or had been awarded 'Advanced' status or above by the PGA and (c) worked with professional and/or elite amateur players. The rationale for selecting coaches from amateur and professional levels was due to the similarities in performance demands placed on coaches, plus the nature of coach–player relationships in each (e.g., similar regularity of contact). Reflecting our focus on long-term technical work, it was also required that the coaches had experience of working with high-level players over an extended time frame (minimum 1 year) and were open and able to discuss their work with one specific player in detail.

To define the 'elite' status more clearly, all amateur players discussed were world ranked inside the top 100 and the two professional players discussed were inside the top 50 in the official world golf rankings at the time of coaching. Furthermore, two of the coaches had

coached recent Major champions (the biggest four professional events in golf). Two other coaches had also coached recent Ryder Cup players/European Tour winners. Four coaches had coached multiple Curtis Cup and Walker Cup players (the highest levels of team competition in amateur golf). Therefore, the participants had the status, experience and coaching success to offer a realistic and representative view of practices within coaching at the truly elite level.

Data Collection

Prior to the interview, participants were sent information relating to the purpose of the study, a consent form and a copy of the interview guide. Once all participants had given consent, the interviews were arranged for a relevant time. Five of the interviews look place face-to-face at the participants' place of work and five took place on the online platform Zoom (Zoom Video Communications, California). Interviews were conducted between December–March, with this being golf's off-season and therefore (relatively) easier for a coach to commit to participating. All interviews were recorded on a Dictaphone and all procedures were approved by the lead author's institutional ethics committee.

Based on the study purposes, the interview was supported by adopting a chronological timeline approach. This was used specifically because: a) its ability to support participants' accurate recall; and b) to help expand and supplement the interview data collected. Specifically, the coaches were asked to draw visually on a blank page how they phased their work with their selected player, from a long-term (i.e., macro-level) down to a short-term (i.e., micro-level) perspective. The macro-level timeline was established by nine coaches as a full season, while the remaining coach conceptualised their macro-level work as the time between the professional season's four Major championships (almost a season long).

Against this timeline, the interview then focused on a series of open-ended questions. More specifically, these questions explored the coach's goals, structure and methods at the

macro level (i.e., the biggest block), meso level (i.e., intermediate blocks) and micro level (i.e., smallest blocks) of technical work with their chosen player, as well as their rationale for these. The participants were free to discuss any relevant part of the game, but all chose to discuss their players' long-games (full swings). Example questions related to macro level work included: Where were you trying to take this player technically from a big picture perspective (i.e., *goals*-related)? Why were your phases of work laid out this way (i.e., *structure*-related)? How would you know if you had been successful (i.e., *methods*-related)? An example from meso level work included: What were you trying to achieve in this specific phase (*goals*-related)? How often did you see player 'X' across this phase and why (*structure related*)? Why did you choose this approach and not another (*methods related*)? Finally, example questions on aspects of micro level work included: What did the player do in this session to achieve their goal (*goals* related)? How often did you see player X in the run up to the key event and at the event itself (*structure* related)? How do you get the player tournament ready keeping in mind their technical goals (*methods* related)? Based on these exemplar core questions, follow up probes and prompts were also developed for purposes of clarity and elaboration. These core questions, prompts and probes also helped to support a level of consistency of topics covered across all participants (Patton, 2002)

The data collection procedure was preceded by a pilot study involving a golf coach who met all of the inclusion criteria. This helped shape the clarity and coherence of the final interview guide. As a result, small adjustments were made to the start of the interview guide to clarify the questioning against common coaching terminology so that the focus was clearer for participants, rather than using overly scientific language.

Data Analysis

Interviews were transcribed verbatim, then read several times to generate familiarity and understanding of the data. Against the study aims, data were coded deductively according

to whether they related to the goals, structures or methods that coaches employed at a macro, meso and micro level (Cruickshank & Collins, 2015). Following this initial organisation process, an entirely separate inductive analysis, following the steps of Côté et al. (1993) was undertaken to generate themes from the raw data that summarised the actions and perceptions of the coach within each specific area; as well as the rationale for their approaches.

Trustworthiness

Beyond the appropriateness of the participants in relation to the study aims, plus the profile of the research team, several other approaches were taken to enhance the trustworthiness of the data collection and analysis procedures. Regarding the former, a key factor was the development of trust and rapport with the participants (Sparkes & Smith, 2009). This was enhanced by the fact that several of the participants were already professionally known to the lead author. Of course, this familiarity meant that the researcher had to be particularly cognisant of a number of potential biases that could have interacted with data collection (e.g., impression management; Goffman, 1959). Additionally, for those coaches less well known to the lead author, extra efforts were made to gain familiarity with these participants' coaching histories, achievements and experiences to encourage openness in the discussion. As a marker of the levels of rapport achieved, all participants involved expressed an interest to be informed of the study's findings.

From an analysis perspective, the second and third author also acted as critical friends throughout, helping the lead researcher to reflect on potential assumptions, biases and interpretation of data during the deductive phase, and suggesting alternative codes in the inductive phase, with this process also working vice-versa (Faulkner & Sparkes, 1999). This was further supported by the lead author's use of a reflective diary and recorded memos to carefully monitor and review the data analysis as it evolved (Smith & McGannon, 2018). To support the fairness and accuracy in the findings, member reflections (Smith & McGannon,

267 2018) were also obtained through email and follow up phone calls post-interviews, with
268 participants encouraged to add any further insights or highlight any gaps in their responses
269 (four of the participants added minor details to their existing interview and none suggesting
270 any major amendments).

271 **Results**

272 The results of this study are presented in two parts. Firstly, Table 1 presents the
273 higher-order themes relating to the goals, structure and methods of the coaches' work across
274 macro, meso and micro levels; followed by a brief summary and supporting quotes.
275 Secondly, findings pertaining to the rationale for these approaches at macro, meso and micro
276 levels are presented.

277

278 ***Insert Table 1 here***

279

280 **Macro Level: Goals, Structure and Methods**

281 Regarding the *goal* of the work undertaken on a macro-level (i.e., over the course a
282 full year), all coaches described wanting to change an element of the players long-game
283 technique; albeit the coaches defined this slightly differently (e.g., "technical change",
284 "rebuild", "adjustment"). Specifically, these were changes to the movement of their players'
285 body and/or club (e.g., arm/body connection, length of arc, better pivot in the right hip).
286 Furthermore, four of the coaches highlighted the desire to also develop wider meta-cognitive
287 skills as a necessary concomitant of the technically-oriented outcome; specifically, the
288 development of autonomy, the ability to self-diagnose and take ownership of their own
289 technical development. For example, Coach 4 highlighted: "It was important for her to
290 understand her swing. To be able to self-diagnose and be more self-aware".

In terms of conceptualising a *structure* to achieve the macro goal, all coaches reported that their work took place over a full year, but that the actual 'end point' was undefined or open-ended (i.e., it was not clear in the coach's mind at what point those macro goals would be achieved). Reflecting the common macro goal, the coaches' primary *methods* related to diagnosing the ball flight issues the player had and the corresponding technical principles that were perceived to be causing them. In addition, all coaches reported that this took place within a wider assessment of the player by observing multiple aspects of the players' game, with 80% of coaches observing on the golf course, either in competition or a non-competitive environment. Forty percent of the coaches also spent over a day in this assessment phase to be able to get to know the player and form clear opinions on their game. Reflecting this, Coach 7 highlighted the potential negative impact of not getting to know the player: "If you miss out the psychosocial stuff then you are screwed. This influences the 'what' and 'when' of technical change". Highlighting the importance of the time taken to assess, Coach 8 said, "I watched him on the course, how he structured his practice. I got a two-week picture of his game. So, we had plenty of time to build up a picture". Finally, three coaches reported, at this stage, getting input from other stakeholders involved in the player's game, specifically other coaches the player may have had.

Meso Level: Goals, Structure and Methods

Meso *goals* were not distinct from the macro goal in that the purpose was still to bring about the desired changes in both ball flight and subsequent technique. In other words, the macro goal was not split into separate meso-goals to reflect distinct phases (i.e., the mechanisms) to success. From a *structure* perspective, all but one of the coaches broke their work down into simple phases (or meso cycles); with one phase being the playing season (February to October) and the second phase being the off season (November to January). Against this structure, some coaches actively passed the responsibility to the player to book

the coaching sessions rather than this being led by the coaches themselves: “The off-season is more my time. During the season is their time. And it is up to them to book with me” (Coach 2). This approach was supported by Coach 10: “When in the playing season I’m listening to how the player is playing and for them to come to you. So, it’s a little bit more player-led”. Finally, during both phases, there was no discussion by the coaches of the link between sessions undertaken, but instead discussed as individual, stand-alone sessions.

Reflecting the similarity of the macro and meso goals, the *methods* used by the coaches at the meso-level were also not particularly distinct between in-season and off-season phases. Of those employed, the coaches reported using a variety of methods to attempt to bring about the desired technical changes. Notably, coaches reported using both suggestively implicit and explicit methods. Several coaches advocated using external cues to change technique. Coach 1, coach to a recent professional Major champion, said: “The swing changed when the shot changed… focusing on the outcome changes the swing…I’ve no concern what the swing looks like”. Conversely, Coach 2 advocated the opposite strategy, hitting shots in front of a net, to remove the ball flight completely: “The net removes the flight and puts her attention onto what needs to be worked on…you can get buy-in from the player as the outcome is removed. If they see poor outcomes, you can lose buy-in”. Further methods used for both strategies are highlighted in Table 1. In sum, there were no consistent methods—or sequencing of methods—across all of the coaches to indicate a formal approach to achieving the desired outcome.

Micro Level: Goals, Structure and Methods

At the micro level during the off-season, all coaches reported the same *goals* as at the macro level; that is, to improve the players’ technique, which was not broken down into a set of smaller sub-goals. During the season, however, almost all coaches shifted priorities to a *goal* of immediate performance (i.e., to help the player perform their best at the immediately

next tournament). Notably, one coach did offer a different viewpoint. Reflecting a longer-term view of the player's performance, Coach 7 based the goals of tournament week on the level of importance of the event; in lower-level events, therefore, goals *other than immediate performance* were emphasised: "At lower-level events we will be working on shots for other bigger events. We would also practice certain clubs in smaller events. Also, psychological skills are practiced in smaller events before being put into play in bigger events".

Regarding *structure*, coach–player interactions were infrequent and irregular across both off-season and in-season phases. In terms of the off-season, and while some coaches were able to occasionally spend several days with their player at national camps on a one-to-one basis, typically the player and coach met for 1–2 hours per month, some less than this. For example, Coach 7, who supports a recent professional Major champion highlighted the challenge faced: "Sometimes we can have a lesson with an elite player and then we don't see them for 6 weeks. Ideally with a top player, you want them to turn up the next day".

Notably, levels of micro-level interaction were similar, or even less during the playing season. In this respect, some work was undertaken during gaps in the player's tournament schedule; however, the majority of work was undertaken across a tournament week itself (i.e., when a coach attended a tournament to provide support). While the coaches all reported working with their player every day at an event, finer details regarding the structure of work were different between coaches and often for each coach at different events due to the variable nature of the current form of their player. For example, coaching input was provided 'as needed', particularly should any issues arise where a player was not playing well and needed some immediate work to improve. Alternatively, Coach 8 stated: "Sometimes it is only 5 minutes per day".

Turning to *methods*—and firstly in relation to the off-season—all coaches reported similar strategies and tools within the meso-level section above (see Table 1); so again,

without any distinctions made across levels. In contrast, much more data relating to methods were provided about the in-season phase, predominantly in relation to tournament weeks. More specifically, the *methods* employed could be separated into three distinct categories: practice strategies, attentional strategies and broader psychological strategies. In terms of competition-related practice strategies, the coaches used several forms: including technical maintenance drills, simulation of competition, practice intensity, variation and stress exposure. Reflecting Coach 8's desire to add variation to practice, simulating the demands of the event, he said: "We don't hit the same shot twice on the course ... so we are trying to simulate what we are doing on the course in our practice. So, we are more able to transfer that onto the course". Three of the coaches emphasised drills to maintain the technical work that had been done pre-event, particularly if the player has not performed well in practice, whilst the other seven coaches actively introduced different practice strategies to prepare for competition. Coach 10 discussed putting the player under stress before an event: "I would introduce levels of discomfort and stress to see if the game holds up under pressure".

Regarding attentional strategies, all coaches reported that the player's technique would be in a state of flux throughout the season, where the player would be somewhere on the continuum of change yet still having to perform. To support immediate performance (the micro-level goal for almost all), coaches reported trying to find a feel or cue that would work for the week ahead and move the player away from a more positional focus of attention to a more, kinetic, feel-related focus. Reflecting the challenge, Coach 7 said "Technical work is still in progress when the season gets underway…We try to become more performance focused and find a cue that works for that week. Technical work creates interference". Coach 9 also highlighted the importance of this for his player: "It's shifting from mechanics to feel/outcome/performance focus. He doesn't play any good the other way". Similarly, two other coaches reported that some of their methods were aimed at: "understanding where the

player is directing their attention. Do they have a clear mental process, target, shot shape…The mental feeds into the technical" (Coach 1) and "I will ask the player to state out loud the shot they want to hit…this creates clarity and commitment to the shot" (Coach 8). In line with this, many of the methods in this area were aimed at reducing the volume of technical information to help get the player ready to compete. In parallel with helping the player to identify cues for the week, Coach 7 reported simply intentionally *saying less* to the player, whereas Coach 3, Coach 6 and 8 reported using *a smaller number of technical instructions* whilst Coach 9 was simply *present with the player less* and only attended warm-ups and practice at the request of the player. Coach 9 helped his player with a menu of thoughts that had worked in the past, and rather than offering anything new would encourage the player to self-select an appropriate cue through his own practice.

Finally, the coaches reported the use of other psychological strategies which could be separated into two categories: task-specific psychological strategies and broad meta-cognitive strategies. Firstly, the task-specific, these included methods that helped the player to increase their levels of confidence (Coach 2), tension awareness and the robustness of their routines to execute correctly. Reflecting the training of metacognitive skills, reflection, decision making, self-regulation (e.g., "helping the player to set their own plan for the week": Coach 8) and self-diagnosis/self-coaching (e.g., "helping players to work through technical challenges and ball flight problems on their own": Coach 7) were all deemed important and indeed impactful on the technique the player displayed. Coach 7 commented; "We engage in deep reflection after the round. I want them to become better players rather than just swingers". Coach 4 commented: "I want her to understand her swing. To be able to self-diagnose and be more self-sufficient…it's more psychology than technical stuff".

Summary of the Approaches Taken

Findings point to preferred examples of technical work as being entirely an attempt at technical change that is driven by short-term performance demands. Also, there is a low level of coherence and consistency across the macro, meso and micro levels. Put another way, there appeared to be little translation from what the coach was trying to achieve over the season (macro level) to what the coach did during blocks of the season (meso level), or to individual sessions or tournament support (micro level).

Rationale for Approaches Taken: 'The WHY' of Long-Term Technical Work

The following section explains the coaches' intentions for impact, or rationale; the underpinning *why* for *what* they did, therefore shedding light on the decision making and judgements used throughout the process.

The Perceived Uncertainty and Unpredictability of Technical Change

There was a difference of opinion for how the coaches conceptualised the technical work from both a mechanistic and timescale perspective. Coaches spoke about a lack of knowledge of how long the technical work would take, with opinions ranging from 1 week to a lifetime and also the difficulty in undertaking technical work. Coach 7 reflected a general lack of certainty on timescales for change "I didn't put a time on the changes because I don't think you've got any clue how long a motor pattern takes to change and be robust". Coach 9 supported this view, "It may take 6 months, 6 years or 60 years. You really don't know how long any movement change will take. The player thinks 3 weeks, you think 3 years, the reality is somewhere in the middle". Difficulty, along with previous failures, was further described by Coach 10: "Everybody gets into a pattern that is very hard to change…from my perspective there is times when I've tried to do it and it's been a disaster".

A further theme to emerge was a lack of perceived value in long-term planning. This was almost universally agreed upon by the coaches, however for slightly different reasons.

Coach 2 highlighted a number of factors, including the unique challenges of elite level golf compared to that of cycling:

> There isn't a long-term swing plan. It was more short-term than long-term. The game is so unpredictable, and confidence fluctuates. You are always putting out fires. Cycling you can have a 3-year plan, but golf is a lot less predictable.

Coach 1 further corroborated the position of unpredictability as a reason against long-term planning and more a position in support of responding to short-term demands:

> There wasn't a long-term swing plan. When you get to the next step who knows where you'll be…we make so many assumptions such as being injury free, family etc., that these conversations are a bit no-show…You can get way off track with planning.

The Scheduling and Immediacy of Performance

A key factor as to why the coaches worked to the goals, structure and methods they did was the tournament scheduling and need for immediate performance. Coaches described the busy playing schedule (for some players, close to 12 months of the year) as a limiter to what they were able to do technically: "You back off what you're doing depending on what she is competing in and also the level of importance of these events" (Coach 4). In turn, this same coach perceived the consequences of the playing schedule as a potential reason for changes not remaining, "Playing so much hindered her at times. There was always that reversion. If I could have stopped her paying for tournaments for one summer, I think we could have got there quicker". Similarly, Coach 9 highlighted the potential negative effects of long-term planning:

> Work must be done on what's going to make me better now. If you base your work on let's work on 5 years' time you probably won't have a Tour card in a year….there was never any timescales…we identified the path and then just worked towards it.

Coach 7 also discussed long-term planning as being subservient to the needs of the player at that moment in time:

> Any long-term plan is a bit pie in the sky because if they are moaning about their putting then you have to make them feel comfortable there and then…There is never that big block of time when they are not competing.

In summary, Coach 7 put the challenges of the schedule on technical work most succinctly: "The player has almost no windows in her year to do technical work".

In this regard several coaches expressed a desire for their player to have played less to undertake important technical work, tournament golf "was a distraction" (Coach 6). Coach 10 even stressed that "valuing those gaps in your year when you are periodising things to leave space to address these factors in your game is golden time". However, whilst stressing the importance of this, none of the coaches encouraged their players to remove events and intentionally orchestrate these gaps in their schedule to achieve the aforementioned aims.

Influence of the Player's Readiness and Commitment to Long-Term Technical Work

Finally, it was also clear that decisions were shaped by their players' perceived psychological state. Coach 7 highlighted the general importance of psychology in the work undertaken: "Psychology has a huge influence. If they are in a bad place, they can be fragile... With her mindset there isn't anything I can do technically right now". In this respect, the player's mentality at the start of their work with the coach was noted as a significant factor by many. For example, during the initial assessment with the player, 70% of coaches raised the issue of planning; specifically, that at the start of the relationship, the player arrived without a

clear plan of what they were trying to achieve. One coach described this issue as a consequence of too many stakeholders having an opinion, “He had several coaches suggesting things to him previously. There was a lack of clarity”. Expectations at the start of the relationship were also noted. For instance, Coach 9 also highlighted the player having little tolerance for poor play before looking for different answers for improvement:

> Players will not tolerate low levels of performance for an extended period. He would commit to seeing an improvement up to a point. But if it’s not doing exactly what it should be doing on the course, he will find a different solution.

In summary, a lack of knowledge of timescales for completion of work and a lack of perceived value in long-term planning created a short-term approach to technical work. Moreover, a busy tournament schedule, need for regular and immediate performance and the players’ readiness for change, all influenced the coach’s rationale.

Discussion

The purpose of this study was to explore the nature of and underpinning rationale for coaches’ long-term technical work with elite-level golfers. Specifically, it aimed to explore the goals, structure and methods on a macro, meso and micro level and the rationale for the approaches taken. Ultimately, we aimed to develop an account of current coaching practice in long-term technical work, against which opportunities for a realistic, ‘next step’ progression in the coaching community could be considered and identified. Overall, findings show a fundamentally low level of coherence and consistency across levels of coaches’ long-term technical work. There appeared to be little translation between what the coach was trying to achieve over the season (macro level), what the coach did during blocks of the season (meso level) and to individual sessions or tournament support (micro level). As explained by the participants, this might relate to perceived uncertainties when implementing technical change,

the scheduling of tournaments with an immediate need for optimum performance and the influence of players' readiness and commitment to long-term technical work.

While the level of incoherence is partly due to factors outside of coaches' control, the known entity of the tournament schedule and ability to find out which events players wish to compete in, points to a need for greater consideration of decision-making processes from the outset in terms of the *macro-level goal* and *macro-level plan* (encompassing the structure and methods used to achieve the goal). Regarding the *goal*, it was notable that changing technique was presented as the exclusive outcome of long-term technical work, rather than considering alternatives that might more suitably meet the presenting demands. Regarding the *plan*, there also seemed to be a universal absence and rejection of systematically designed, long-term programmes. We will now consider how these two areas (*the macro goal* and *the macro plan*) could further explain the pattern of results and inform future practice.

'Changing Technique' as *the* Exclusive Outcome of Long-Term 'Technical Work'

As previously discussed in the Introduction, technical work can encompass several different goals and objectives. In this study, however, technical work undertaken could be explained as technical change only, with little consideration of other alternatives. Perhaps reflecting a research–practice gap, none of the coaches used the specific terms 'refinement' or 'regaining' technique (both formally recognised distinct technical change outcomes; Carson & Collins, 2011) when attempting to explain the nature of their work. This decision to change technique in a general sense was due to, at the assessment stage, a recognition of an undesirable ball flight characteristic that was underpinned by a technical problem and a desire to change it. This is also consistent with the view of the need for the coaches to influence performance in the immediate short term. This perhaps reflects a cultural belief within golf coaching of the need, and ability, to see observable changes quickly, a view held by expert golf coaches within the domain (Schempp, McCullick, Busch, et al., 2006).

The Absence and Rejection of Systematically Designed, Long-Term Work Programmes

Perhaps reflecting the need for a technical training framework (Farrow & Robertson, 2017), none of the coaches explained the process of technical work systematically, or mechanistically, as outlined in the literature and there was a lack of consensus regarding its implementation (cf. Carson et al., 2013). Broadly, some coaches preferred what have been explained as implicit methods for *learning* new movements, allowing for subconscious movement processes (Wulf et al., 1999), whilst others chose to utilise explicit methods to bring about greater levels of expertise (Toner & Moran, 2015). It is therefore apparent that coaches in this study are using a fragmented and inappropriate process for technical work. Evidence even shows that implicit methods are ineffective at changing already well-established skills (see Rendell et al., 2011). It is, therefore, possible that the coaches are working based on experience and intuition (Schempp, McCullick & Mason, 2006), with little consideration of critical factors identified within current evidence (Carson & Collins, 2011). Further, coaches stated that they did not know how long the process would take, ranging from a week to a lifetime, nor providing insights into the causative factors that might underpin such differences, and did not discuss a clear session to session link. This lack of within and between participant consistency within expert level golf was also found by Carson et al. (2013) when investigating systems for technical refinement.

Reflecting this evidence-base, the Five-A Model, which is designed to bring about long-term permanent and pressure-resistant technical change in well-established skills (Carson & Collins, 2011), provides a macro-, meso- and micro-level conceptualisation, however, this was *not* comprehensively followed or mentioned by the coaches. Generally, though, coaches did describe an initial Analysis (Stage 1) as well as elements of raising Awareness of the intended movement (Stage 2), albeit not clearly staged or comprehensive in nature (e.g., limited or no attempt to de-automate the existing kinematics). Notably, the

Adjustment (Stage 3) and (Re)Automation (Stage 4) stages were not discussed, when the movement is gradually modified and internalised to subconscious control. Finally, the Assurance stage (Stage 5), which is when the new kinematics are made resistant to the negative effects of pressure with coach and athlete convinced that change is no longer necessary, was only mentioned by one coach. Notably, five coaches reported 'regression' in their player's technique (i.e., where the technique changed back toward its original condition), and this may be in due to a lack of adherence to and/or completion of any of the five stages. Typically, when a change *is* decided as the best course of action, this can be due to insufficient de-automation of the existing kinematics targeted for change; thereby maintaining greater familiarity, automaticity and consistency of an old version (Rendell et al., 2011). However, in the context of the coaches reported constraints on time to implement change, we suggest that the decision to proceed itself could represent a more plausible reason for limited success (i.e., the Analysis stage). Addressing the issue of timescale to implement change in this regard, Carson and Collins (2015) demonstrated that this process was possible to complete in 3 months, however, depending on the complexity, level of establishment and extent of change required, as some examples of key factors, it may take up to 12 months from start to finish (Carson & Collins, 2016b). Therefore, it is a process that must be thought out, understood, planned and agreed on by the coach and player.

All coaches, however, rejected the *value* in long-term planning. Indeed, these findings appear consistent with those of Schempp, McCullick, Busch, et al. (2006) where expert golf coaches seem to view planning through a narrow lens pertaining only to the lesson structure, but significantly, did not mention the long-term development of training or the linked decision making between sessions to impact on long-term player needs (i.e., the macro-level). Whereas, Abraham et al. (2015) argued that effective planning *is* an important skill in coaching. Planning appears to be important from investigations reporting the behaviours of

renowned coaches (Gallimore & Tharp, 2004) and across different sports (e.g., Toner et al., 2020). However, Loturco et al. (2016) suggest that such effective planning should more critically use the principles of periodisation due to, 1) its low rate of effectiveness in athletic performance and, 2) the need for more applied and effective methods of planning for athletes who compete several times per year and have to maintain consistently high levels of performance. Kiely (2018) argued that rather than seeing planning as *only* the implementation of pre-established training structures, which the author acknowledges to have some benefits, it should be seen as the implementation of systems designed to detect threats and opportunities at the earliest time. Therefore, there appears a need to reconceptualise, clarify and update specifically what effective planning is within elite level golf coaching. Specifically, we need to understand how and why coaches are making decisions and, crucially, whether they are making *effective* ones as part of the framework for reconceptualising planning (Martindale & Collins, 2005).

So What? Explaining Current Practice and Future Progress Through Case Formulation

When examining the above findings, there are several important considerations for practitioners and researchers. Practitioners seem to understand and view their technical work through a fairly narrow lens of only technical change but driven by short-term performance demands. Furthermore, there appears to be a lack of mechanistic appreciation of work in terms of the nonlinear progression, timescales involved and influence of complex factors when undertaking this work, with long-term planning seen as less important than responding to immediate issues of performance. Therefore, we should now consider how practitioners conceptualise or formulate a case for their work and how case conceptualisation may be a way for understanding more effective practice in the future. When looking at other fields such as psychotherapy (Sperry, 2005) and more recently, sports psychology (Hutchison &

Johnston, 2013), case formulation is seen as an essential bridge between what the specific client's needs are and the interventions chosen. John and Segal (2015) go further and state that "the strength of treatment choice is often reflected in the strength of the case conceptualisation from which it originated" (p. 1). Case conceptualisation would allow the coach to synthesise player experience with coaching theory and research, reduce the tendency to make decisions based on biases and heuristics, allow for consistent session-to-session coherence and to address the complex factors that are often required for optimum impact. This process would allow a coach to establish and develop over time a clear rationale for what work they are doing, as well as how, when and why.

Currently, there are no investigations of how golf coaches do this. Therefore, future research in golf could investigate case conceptualisation and consider factors such as choice of interventions, plus the planning, structure and adjustments to behaviour and reflections through the process. It can be utilised at all levels of delivery from the macro to meso to micro levels and help coaches consider not just what work to undertake (i.e., alternatives to technical refinement), but importantly why, when (i.e., the timing an frequency of interactions) and how to undertake it to produce consistent results. In doing so, such a meta-cognitive process has the potential to expand coaching repertoire, effectiveness and ability to adapt to a range of different athlete needs and performance demands (L. Collins et al., 2016).

Strengths and Limitations

A strength of the study was its methodological coherence, where our pragmatic philosophy guided our research questions, use of participants, epistemology, methods and use of theories (Judge et al., 2009). This was consistent with attempting to generate meaningful insights to inform future practice and to more effectively address applied issues. Therefore, we ask the reader to consider the 'so what?' principle (Bryant, 2009) when considering if this aim was met. In addition, the participants were representative of coaches operating at the true

elite level end of the performance spectrum. Despite these strengths, this study was not without limitation, one of which was the reliance on retrospective recall. Whilst some of the participants referred to training diaries and training plans for recollection, some only used memory for recall of actions and steps taken (which perhaps reflect the limited planning and design activities reported in the results). Additionally, this study does not offer player perspectives. Furthermore, it is acknowledged that some responses may have been influenced by impression management and indeed the desire to respond is such a way to gain credibility (Morgan, 2007).

Conclusion

In conclusion, this paper highlights coaching practice with elite level golfers to understand current approaches and the rationale for such approaches. Findings revealed, (a) coaches attempted to undertake technical refinement with players but without a clear systematic process, (b) there is little coherence and consistency across the levels of work, (c) the process and timescales of technical work is considered unpredictable and uncertain and, (d) long-term planning is seen as subservient to meeting players' immediate performance needs. Accordingly, while the coaches in this study are recognised as high(est)-level, in practice there is a need for greater utilisation of case formulation in practice, which would incorporate a systematic approach, taking into consideration the *nature* of technical work including planning, timescales for implementation, the *content* of that work (what to do and how) and also the psychosocial concomitants that influence the *delivery* this process. It is acknowledged that driving change/development about current coaching practice is not easy since golf, like many sports, has long standing traditions and will require some shift in culture as well as the style of coach education. However, this step is worth pursuing to the benefit of both practitioners and pragmatic researchers alike.

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Table 1

Macro, Meso and Micro Goals, Structure and Methods

Phase	Defined Timescale (% of coaches)	Goal(s) (% of coaches)	Structure of Work to Achieve Goal(s) (% of coaches reported by)				Methods to Achieve Goal(s) (% of coaches reported by)		
			Nature	**Frequency**	**Duration**	**Considerations ***	**Physical**	**Psychological**	**Organisational**
Macro	Calendar Year (90%) Around 4 Majors (10%)	Identify, and improve ball flight and related technical change required (100%) Improve ownership / autonomy (30%)	Coach-led (100%)	Scheduled during gaps in playing schedule (70%) At national training camps (30%)	Varied	**Present** Future	Observation of all aspects of players' game (100%)	Observation under tournament pressure (50%) Assessment of personality (10%)	1–2-day assessment (40%) On course (80%) Discussion with other key stakeholders (30%)
Meso	Off-Season: Nov–Jan (90%) (3 month period)	Technical change (100%)	Coach-led (80%)	Varied from 2 sessions per week to once per month.	Varied (5min–2 hr)	**Present** Future	Remove ball Exaggeration. Slower swings. Sticks on ground. Use of shorter club.	Focus of attention: club movements, specific ball flights, sticks on the ground. Self-diagnose swings through observation and questioning (i.e., if the ball does this, why?) Problem solving (i.e., how do you hit this shot?)	Use of net to remove outcome.
	In-Season: Feb–Oct (90%) (9 month period)	Technical change (100%)	Player-led (70%)	Varied / Infrequent	5 min–2 hr per week	**Future** Present	Methods for technical change as per those reported in 'off-season' work.		
	Time between each major (10%)	Technical change (100%)	Coach-led	Every week	1 hour				
Micro	Tournament Week (100%)	Optimise immediate performance (90%)	Collaborative on coach attendance (100%)	Every day at event	Varied	**Present** Future	Technical drills a week before or early in week if needed. Target weakest areas	Reflection post-round, confidence, visualisation, pre-shot routine, self-awareness, decision-making, reduced volume of swing thoughts, commitment.	Stress exposure Educate Caddy Increased time on golf course (instead of range) Competitive scenarios Reduce time with player.
		Smaller events as prep for key events (10%)	Collaborative	Every day at event		**Future**	Train shots required for key events	Train mental skills required for key events	

Note: Bold denotes primary consideration