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Seven reasons why you should be incorporating time constraints into your coaching

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ABSTRACT

Manipulating time in practice can engage players physically and psychologically and can be used to support skill-learning and transfer to competition. Seven ways in which time pressure influences the behaviour of players are suggested, drawn from existing research in sport science. Practical recommendations for ways in which to implement time pressure are made.

Key words: Skill acquisition, Expertise, Practice, Pressure training

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INTRODUCTION

The ability to manipulate time pressure—by which is meant using a temporal boundary, constraint, or impetus that creates urgency, or necessitates speed—is a powerful and under-appreciated tool at the coach's disposal. The purpose of this article is to draw from extant research to provide a menu of possibilities for how time pressure can be used in the service of improving practice. This article proposes seven ways in which pressure of time may be leveraged to raise the quality of a practice or coaching session. The impact of time pressure on learners encompasses both physical and psychological aspects of behaviour, as well as having potential to impact on the rhythm and intensity of the coaching session as a whole. While seven different ways have been identified in which time pressure can influence, they are overlapping and not entirely discrete or mutually exclusive. Time constraints are versatile and judicious use of them can add an extra layer to an activity and increase the sophistication of practice. There is no doubt coaches reading this will already be employing many of the ideas and suggestions proposed, however it is hoped that the following will bring together some of the varied uses of manipulating time so that coaches may learn new ideas, better exploit techniques already in use, or be stimulated to think of new applications of their existing methods.

WHAT DOES TIME PRESSURE DO?

It Creates More Repetitions

Most simply, the first reason to incorporate time pressure in your coaching is that, with the associated urgency, the number of repetitions players experience will grow. A higher tempo in practice may not always be appropriate as it may mean fewer representative tasks (Pinder, Davids, Renshaw,



& Araújo, 2011), or a level of complexity for the learner that renders information for learning of no use (see Guadagnoli & Lee, 2004). However, though greater repetition of a shot, decision, or game situation is not an automatic guarantee of more improvement, if the level of challenge is appropriate, and if quality of practice is present, then a higher volume of points played, decisions made, and balls struck is more likely to be positive than negative, particularly in the earlier stages of learning, when acquiring skill is more of an exploratory process (Button, Seifert, Chow, Araújo, & Davids, 2021).

It Pulls Attention Upstream

The dynamical systems approach to skill acquisition advocates for the education of the attention and intention of a learner in their pursuit of attunement to specifying information in the environment (Jacobs & Michaels 2007). Experts in high-

intensity sport do not demonstrate skill simply by moving faster, or reacting quicker, rather they demonstrate perceptual skill characterised by sensitivity to information from all stages of the rally-cycle, while the novice may rely primarily on ball-flight information occurring immediately before her shot. Relying on late-occurring information in the rally cycle, coaches will see a novice "reacting" late to an incoming ball, then perhaps coach them to find a stronger ready-position, execute a split-step, or prepare the racquet earlier. However, it may be a more beneficial strategy to help novices couple their action to different sources of perceptual information. By educating the attention of players through the use of time constraints, we can allow them to better sensitise themselves to this new information. By using time pressure and making the later ball-flight information insufficient for successful performance, we can direct learners' attention to earlier "upstream" information, as they sensitise to what is available to perceive at different stages of the rally-cycle. Gray (2022) argues that practices must be designed by coaches in ways that help learners in this regard, "amplifying" information in ways that make it more apparent to the player, driving their attention towards events in the environment of which they are currently not fully aware. Practising at higher tempo, and with the guidance of an astute coach, places a demand on a learner to look ahead and adjust their behaviour in anticipation of the next repetition or execution, such that they can exploit new perceptual information that will underpin more efficient and adaptive performance.

It Elicits Muscular Co-Contractions

Muscular co-contractions, where both the agonist and antagonist muscles activate simultaneously, serve several purposes in support of efficient movement, according to Bosch (2015). He states that, prior to tensing, muscle-fibres hang between attachment points "like a dangling rope" and managing this muscle-slack is integral to performance. Tensing the muscle and removing the slack takes valuable time, particularly in fast, high intensity sports like tennis. Feedback via the central nervous system is too slow at the tempo required in high intensity movement, and muscles must work together to stabilize and protect joints through self-organising pre-flexes with little or no delay (Bosch, 2020). In other words, performance of skilled movement is a delicate management of tension and slack in the muscles as the body attempts to execute actions in complex environments. Acting as a bodily shock-absorber, protecting joints, muscular co-contractions regulate slack such that movements can be executed efficiently with appropriate muscle-tension. To react without delay the necessary pretension for action removes slack, preventing the body from relying on "passive attractors", and ensuring utilisation of the body's optimal economy and protection mechanisms (Bosch, 2015). Pressure of time is a means of stimulation of muscular co-contractions and removing muscle slack in physical training. To summarise, relative to the ability of a player, a higher tempo of play, faster balls to deal with, and less delay between actions, all naturally facilitate the muscular co-contractions that help train an efficient and effective physical platform for explosive movement and lower response time.

It Leaves No Time To Think

Research into the nature of skilled performance has repeatedly converged on variations of the idea that smooth, automatic, fluid execution of skills can be disrupted by explicit cognitive interference. Common parlance reflects this understanding with terms like "over-thinking" and "paralysis by analysis". Masters (1992) referred to the tendency of explicit, rule-based knowledge held in working memory to upset procedural skills as reinvestment. If explicit information typically acquired during the learning process can be minimised, or bypassed, then the propensity to reinvest can be reduced and procedural skills would be better protected in pressure situations (Masters & Maxwell, 2004). Time pressure can be used as a means of achieving this when training tennis players. Adding time pressure means the learner is more likely to bypass working memory without opportunity to pick up detailed technical information i.e. more likely to self-organise using implicit, perceptual information as described above. By employing an implicit learning approach, cognitive resources are freed up to direct attention to meaningful external information in the environment and perform other tasks such as tactical or situational evaluations to support performance. It has been shown that excessive accumulation of technical information during the learning process leads to an increased likelihood of reinvestment in technique, especially under stressful situations, which has been linked to choking (Beilock & Carr, 2001). Removing time for hypothesis-forming and opportunity to micro-manage techniques during execution, stimulates this adaptive, implicit acquisition of skilled movement.

It Identifies Errors

The Challenge Point Framework (Guadagnoli & Lee, 2004) is an articulation of what coaches already know, that an essential ingredient to learning is an optimal match between the level of challenge of an activity and the current performance level of the learner. To keep someone in this optimal zone for learning, the complexity of a task may need to be adjusted depending on the level of success. While too many errors may indicate a low level of learning, if there are few or no errors at all, learning may also be absent. Adding or increasing time pressure is one of the coach's options for raising the level of task-difficulty if there is insufficient error feedback to stimulate adaptation. Ericsson & Pool (2016) proffer corresponding advice for those faced with the challenge of overcoming learning plateaus. They state that, when an apparent ceiling in performance has been reached, the application of time constraints will help push you over the hump by making sources of error more apparent.

Tennis involves complex skills made up of multiple components, and one of the mechanisms by which practising under time pressure improves performance is by helping identify which aspect of the task requires improvement. Speed things up and see which aspect of a skill tends to break down, this information can then be used to design targeted practice activities to address the weakness.

It Creates Mental Pressure

Pressure training is the deliberate, strategic, and measured application of stressors to help athletes cope with emotional and psychological loads that accompany competition, and research shows that it can benefit athletes across different skill-levels and circumstances (Low, Sandercock, Freeman, Winter, Butt, & Maynard, 2021). Thoughts, emotions, and interoceptive information influence behaviour and can serve the purpose of guiding learners to stable, functional

states of organisation. Pressure training research attempts to identify the best ways in which to simulate the emotional and psychological components of the competitive environment and facilitate this adaptation. Time pressure is one means by which to achieve this, acting as a "task stressor" (Stoker, Lindsay, Butt, Bawden, & Maynard, 2016) that can be used to increase the demands of training, to induce adaptation in athletes that will be beneficial for competition.

Resistance to the negative effects of stress is a useful quality to have in matches and time pressure in training has been used effectively as part of a battery of stressors to bolster athletes against the psychological rigours of competition (Kegelaers, Wylleman, Bunigh, Oudejans, 2021). Kegelaers & Oudejans (2024) cite several specific functions of this type of pressure training, including: strengthening psychological characteristics; mastering coping skills; building confidence; reducing choking; and increasing awareness.

Even with those for whom competitive performance is less important, the challenge of learning a new movement pattern nevertheless comes with an underlying uncertainty and excitement that is integral to the learning experience (Headrick, Renshaw, Davids, Pinder, Araújo, 2015). The pressure, urgency and intensity that comes with time constraints is a potential lever that can be pulled to enhance this experience for novice players. Situations that increase cognitive and emotional activation are useful for learning and for skill transfer: "Emotion acts to strengthen memories… and produces greater engagement in ambiguous, unpredictable, or threatening situations" (Headrick et al., 2015). Time pressure in training scenarios can therefore be manipulated to optimise affective learning design. Affective learning design is "… seeking ways to sample the intensity of emotionally charged performance conditions in learning environments and practice situations" (Headrick et al., 2015). Practising with situational fidelity to increase the transfer of learning is not limited to the physical environment and structural qualities of the practice, but simulating an authentic emotional experience helps the learner navigate practice tasks that are faithful to competitive situations on an emotional and psychological level.

It Encourages Smarter Practice

This final point may be the most speculative but is nevertheless based on reasonable assumptions arising from research. Evolution has endowed us with limits to the length of time for which we can continuously concentrate. There is likely individual variation on this limit, depending on the nature of the task; and on factors like the amount of training undertaken, such as after the thousands of hours of music practice completed by the research participants in the deliberate practice study of Ericsson, Krampe, & Tesche-Römer (1993). Though Ericsson et al. (1993) cite the figure of 90 minutes as an approximate maximum, alternative estimates of the attention threshold of the general population in everyday tasks tend to converge at much lower lengths. One piece of electronic tracking research found the most productive employees in an office environment worked, on average, for 52 minutes, followed by a 17-minute break (Thompson, 2014). Another popular time-management technique is based on cycles of 25 minutes concentration followed by a 5-minute break (Cirillo & Borgeaud, 2020). Dr. Noa Kageyama (2009) summarises some research into practice duration for expert musicians and similarly infers that 45-60 minutes may be the maximum for one continuous practice session for a typical adult, significantly less for a junior. A key anecdotal finding that accompanies this conclusion is that the best musicians' practice sessions are often shorter than one would think. What separates them is the process of practice, not the duration. Moreover, there is good reason to think that shorter sessions can improve the process and encourage smarter practice, while practising for too long does the opposite (Kageyama, 2009).

Generalising these findings to tennis, the practical implication is as follows: a standard coaching session in a club setting will likely be scheduled for 1 hour and, considering the above evidence, this may be too long for a single block of continuously focused practice. There is a trope in tennis coaching that the last 10-15 minutes of a one-to-one lesson is often spent in isolated serving practice. This is sometimes attributed to laziness or poor time-management on the part of the coach; however, it could be that this common trend stems from the natural thresholds for concentration described above, i.e. the session naturally winds down and the focus drifts from both player and coach. Then it's natural and easy for the coach (and player) to resort to hitting serves to fill the remaining time.

RECOMMENDATIONS

Some practical suggestions for implementing time pressure when coaching:

- Set time limits and put a clock on it: either at the outset of an exercise, or as the coach decides it's time to move on, e.g. "Whoever's in the lead in 2 minutes will be the winner"; "you have 30 seconds to beat your record so far"
- Make the time limits explicit and use "countdowns" to create urgency

Incorporate a "racing" element into activities:

- 2 pairs competing to achieve a rally challenge the fastest
- Player(s) aim(s) for their best rally (player-player or player-coach), while another player acts as an "egg-timer", racing to complete an individual challenge like a set number of tap-ups, successful serves, or a number of physical exercises (e.g. a squat-thrust or court-sprint). Players then swap roles and try to beat each other's score, or their own personal best

Time pressure can be induced indirectly for groundstroke challenges in 1 vs 1 practice:

- Shortening the distance between players, e.g., through restricting players to rally from inside the baseline or appropriate markers
- Stipulating that all balls must be struck on the rise or at the peak of the bounce
- Switching to a faster ball, or faster court-surface
- Practising groundstrokes against someone at net rather than at the baseline—this effect can similarly be achieved in 1 vs 0 practice by playing against a wall
- Rallying with 2 balls simultaneously
- For coach-player rallies, the coach can increase the tempo and increase time pressure with power, or by taking the ball earlier

Time pressure can be introduced into points situations:

- A serve-clock can be used between points
- By ruling that the serving or feeding player does not have to wait for the returner to be ready at the start of each point
- Time pressure can also be created with a maximum number of total shots, or time limit for each point

Time pressure can be induced when practising serves:

- The server must serve 2 or more balls out of their hand in rapid succession
- The coach can toss the ball for the server, who must meet the ball as it is rising through the contact-point (both the above will induce muscular co-contractions)

...And returns:

- Stipulate an "awkward" ready position for the returner e.g. hands behind back; racquet upside-down, or on the floor until serve is struck
- Have the server deliver the serve from inside the baseline, or have the returner position themselves nearer the service-line to receive

Scheduling and time-management can be used to increase urgency and focus attention in practice sessions:

- Aim for shorter sessions or divide your sessions into short blocks of higher intensity to reflect the limits of effective concentration thresholds and encourage physical, cognitive, and emotional engagement.

CONCLUSION

"Practices at UCLA were nonstop, electric, supercharged, intense, demanding... Games seemed like they happened in a slower gear. I'd think in games 'why is this taking so long,' because everything we did in games happened faster in practice." So describes Bill Walton, student of basketball coach John Wooden, as recorded by Nater & Gallimore (2010). Wooden's students recall the high tempo at which he used to conduct his practices, and how when it came time to compete, matches appeared to take place in slow motion. Wooden's practices were famed for their urgency and intensity, qualities which allowed for a higher volume of repetitions, but additionally placed perceptual & cognitive demands on players, aa well as creating a sense of more available time when competing in matches. Effects like these can be achieved if coaches experiment with manipulating time as part of their task-design, but also by scheduling shorter sessions where possible or, like John Wooden, by dividing their scheduled practice time into shorter, tighter blocks, to test the effect on intensity and continuity of attention from players.

The purpose of this article is to pool various pieces of research from across the skill acquisition literature relating to how time pressure may affect behaviour and support learning. It has been proposed that time pressure can be used to engage players physically, psychologically, and emotionally, for a variety of purposes and intentions. It is hoped that readers will gain some insight into the expansive possibilities of manipulating time and acquire new ideas as to how they might use time to supplement their preferred practice activities, create more enduring learning experiences, and achieve positive transfer to competition.

CONFLICT OF INTEREST AND FUNDING

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