



Queensland University of Technology
Brisbane Australia

This may be the author's version of a work that was submitted/accepted for publication in the following source:

Taylor, Sarah, Renshaw, Ian, Pinder, Ross, Polman, Remco, & Russell, Scott

(2023)

Coaches' Use of Remote Coaching: Experiences From Paralympic Sport. *International Sport Coaching Journal*, 10(3), pp. 316-327.

This file was downloaded from: <https://eprints.qut.edu.au/241740/>

© 2023 Human Kinetics, Inc.

This work is covered by copyright. Unless the document is being made available under a Creative Commons Licence, you must assume that re-use is limited to personal use and that permission from the copyright owner must be obtained for all other uses. If the document is available under a Creative Commons License (or other specified license) then refer to the Licence for details of permitted re-use. It is a condition of access that users recognise and abide by the legal requirements associated with these rights. If you believe that this work infringes copyright please provide details by email to qut.copyright@qut.edu.au

License: Creative Commons: Attribution-Noncommercial 4.0

Notice: *Please note that this document may not be the Version of Record (i.e. published version) of the work. Author manuscript versions (as Submitted for peer review or as Accepted for publication after peer review) can be identified by an absence of publisher branding and/or typeset appearance. If there is any doubt, please refer to the published source.*

<https://doi.org/10.1123/iscj.2022-0073>

Elite coaches' use of remote coaching: experiences from Paralympic sport

Sarah Taylor¹, Ian Renshaw¹, Ross Pinder², Remco Polman³, & Scott Russell¹

¹School of Exercise & Nutrition Sciences, Faculty of Health, Queensland University of Technology,
Brisbane, Australia,

²Paralympics Australia, Adelaide, SA, Australia

³Institute of Health and Wellbeing, Federation University, Berwick, VIC, Australia

Published in: International Sport Coaching Journal (ahead of print)

<https://doi.org/10.1123/iscj.2022-0073>

Abstract

Remote coaching via the use of digital technologies has been utilised within Paralympic Sports since 2015 to address challenges experienced by coaches. These technologies have connected coaches, and athletes in real time, alleviating time, and travel costs. However, very little is known about the experience of coaching in these environments. Therefore, the aim of this study was to explore the experiences of coaches' use of remote coaching technologies. Seven coaches from five Paralympic Sports were recruited for this study and participated in semi-structured interviews. Additionally, observations were conducted of remote coaching sessions that were part of their regular training schedules. Coaches' insights highlight that remote technologies created opportunities to increase, coach-athlete interactions and positively impact the development of interpersonal relationships. This allowed coaches to explore and exploit newly discovered information from within training environments to aid athletes in skill development. Additionally, remote coaching provided unexpected opportunities for coach development. However, coaches also reported new environmental and logistical challenges which disrupted their usual coaching approach. Overall, remote coaching technologies were perceived as being beneficial despite the challenges experienced. However, future research that looks to understand how to impact coach and athlete development through the online environment is encouraged.

Key Words: coach-athlete interactions, technology, para sport

Introduction

Opportunities to receive regular quality coaching is recognised as a significant barrier for athletes in Paralympic sport, due to reduced access to coaching expertise (Pinder & Renshaw, 2019; Wareham et al., 2019). Existing research has shown that coaches in disability sport have limited access to disability specific resources and education, often fulfill multiple roles, coach a wide variety of athletes (i.e., impairment types, training ages) and have limited access to sport practitioners (i.e., physiotherapy, strength and conditioning, skill acquisition) (Lepage et al., 2020; McMaster et al., 2012; Taylor et al., 2015; Pinder & Renshaw, 2019). Research has also shown that coaches experience further challenges in accessing competition opportunities or suitable equipment and training venues (Allan et al., 2019; Cregan et al., 2007; McMaster et al., 2012; Pinder & Renshaw, 2019; Wareham et al., 2018; Wareham et al., 2019). In addition, limited financial resources reduce opportunities for regular in-person coaching interventions. Often this means athletes rely on part-time or volunteer coaches (McMaster et al., 2012; Pinder & Renshaw, 2019; Wareham et al., 2018, Wareham et al., 2019).

Paralympic sport programmes in Australia are typically decentralised, meaning that coaches, athletes, and sport practitioners often live in different geographical locations, rather than living and training in a central location or hub (e.g., the Australian Institute of Sport based in Canberra). In Australia some of these challenges are further exacerbated due to the immense distance across and between states, and a tendency for Paralympic athletes to live close to their extended support systems (Pinder & Renshaw, 2019). Paralympics Australia (PA) have long been aware of the challenges highlighted above and have searched for innovative ways to connect coaches, athletes, and practitioners on a more consistent and regular basis. One strategy that has received active attention since 2015 has been the use of video conference technologies to provide opportunities to bridge the gap between coaches and athletes via remote coaching (Sygall, 2020). Remote coaching has been defined as 'the delivery of live coaching via digital/ online technologies' (Taylor et al., 2021). In this instance, the technology acts as the medium to enable coaching to occur regardless of

geographical location. This would allow coaches and athletes to connect on a more regular basis in real time, alleviating the time and pressure of costs associated with travel.

The use of technology, per se is not a new concept for coaches, athletes, or practitioners in both Paralympic and non-disabled sports. It has typically been utilised to provide retrospective data analysis of training and competition footage to coaches and athletes, in the management of day-to-day planning and administrative tasks (i.e., word processing, online communication platforms), or for coach education and development opportunities (Liebermann & Franks, 2019; see also Cushion, 2019 for a comprehensive review of TEL). For example, coaches of athletes with a disability report using technology to support and access informal learning opportunities such as accessing disability specific resources online and sharing video with other coaches (McMaster et al., 2012; Wareham et al., 2018). Primarily research has leaned towards a focus on monitoring technologies used by coaches to collect athlete health, training, and performance data (e.g., global positioning system, heart rate, sleep) used to support the coaching process (Jones & Toner, 2016; Manley & Williams, 2022; McCosker et al., 2022; Williams & Manley, 2016). The use of 'surveillance technologies' during training and competition has received criticism in literature due to concerns around the "lack of social interactions, loss of 'self' and the creation of an unbalanced power gradient' between athletes and coaches" (Williams & Manley, 2016, p. 845). Consequently, the use of these technologies can be seen as invasive, potentially providing additional pressure and anxiety for athletes, as well as evoking feelings of distrust around the manipulation of presented data (Manley & Williams, 2022). It is currently unknown whether similar issues may present themselves to the same degree in situations where video is being used to connect coaches and athletes in real time (i.e., what we have described as remote coaching). Particularly, as initial athletes' perceptions have reported positives (i.e., greater focus and motivation for athletes) when working with a video coach (Bennett, 2020a). To this end, regardless of the type of technology used, both require additional consideration to better understand how their integration and implementation might influence coaching priorities,

development, and education frameworks (Cushion & Townsend., 2019; Jones & Toner, 2016; McCosker et al., 2022)

Current conceptualisations of the “coaching process” (see Lyle & Cushion, 2016, pp. 42 - 69) typically assume that the coach is present in the training or competition environment with their athletes (i.e., in person, including when using the technology) and consequently, very few studies (e.g., Bennett, 2020a, 2020b; Szedlak et al., 2022) have so far explored how coaching remotely impacts the coaching process or coach-athlete interactions. Of particular interest is exploring if coaches approach remote coaching in same ways as they would when coaching in person or whether they adapt their pedagogical strategies. Importantly, there is a need to consider if the lack of physical presence in a coaching session, limits a coaches’ ability to pick-up and use information within that environment (e.g., temperature; humidity; the sound of the session; the ability to pick-up on the body language of athletes) (Gibson, 1986; Woods et al., 2023). Bennett (2020a) offered preliminary insights into the use of ‘video coaching’ via a case-study and reported both positives and challenges of such an approach in Kendo (Japanese fencing). Positive impacts included providing “structure, it spurred motivation and added authority to the preparation phase” for athletes (p. 15). Whereas more recent work by Szedlak et al. (2022) found the online environment facilitated improved connectivity with athletes by providing insight into different environments and an opportunity for practitioners to express care and empathy, focusing on athletes’ overall wellbeing outside of the direct sporting context. However, challenges identified by Bennett (2020b) included limited freedom and an inability to move around the training environment. Although recent research offers initial insights (Bennett, 2020b; Szedlak et al., 2022), given the proliferation of such technologies, accessing the perspective of coaches’ who actively use the technology could offer crucial insights on its strengths and weaknesses in coaching contexts, as well identify areas for deeper study. In alignment with current theories in skill acquisition such as ecological dynamics, there has been suggestions there is a need to broaden our conceptualisation of what constitutes the

coaching or learning environment to account for the use of remote coaching technologies (McCosker et al., 2022; Woods., et al., 2023).

A further limitation of the current research in sport identified by academics and coaches are the concern of directly transferring results and findings from existing empirical research situated in high performance non-disabled contexts (i.e., Olympic, and professional sports) into those for athletes with a disability. This practice, allied with the typical approaches to coach education (i.e., often purely information dissemination), tends to lack context and individualisation relevant to Paralympic contexts and needs (see Cushion & Townsend, 2019). Specifically, research fails to take into consideration the unique challenges experience by coaches and individual athlete circumstances (e.g., impairment, resources; Cregan et al., 2007; McMaster et al., 2012; Paulson & Goosey-Tolfrey, 2017; Pinder & Renshaw, 2019; Wareham et al., 2019). Interestingly, coaching athletes with a disability may require more nuanced communication with an athlete with an intellectual impairment, more hands-on demonstration, or manual guidance for an athlete with a vision impairment, or the ability to pick up subtle postural changes that indicate a level of fatigue for an athlete with a physical impairment. While the design of practice to meet the needs of individual athletes should be an important consideration for all coaches, it could be argued that coaching in Paralympic Sport acts to place even more focus on achieving this goal (Pinder & Renshaw, 2019). In this way, exploring these challenges in Paralympic contexts could provide insights that have an impact across a range of high-performance programs (Askew et al., 2023).

Given our current lack of understanding of how remote coaching impacts coach-athlete interactions, a first step in exploring these contexts and shaping future research should be to expand on the work of Bennett (2020a, 2020b) and Szedlak et al. (2022) by seeking to understand the experiences of a wider cohort of coaches utilising remote coaching within training and competitions environments. The aim of this study, therefore, was to explore Paralympic coaches' firsthand experiences, insights, and perceptions of the opportunities and challenges when using remote coaching.

Methodology

Philosophical Approach

Our chosen qualitative methods of interview and observation sought to capture the unique experience of Paralympic sports coaching. Our thematic analysis of these experiences reflects an interpretive approach, seeking to represent, evaluate, and acknowledge, our participants shared experiences, while aiming to retain nuances of individual Paralympic coaching perspective (Holt & Tamminen, 2010). Thus, by adopting an interpretive approach our results allow insight into how peoples individual backgrounds and values (including our own) shape “what is possible to know and how that knowledge is obtained” when using remote coaching (Smith & Sparkes, 2020, p. 1003). The thematic categories we present do not intend to detail every opportunity or challenge faced by Paralympic coaches when using remote coaching technologies. Rather, our methods of collection and analysis sought to consider how remote learning technologies have evaluative (i.e., ways remote coaching is used) and behavioural consequences (i.e., ways remote coaching may affect the coaching process) for remote coaching environments (Glăveanu, 2011).

Recruitment

Participant recruitment adopted a purposive sampling approach for this study which involved deliberately selecting participants with previous experience that have the potential to maximize understanding of the phenomena under investigation (Braun & Clarke, 2013). Consequently, coaches must have previously used and have access to digital/online technologies (including supporting software and devices/equipment) for remote coaching in training or competition environments. Additionally, all coaches at the time of the interview were coaching athletes in sports preparing for the Tokyo 2020 Paralympic Games. Initial contact and invitation to participate was sent to prospective National Sporting Organisations via email which outlined the study aims and participant information prior to coaches being contacted. Although not considered primary participants, athletes that participated in remote coaching sessions in which observations were conducted were sent information about the study prior to observations occurring. Informed consent was obtained

from all participants. Institutional approval was obtained from Queensland University of Technology ethics committee.

Participants

Seven coaches from five different Paralympic Sports agreed to participate in this study. All coaches had experience at international competitions and went on to coach in their respective sports at the Tokyo 2020 Paralympics. All coaches had access to software (e.g., zoom or bespoke platforms) and equipment (e.g., smartphone, laptop, iPad/tablet, Bluetooth headphones) needed to conduct remote coaching. However, access to equipment and the use of software platforms used varied between participants (e.g., number of devices set up and used during sessions). Participant information and result are presented using pseudonyms (see Table 1). This information has been considered to balance the need for reader insight into the previous experience of participants, while ensuring anonymity given the small pool of Paralympic coaches.

Table 1. Participant Information

Coach	Gender	Athlete	Years Coaching	Current Role	Remote Coaching	Athlete impairment types
Carol	Female	Yes	>12 years	< 1 year	<1 year	Physical
Bob	Male	Yes	>35 years	4 years	>5 years	Physical, Intellectual
Frank	Male	Yes	>13 years	2 years	>3 years	Physical
John	Male	Yes	>18 years	16 years	>2 year	Physical
Max	Male	Yes	>10 years	2 years	<1 year	Physical
Tom	Male	Yes	>10 years	4 years	<1 year	Physical
Sam	Male	Yes	>28 years	4 years	<1 year	Visual

Procedure

A combination of ethnographic research methods (interviews, observations, and field notes) was used for data collection in two different phases. Ethnography combines several different methods (e.g., interviews and observations) and requires “direct contact” with individuals or a group (i.e., sport team and/or squad) over an extended period within their everyday environment (Atkinson, 2017, p. 50). By exposing the lead author to the context (i.e., Paralympic Sport) of the population group in question, the author was able record or capture not only what happens but also look to gain firsthand experience and insight of the coaches’ experiences with remote coaching from their

perspective (Atkinson, 2017). Notably, the lead author has over 10 years of experience working in high performance sport within Australia, working across a number of different roles including several years working with coaches and athletes who have coached, participated and competed across different Paralympic Sports and at Paralympic Games. One of these roles included supporting the set up and facilitation of remote coaching. Immersion in the field in this way allowed the lead author during both observations and data analysis to be contextually sensitive to key terms and meanings that are relevant to coaching in Paralympic contexts.

Coaches participated in semi-structured interviews as well as having remote coaching sessions observed by the lead author. Coaches also participated in short follow-up interviews with the lead author to ask any questions or seek clarification on observations from the sessions as required. All sessions were scheduled in the coaches current training plan (i.e., they would have been conducted regardless of the research study).

Phase 1 Semi-structured Interviews

Interviews were semi-structured to allow for a natural flow/progression of conversations but ensured that an overall guide and themes were followed (Clarke et al., 2015). Interviews were developed based on the lead authors experience within Paralympic Sport and with the use of remote coaching technologies, in consultation with the research team. Pilot interviews were conducted with colleagues of the lead author who acted as critical friends (Braun & Clarke, 2013). All colleagues had previous experience in Paralympic Sports and with the use of remote coaching technologies allowing for an opportunity for questions to be refined and ensure language and terminology appropriate to the coaches was being used. Interviews commenced with questions to help gain an understanding of each coaches' background and current role within their respective sports to help develop rapport and develop an understanding of each coaches' sports' specific context. Interview questions then focused in and around coaches' use of remote coaching technologies and included questions such as: What has your experience been like using remote coaching? What challenges have you experienced? Additional sub-questions emerged as part of the interactive dialogue and included

suggestions and prompts to help facilitate follow up conversation and discussions (Braun & Clarke, 2013). This ensured exchanges became focussed on the theoretical interests of this inquiry, rather than more general non-remote learning experiences (Russell et al., 2022).

Interviews were organised at a time that was convenient for coaches in and around existing training and competition schedules. The lead author conducted all interviews. Six interviews were conducted online (Zoom Video Communications), and one in person with audio recording (Olympus Digital Voice Recorder WS-852). Interviews ranged from 45 - 60 minutes in duration. All interviews were transcribed verbatim by the lead author. Each transcript was reviewed against each interview recording upon completion to ensure accuracy of transcription.

Phase 2: Observations

Following interviews, observations ensured the lead author had the opportunity to gain firsthand experience as a participant in remote coaching sessions across different Paralympic Sports contexts. Observations occurred via commercially available (e.g., Zoom) or a bespoke platform ('Paralympic Connect') on either an iPad or laptop using internet browser windows (Google Chrome). Over 40 hours of remote coaching sessions were observed across different states and training venues (mean session duration = 83 minutes).

Observations were conducted during planned remote training sessions between coaches and athletes; with no sessions having to be created or manufactured solely for the purpose of this study. Both the coach and athlete were aware prior to the session commencement of the lead authors attendance. Remote coaching sessions commenced at a pre-determined time and date on an agreed upon platform (e.g., Zoom) and commonly commenced when all participants joined. To join a session all participants were required to have both video and microphone connections on and working through their respective device. However, during observations it was not uncommon for participants to mute themselves at different times to avoid background noises and distractions. For observations, the lead author was considered a passive participant in sessions, meaning that their camera was on and visible, their microphone was muted and there was little to no interaction

outside of initial introductions (and goodbyes at session completion), informal casual conversations with the coach before the athlete joined, or interactions that were initiated by coaches or athletes. An example of such an interaction would be when specific aspects of training or sport specific information was shared. This approach was taken to minimise any potential disruption to the training sessions that may occur from the lead author's attendance. As highlighted above, the lead author has supported remote coaching set ups, so it was not unusual for them to be observing training sessions.

The lead author took field notes during observations of the remote coaching sessions. These notes informed informal interviews that were conducted with coaches to clarify thoughts, insights, and themes from the training sessions and obtain additional insights as required. Field notes, reflections and additional insights from coaches were handwritten and transcribed verbatim. Adopting these different methods of data collection to investigate the same research question gave the lead author additional sources of information to generate a greater understanding of each participant and context (Braun & Clarke, 2013; Smith & Sparkes, 2020). Together, these different but complimentary sources of information offered a more proportioned view of the coaches' experiences, as well encouraging the lead researcher to be more reflexive when developing thematic ideas (Russell et al., 2019).

Analysis

Interview transcripts, field notes and researcher reflections were analysed using thematic analysis. Thematic analysis is a "method for identifying themes and patterns" from within a dataset in response to a research question (Braun & Clarke, 2013). A primarily inductive approach was adopted as this "aims to generate an analysis from the bottom (the data) up; analysis is not shaped by existing theory" (Braun & Clarke, 2013, p. 175). Analysis was guided utilising a six-step process including (1-2) familiarization and coding; (3 - 5) theme development, refinement, and naming, and (6) writing up (Braun et al., 2017).

Interview transcripts were entered into NVIVO 12 for analysis. The lead author conducted preliminary coding of transcripts. Preliminary codes were reviewed and refined with the broader research team following in-depth discussion, critical questioning and reviewing of interview transcripts as required ensuring accurate interpretation and code allocations. Following discussions, codes were again reviewed by the lead author and then grouped into first and second order themes. Themes with supporting examples from field notes and reflections taken during observation were then presented back to the broader research team prior to being finalised. The goal of this iterative process was to interrogate tensions surrounding proposed interpretations, to ensure more complex dense thematic renderings (Glaser, 2003).

Results

A total of five overarching themes were identified from interviews that reflect the coaches in Paralympics sport experiences of the use of remote coaching. Opportunities included (1) *increased coach-athlete interactions*, (2) *being able to explore and exploit new information* within the online environment and, (3) *inter- and intra-coach development*. Whereas challenges that were experienced and discussed were those that were perceived to (4) *impact on coaching* in a way that differed to coaching in person. Finally, (5) *practical considerations* present the real or perceived impact on training design and delivery of sessions born from these opportunities and challenges connected to remote learning. These themes are presented and discussed with supporting quotes and insights from observations.

Increased Coach-athlete Interactions

The use of remote coaching gave coaches the opportunity to increase the number of interactions they had with athletes located interstate. This immediate communication allowed coaches to build and develop interpersonal relationships with their athletes and be more efficient within their own time constraints.

Increased Frequency of Interactions

All coaches commented positively on the ability to connect and interact with their athletes more frequently due to using remote coaching technologies. Coaches discussed that in some instances prior to the use of remote coaching, they may have only seen athletes who lived interstate two or three times per year due to the decentralised nature of elite Paralympic Sports programs in Australia and limited financial resources. For example, Max acknowledged the value of these additional interactions in comparison to the alternative “I think it’s added enormous value to be honest and it’s that connection side of things as well. That you may not see some athletes for 6 months or something, at least you are seeing them”.

Coaches were observed across multiple sessions with the same athlete(s) with variation in the frequency (i.e., multiple days or weekly) and duration being dependent on the individual athlete, their current training plan, work or study commitments and goals. Observations demonstrated that regular (even if short) connections allowed for a continuation of ideas on training design, skill progressions and goals from session to session to be shared between coaches, athletes, and practitioners. Additionally, the increased use of remote coaching during the COVID-19 pandemic allowed coaches to see and remain in regular contact and communication with athletes that they typically coached in person day to day but were unable to do so as a result of government enforced social distancing requirements.

Immediacy of Interactions

Outside of being able to see and connect with their athletes more frequently, all coaches commented on the positive impact of live (i.e., in real time) communication and interaction, compared to delayed video sharing that was typical in many of the coaching contexts. As Bob highlighted, the biggest impact for him when using remote coaching was the speed of interactions and communication during live sessions “I think just that immediacy of communication is probably the biggest thing for me.”

This immediacy provided opportunities for communication, but also allowed coaches to see and experience the different emotions or reactions that athletes display throughout a session. For

example, Carol explains how the use of remote coaching also allowed her to not only speak to athletes but see them and how their body language and emotions change throughout sessions “I can see their emotions, like how they’re happy to train or they get frustrated or something like that ... It’s more like in the real face-to-face coaching.”

The use of additional equipment such as Bluetooth headphones was observed to enhance the immediacy of coach-athlete interactions, allowing a more immersive experience for the coach, and real time discussion during training sessions. By using Bluetooth headphones coaches were less impacted by their reduced mobility and freedom of movement within the athletes’ training environment. For example, without the use of Bluetooth headphones, coaches were often required to wait for athletes to stop training, have a break or to approach devices (i.e., iPad or laptops) to interact and communicate instructions, encouragement, or feedback.

Building Relationships and Rapport

Connecting with athletes more frequently through remote coaching presented coaches the opportunity to build stronger relationships and rapport with athletes, allowing them to get to know and understand their athletes both within and outside their respective sports. As John explained remote coaching allowed him to dedicate more of his time and show care towards the athletes he works with in other states “[it] also helps build the rapport a bit more with the athlete as well, they feel like they have got your attention, and they are not second rate to other athletes who might be based where you live.” Bob then further adds how this additional time contributes toward fostering interpersonal relationships “They are hearing what I am saying... seeing my actions, my emotions. It’s just building that fuller relationship with the players. So that, they’re understanding you and you’re understanding them a little bit more.” For example, coaches were observed engaging in what would be considered ‘off-topic’ conversations with athletes and practitioners (e.g., skill acquisition) that did not directly relate to the athlete’s sport. Conversations would include a variety of topics related to current news and events (e.g., Covid-19 global pandemic), work or study, professional sporting results, family, and shared/common interests outside of sport. Bob provided additional

insight indicating that off-topic conversations provide an “opportunity to *really* get to know them” and allows them to “build relationships and reference points. You can then come back to reference points later and understand what they are interested in.” The reference points that Bob discusses relate to insights that they have gained about their athletes outside of the direct sporting context and give ‘starting off points’ to initiate conversations at a later stage. This helped to build the coach-athlete relationships as it demonstrated to the athlete that the coach is interested in them as a person, not just as an athlete (Rollnick et al., 2020). Coaches were observed using these reference points. For example, they used athletes’ interest such as other sports teams/athletes as analogies when providing instruction or direction on technical and tactical skills during training sessions. Coaches leveraged existing and new knowledge of athletes’ interests in other sports and activities to spark further discussion to understand their athletes more deeply, which in turn shaped the way in which they coached.

Increasing Efficiency

The use of remote coaching allowed coaches to be more efficient with their time, removing the need for extended travel, and providing additional time that could then be dedicated to connecting with athletes, or increasing the number of touch points with athlete(s). As a result, coaches were observed participating in or observing multiple or even back-to-back remote training sessions in one day. John discussed how using remote coaching allowed him to “do a lot more sessions without having to do as much travel”. This efficiency was a clear benefit for athletes, who were able to access more from their (typically) time poor coaches (two out of five were part-time coaches) and balancing training commitments with work or study. Frank highlighted how the use of remote coaching sessions replaced in-person training with his athletes as they found it allowed them to be more efficient with their time and help maintain a balance between work and sport commitment and prioritise athlete wellbeing:

“So, there is about a four-hour period where they can only train for an hour and a half. Whereas now they don’t need to leave work early, they can leave work normally. Go back home, their

equipment already set up because they train at home ...we'd train for 2 hours and then they would finish training, they can eat or rest or whichever but they're already at home, so it saves a lot of time."

Explore and Exploit Information

Coaching remotely meant that coaches had the opportunity to explore and discover new training information available within the online environment that was not previously perceived during in-person sessions. Remote coaching sessions also allowed coaches to view things (i.e., skill execution) from different perspectives (e.g., angles and positions), which resulted in the development of new strategies and streamlined communication with athletes.

Creating New Strategies

The use of remote coaching technologies afforded coaches the opportunity to be creative in the way they adapted to the online environment and create new strategies to assist in their communication with athletes, which in turn enhanced their coaching in all contexts.

When coaching remotely it is possible for there to be some confusion at times as coaches' see the mirror image of the athlete's video. That is, depending on the set-up of the session, a coaches' right and left view may be the opposite to the athlete's view. Consequently, observations were that coaches needed to be very clear when providing any information that contained directions.

Coaches overcame this potential problem by using numbers, letters, or clock faces as reference points to communicate tactical information more effectively, regarding equipment placement or specific positioning on the field of play. Bob explained that working with his athletes remotely led to the development of what is now key communication strategies "we've developed a few communication tools through remote coaching. Just through the need, or ease of communication".

The impact of these strategies was so successful that they have been adopted by coaches in all sessions and during competitions and is "something now that translates into when we are [physically] in the training venue with the athletes." (Bob). Coaches reported that the challenges of coaching remotely created a perturbation in their pedagogical approach (Wood et al., 2023) and

sparked ways to be more efficient in their communication, particularly when under time constraints (i.e., time limits during breaks in competition). Additionally, coaches were observed using a range of simple tools to improve instruction clarity, such as the use of the clock face as a reference to guide camera placement based on what the coach wished to observe when coaching remotely.

New Information from Different Perspectives

Through trial and error with additional equipment, coaches discovered they were able to explore new information from the training environment that they may not have previously explored (or even been able to access) when coaching in person. Through the constraints of the remote environment, or by specifically trialling how they might use or place devices, coaches were able to gain different observation opportunities (e.g., closer positions) of training drills and skill execution compared to where they might typically (and perhaps consistently) observe from. These new options acted to provide new information and enhance coaching impact. For example, as Frank explained when coaching remotely allowed a different perspective that he would not have thought to consider when coaching in person:

“I found that I could make technique changes, like aggressive technique changes and it was actually better online than in person! Now, I’m not too sure why yet, I think it has a lot to do with using video, as well the camera being super still and I could see movement [of the athlete].”

As highlighted above, the use of additional technologies during training sessions enabled coaches to enhance and streamline communication with athletes, but also access to new information sources or coaching opportunities. As an example, the use of Bluetooth headphones resulted in a chance to hear athlete ‘self-talk’ during training and skill execution; a source of information not previously available due to specific sport or event constraints (e.g., due to safety, where coaches are allowed to stand, or noisy practice halls). Access to this previously unattainable information allowed coaches to adopt new coaching strategies, understand athlete behaviour better, and enabled them to be more targeted in their use of questioning. For example, Frank explained how the additional information available when using remote coaching helped to direct and align his thinking with the athletes’

feedback when coaching “there was just something different [said] and then that made me think ‘ahh okay’, what I originally thought didn’t quite align...I guess different opportunities, different perspectives.”

Inter- and Intra-coach Development

One of the biggest (perhaps initially unexpected) benefit coaches discovered when coaching remotely were the opportunities it created for them to develop their own coaching skills (i.e., communication and planning) through increased opportunities for interactions with other coaches and practitioners (e.g., skill acquisition specialists). Coaches also highlighted and discussed the potential benefits of remote coaching in providing coach development opportunities for other coaches both within and between Paralympic sports.

Developing Personal Coaching Skills

Coaches reflected on the way remote coaching allowed them to work on their own coaching skills. The challenges experienced meant that coaches had to be more consistent with what they were saying to athletes, when they were saying it and how they were saying things during remote training sessions. Sam indicated how the use of remote coaching helped him to be more consistent and concise with his communication when coaching “I think without remote [coaching]; I would have possibly got lazy on it and assumed that me being able to wave my hand around got the same message across. [Using] no, language specific, consistent language.” This was also supported by John who explained how coaching remotely made him conscious of how long he was talking for, “I suppose when you are in person... you can waffle on a fair bit like I am now [with remote coaching] ... you’re trying to talk less but getting to the point sooner.” In this way, remote technology acted implicitly as a feedback tool for coaches to reflect on their practice and delivery styles when communicating with athletes.

Coach Accountability and Planning

The use of remote technology increased coaches access to practitioners (e.g., skill acquisition specialist, psychology) and was seen as an effective way to enhance their own learning opportunities

during training sessions. Coaches reported that the presence of practitioners acted as a sounding board and someone to share ideas with, but someone who could hold them accountable for planning and preparation of training sessions more than was possible prior to the use of remote coaching. Frank provided an example of how the attendance of the practitioners reminded him that he should be clear on his plan for the session beforehand:

“when [the skill acquisition specialist] was chiming in earlier, he’d kind of ask ‘what’s the goal for the session’ ...I’m so used to coming up with it on the day itself, but the forward thinking, it helps me, keeps me on my toes.”

Similarly, this use of remote technologies required coaches to plan, structure and communicate times, meeting details and training information (i.e., goals and plans) with athletes and practitioners. As Tom described how using remote coaching allowed him to plan and commit to his remote sessions and athlete interactions more formally than ad hoc:

“I think it gives my days some more structure as well I know I can plan in those coach interactions.... it provided me with that structure knowing I have that time to connect with someone, somewhere else, provides me with that structure to, which I wouldn’t have had in the past.”

In both examples, the emphasis on being prepared and organised was particularly useful outcome of remote learning, as Paralympic sports settings in Australia primarily run as decentralised programs, where coaches need to support athletes across different states and therefore time zones.

Developing and connecting with other Coaches

An unexpected benefit that coaches identified and discussed was that remote coaching enabled them to connect more frequently with other coaches (e.g., personal coaches) who were supporting athletes during sessions. Coaches highlighted that this created informal opportunities for coach development and learning by allowing observations of training sessions that may stimulate additional interactions between coaches. Frank reflected on the realisation that remote coaching

and working with other coaches in sessions may provide opportunities for coach development and education within his sport, when these opportunities may not occur otherwise:

“like after the whole video session they [coach] gave me a call and started to ask me a lot more questions about it, so I explained a lot more and it made me realise that this is pretty useful learning for other coaches as well.”

Even though coaches primarily observed sessions within their own sport, they identified the potential benefits of remote coaching to facilitate interactions with coaches in other sports by reducing logistical barriers (i.e., cost and time associated with travel) similar to those experienced by athletes. This opportunity was identified by Bob who expressed an interest going forward in using remote coaching to connect with other coaches:

“being able to watch other coaches coaching as well...I think that’s an area that will really develop over the next few years as well. Just that communication with other coaches, I’m able to see what another sport does, and [the] games and insights into some simple things from them...as coaches, we always talk about wouldn’t it be nice to go and watch someone else coach, this is an easy and simple way to do that”.

Impact on Coaching

Overall coaches’ experiences of remote coaching were positive, several challenges and restrictions were identified. These were primarily relating to limitations around movement and visibility, changes to the perception of the learning environment (i.e., the information available to them), as well as some changes to their traditional coaching delivery (e.g., instructions, demonstrations, feedback)

Limitations to Movement and Visibility

Coaches discussed several limitations of remote coaching, including the fact that they were only able to have a limited view when observing training as they were unable to move around the training venue as they would have done when coaching in person. Often, restrictions on training space and limited equipment and resources also constrained the placement and positioning of

devices. For example, coaches often had to compromise on what they observed given the available space and/ or image quality. As Carol expressed there was challenges at times simply around what she could see during sessions:

“From my side, sometimes I feel like if [the athletes] don’t have a perfect [camera] angle to [observe] the training space and I can’t see their training clearly, maybe I only can see their skill and execution, but I can’t see the outcome or not.”

In team sports, coaches found that coaching remotely meant they missed being able to approach and check in with individual athletes if required during sessions. Sam explained that in a group training session (without Bluetooth headphones) he missed the opportunity to check in with athletes one-on-one without everyone else hearing the conversation: “I can’t walk up and talk to [an individual athlete] quietly and say, ‘what’s up here?’.” The opportunity to have a ‘quiet word’ offline from the session is highly valued by coaches and in remote coaching this opportunity is lost as conversations may be heard by everyone in attendance at the session if audio was broadcast through devices speakers and not headphones.

Changes to the Perception of the Environment

In contrast to the positive benefits of exploring new information sources, coaches also discussed challenges through missing other key environmental information (e.g., weather, temperature) when coaching remotely as they were not able to personally experience that same environment. Coaches acknowledged needing to be aware of the environmental information they are missing when observing training sessions as it may impact their interpretations of athlete performance or effort during training. This is particularly important when working with athletes with specific impairments who may be more easily impacted by environmental conditions than non-disabled athletes. For example, John explained how it was easy to misinterpret what you were seeing if you weren’t experiencing a particular aspect of the environment in person such as the weather firsthand:

“it’s just like really hot and you know from a at home perspective your like ‘far out that athletes getting tired pretty quick’ and it’s not a reflection of their fitness it’s actually an indication about the information about how hot it is and fatiguing and different surface temperatures.”

Coaches discussed further challenges in being able to pick up on the vibe or read the energy of a training session. John further explained the differences in picking up on some of the non-verbal or subtle aspects of the current training environment compared to when he would be coaching in person: “You know when you’re in the environment, when you’re coaching a game or a training session you can kind of feel the energy a bit more and see what going on.” This was further discussed by Tom who reflected being “locked on a limited field of vision” and that if something was to occur outside of this field of view then it was hard to determine or ‘pick up’ on. Often this meant that coaches were reliant on athletes (or facilitators) to provide information and details on what has occurred.

Disruption to Coaching Approach

Coaches also identified key differences to in-person coaching when it came to the ways in which they approached and delivered the session (i.e., communication, including instruction, feedback, and demonstrations). As Carol explained when coaching remotely, she felt she had to talk a lot more than when coaching in person: “I have to talk to [the athlete] a lot because I can’t do the drill, demonstration...I need to keep repeating, repeating, repeating sometimes”. To adapt to the perceived limitations of the online environment, coaches indicated they tended to give more instructions and feedback but used fewer demonstrations compared to in-person sessions. The increase in verbal interactions required a different coaching approach rather than simply trying to replicate coaching in person. For example, coaches reported that they asked more questions of athletes in remote coaching. Carol further explained how this created some challenges for her in how she approached sessions:

“sometimes I feel like it’s harder to communicate with them than in the real life yes, sometimes maybe it’s hard for me to demonstrate it. If I was there, if I was in the training venue, I just show them ... it all depends on how much they understand me, or how much I can say clearly, yeah.”

Coaches highlighted limitations in the use of demonstration when coaching remotely, this was one of the key areas where our observations challenged the interview data. During sessions, coaches were observed performing multiple demonstrations, all be it on a smaller scale and (often) without sport specific equipment. Instead, they utilise whatever pieces of equipment they had available to them (i.e., exercise bands) or they shadowed or mimicked the skill.

Practical Considerations

With the use of remote coaching, coaches identified additional practical considerations that had an impact on training design and skill progression that amplified existing challenges faced by coaches. These considerations included inconsistent training venues, access to suitable and additional equipment, and the availability of facilitators to support session set up and equipment management.

Inconsistent training venues

An ongoing challenge in Paralympic sport discussed by coaches was access to suitable and/ or consistent training venues. This issue was exacerbated due to restrictions during the Covid-19 pandemic as athletes were often only able to train at home given Australia’s tough and prolonged social distancing measures. This further challenged coaches when coaching remotely due to limited access to sport specific equipment, suitable training aids, or differences in the set up and location of devices for sessions. For example, with the athlete often solely in charge of set-up, and fitting training in around spaces in their home or public venues, skill development was often difficult to monitor. Tom provided an example of how the variation in equipment set up in different training locations for remote coaching sessions at times lead to inconsistencies with what he was able to see:

“with that bit of ‘the cameras not in the right spot today’ or ‘the equipment's in the wrong spot’ so there is always that little bit of lack of consistency when it came to [working] more on those skill components [due to a] lack of consistency with what we were seeing.”

Sessions were observed across a variety of different training venues, which at times also resulted in constraints on the availability of suitable training spaces and access to equipment. Constraints on training space were observed to impact the content and goals for training sessions as certain skills or activities could not be safely conducted when athletes had to train in spaces that were approximately a quarter of the size compared to those in which they would typically train and compete. For example, when training at home (due to Covid-19 restrictions) athletes often had to navigate around existing structures (i.e., walls, doorways), furniture and variation in flooring surfaces (i.e., carpet, tiles, or uneven outdoor surfaces) which created additional environmental constraints that limited the potential of remote training and task design.

Additional Equipment and Technology

All coaches reported that experiencing issues with access to Wi-Fi and suitable internet speeds was one of the biggest challenges when using remote coaching technology. Challenges experienced included delayed video which impacted communication and interactions, pixelated footage and sessions dropping out or disconnecting unexpectedly. Bob highlighted the importance of ensuring that you have access to the right equipment such as suitable wi-fi or internet connection to ensure you can see the video and communicate with athletes: “I guess, the Wi-Fi for me is always the limiting factor, initially. If you’ve got great Wi-Fi, communication is easy, video is easy; you can see exactly what’s going on.”

Coaches acknowledged that although remote sessions could be run with minimal equipment (i.e., a single smart phone, tablet, or laptop) that access to additional devices, technology and equipment did have a positive impact and aided in sessions running efficiently (as highlighted in ‘New information from different perspective’ above). When coaching remotely, coaches commented (and were observed) on the positive impact of their ability to utilise multiple devices at the same time.

Coaches reported that having multiple camera views available at the same time in remote sessions was a significant advantage over and above the single view they had when delivering in-person coaching sessions. Coaches were observed accessing, reviewing, and editing videos, and making notes on athlete training plans or access training and performance related data, which then helped inform and facilitate conversations and discussions with athletes during training. The use of multiple devices also allowed for those coaches with more experience to manage and participate in sessions that ran concurrently (i.e., coaching in person and remotely, or two remote sessions). This often led to new opportunities to connect remote athletes or multiple training hubs for enhanced team connection. However, access to additional equipment was often dependent on access to financial resources or personal equipment. Frank explained how it was possible to coach remotely without additional equipment (i.e., tripod) but that it was more challenging without this:

“So, for example if they are restricted at a certain place because they don’t have a tripod or there just putting their phone on a bench or a chair or that kind of thing. Like it’s still useful because the camera is still, and I can still see movement but if I need to see certain angles; it’s really tough.”

Reliance on Facilitators

In many situations, having another coach, practitioner, carer, family member or training partner to assist and facilitate proved to be a determining factor in how smoothly a session ran. Coaches spoke of the importance of these facilitators in helping with equipment set up, ongoing management (i.e., repositioning and troubleshooting connectivity issues) and communication with athletes. This was a key issue acknowledged by Bob who explained how the presence of a facilitator impacted the management of equipment (i.e., phone and tripod) and helped minimise disruptions to training during sessions:

“You know you want to see something from this end, but then you also want to see it from the other end. If there is no facilitator there it’s difficult, to stop the athlete and move the thing up the other end.”

Coaches' comments were supported by observations that the presences of facilitators helped to ensure that the athletes could focus on training and did not have to worry about repositioning or moving equipment when requested by coaches. When facilitators were not available (due to resource of time demands in Paralympic contexts) or unable to attend in person (often due to Covid-19 restrictions) then sessions were disrupted, and these responsibilities fell on the athletes. For example, a requirement to reposition equipment, particularly for athletes with more severe physical impairments could lead to delays in sessions commencing and interruptions or longer breaks during sessions. A challenge that may be exacerbating in Paralympic contexts, where some athletes may have challenges in setting up and managing equipment when on their own as Max discussed: "Yeah, obviously I think the challenge is the athlete's disability and they are by themselves to have that to set up is just challenging. And that's where having extra people involved in a particular session makes it easier". In this way, practical considerations connected to the realities of operating sessions online, had the potential to significantly reduce or improve the opportunities and challenges that remote coaching technology offers.

Discussion

The purpose of this study was to explore Paralympic coaches' firsthand experiences, insights, and perceptions of the opportunities and challenges during remote coaching. The use of such technologies has been utilised within elite Paralympic Sports in Australia from as early as 2015 to address the barriers to connecting regularly for training (Sygall, 2020). There was then a further increase and uptake in the use of such technologies in Australian Paralympic sport, as was seen across the World, during the Covid-19 pandemic where all existing opportunities for in-person coaching were heavily restricted. Findings from this study clearly support the potential use of digital technologies as a medium to facilitate and support increased coach-athlete interactions in real-time via remote coaching, regardless of ongoing social distancing measures going forward. The use of these technologies provides an opportunity for coach creativity and exploration due to constraints of the online environment compared to coaching in person. Remote coaching can also provide a way to

begin to solve some of the challenges previously reported in Paralympic sport literature, including a lack of coach development opportunities (McMaster et al., 2012; Wareham et al., 2019), and limited exposure to and access to practitioners or experienced coaches (Pinder & Renshaw, 2019).

Existing literature highlights the importance of the coach-athlete relationship for all sports contexts (Jowett, 2017). Coaches acknowledged during interviews that remote coaching helped facilitate increased connections with athletes, allowing them to develop and build interpersonal relationships. Coaches in Paralympic sport work hard to develop interpersonal relationships as it allows them to get to know and understand athletes, and how individual constraints, including their impairment impacts sport performance. Information obtained through these informal interactions can inform and enhance the coaching process (Allan et al., 2019; Cregan et al., 2007; McMaster et al., 2012; Taylor et al., 2015). For example, enhanced interpersonal interactions are important in supporting the development and individualisation of communication strategies (Pinder & Renshaw, 2019), and provide opportunities for the co-creation of coaching activities (Allan et al., 2019; Alexander et al., 2019; Cregan et al., 2007; Orth et al., 2019). Increasing the number of coach-athlete interactions using remote coaching provides opportunities for coach learning, individualisation of training designs, and the co-creation of activities. By utilising technologies in a way that acts as a medium to facilitate these interactions, it may be possible for remote coaching to address some of the barriers and challenges discussed previously in Paralympic and other low-funded sport contexts.

Our findings revealed that coaching remotely was initiated to reduce travel time and remove financial cost as a barrier to engagement with athletes. The use of remote coaching meant that coaches were able to connect with athletes regardless of their geographical location, time zone differences and any time or resources constraints. In addition to allowing coaches to be more efficient in their time, the use of remote coaching also allowed coaches to support athletes to maintain a balance between work and training commitments. These findings indicated how remote coaching may help address the challenges previously reported in literature, such as how inadequate

financial resources and low numbers of full-time (or even part-time) employed coaches within Paralympic sport contexts limits potential in-person opportunities to build communication and interpersonal relationships (Alexander et al., 2019; Wareham et al., 2019). Coaches further discussed the importance of immediate communication with athletes when training, as well as being able to see and experience athlete emotions, an important factor in building interpersonal relationships. However, the importance of emotions in learning has only recently begun to receive attention in research (Chow et al., 2022). Our findings suggest that the increase in connections using remote coaching, despite the potential loss of information discussed anecdotally, may provide opportunities for coaches to become more 'attuned' to the 'emotions revealed through the body language' of athletes (Chow et al., 2022). Given the potential 'gaps' in coach-athlete interactions in decentralised or camp-based programs, this can result in a significant increase in exposure for coaches and athletes alike. Therefore, when coaching remotely coaches can observe performers in training environments and enable them to become more aware of the current [in real time] emotions of athlete(s) during affective practice tasks. Coaches can then use this information to inform the design of individualised learning task for athletes (Button et al., 2019; Headrick et al., 2015; see Chow et al., 2022 for a detailed overview on 'Affective learning design').

Coaches highlighted that remote coaching and the online environment differed to in-person coaching and found that it created opportunities for creativity. A trait which has previously been identified in research as being an important attribute for coaches within Paralympic contexts (Wareham et al., 2019; Alexander et al., 2019). Findings from the current study suggested that an online environment afforded coaches the opportunity to challenge their thinking and often resulted in outcomes that were better than they would have predicted following an in person intervention or resulted in new ideas and innovations in practice (e.g., communication strategies) that transcended current coaching methodologies. For example, through trial and error and the use of different supporting technology and equipment (e.g., athletes wearing Bluetooth headphones) when coaching

remotely, coaches were able to discover and access new training information that they could then utilise to inform interactions with athletes.

However, coaching remotely also acted in a negative way to limit coaches' ability to pick-up and perceive important physical and socio-cultural information in contrast to the in-person environment. For example, when coaching in person, coaches can perceive first-hand *knowledge of* the physical (i.e., temperature) aspects of the environment in which they are coaching (Gibson, 1986). Whereas, when the coach is not physically present in the same room as their athlete(s), they are unable to *feel* the temperature, *hear* the background noises or *see* distractions when they occur outside of the video/computer screen and their field of view. As a result, coaches need to be reliant on athletes (or facilitators) to provide *knowledge of* the environment or seek new ways to adapt to and explore the environment to access new sources of information from the environment (Gibson, 1986).

Coaches indicated that facilitators also played an important additional role in supporting the set up and management of remote coaching sessions for athletes. The role of facilitators was able to be fulfilled by a magnitude of different people including support personnel (i.e., skill acquisition, carers, family members, partners, and training partners). Existing research has highlighted the importance of parents and carers in supporting the attendance and participation of athletes with more severe disabilities in their chosen sport by providing transportation for athletes as well as and additional support and individualised attention in coaching sessions (Cregan et al., 2007). Whereas our findings indicate that facilitators played an additional role in streamlining the set up and management of remote coaching, the availability and access to this support could be seen as a challenge for paralympic athletes regardless of whether they are training in person or remotely.

Our findings indicate that coaches may need to adapt their approach when coaching remotely as coaches suggested they were unable to (or chose not to) replicate coaching as they would in person, with limitations on their movement, restrictions on what they can see, and their ability to provide demonstrations or act as a training partner. While further research is required to explore specific differences in coaching behaviour between online and in person, our findings suggest that the online

environment changes the environmental information readily available to coaches in comparison to in person. As our findings strongly suggest that we should widen our understanding of the coaching environment to include the remote coaching context, and that going forward coach development and education frameworks integrate different ways in which coaching can be delivered (Cushion & Townsend, 2019; McCosker et al., 2022). Therefore, additional research is recommended that looks at 'reimagining the coaching environment' to reflect the application of technologies such as those used in remote coaching.

Increasing the number of coach-athlete interactions also increased opportunities to connect with other coaches during remote training sessions (e.g., assistant, club or personal coaches providing support and facilitating remote coaching sessions, or other sport coaches). Additionally, remote coaching increases development opportunities and better alignment of training and task design for athletes through connection with practitioners such as skill acquisition, strength and conditioning, and physiotherapy. The use of remote coaching technologies in this way provides an opportunity for a more multidisciplinary approach between coaches and practitioners, while also aligning more with an athlete-centred approach and overcoming the challenges experienced in Paralympic sport (i.e., travel and limited resources). Previous research has reported limited coach development opportunities, specifically those that included specialised disability information (Cregan et al., 2007; McMaster et al., 2012; Pinder & Renshaw, 2019). When considering coaches preference for informal learning opportunities, including learning through interactions with others (i.e., coaches, practitioners, and athletes) (Duarte & Culver, 2014; Erickson et al., 2008; Lepage et al., 2020; McMaster et al., 2012; Nelson et al., 2006; Walker et al., 2018). the use of remote coaching may provide a medium to facilitate these context specific connections *in situ*.

As suggested by Cushion & Townsend (2019), the use of technology enhanced learning (TEL) may "provide interactive environments that enable individuals to address unique learning interests and needs relevant to coaches' individual contexts" (p. 646) as experienced and desired by coaches within Paralympic Sports. Therefore, the use of digital technology for remote coaching may be able

to fill an identified gap in coach learning as a medium to facilitate improved connections between coaches and practitioners in situ, irrespective of the additional challenges discussed previously such as travel, time, and financial constraints (Bentzen et al., 2021; Lepage et al., 2020). In addition, remote coaching may allow coach developers in the future to address calls for a shift in the delivery of coach education and development opportunities to be more *in situ*. This would facilitate a move away from the more traditional approaches currently used (i.e., online courses), because remote coaching may foster greater connections through peer learning with other coaches and practitioners. However, additional research is recommended to further understand the potential use and impact of remote coaching within coach development.

Implications for future research

This study used a combination of semi-structured interviews and observations to gain an insight into coaches' experiences with the use of remote coaching in Paralympic Sports. Although observations were an additional source of data with the aim to provide a fuller picture of each coaches' context, the study was conducted over a relatively short period of time providing a snapshot of remote coaching sessions. In addition, most training sessions observed within the current study were 'one-on-one' (i.e., a single coach-athlete interaction) and, therefore, future research is recommended to look at a greater variety of training contexts (e.g., larger squads, comparing coaching in person and remotely) over a longer duration of time to further understand perceived differences. While we posit that the intent behind the use of video technologies within the context of Australian Paralympic Sport for remote coaching has offset concerns around surveillance reported in previous research when using monitoring technologies (e.g., GPS, wellness measures), any use of additional technology may lead to feelings of distrust and anxiety (Manley & Williams, 2022; Williams & Manley, 2016). It is therefore recommended that future research should look to expand on coach insights from this paper and include the athletes' experiences and perceptions of remote coaching technologies (Townsend et al., 2015).

Finally, it is recommended that coaching research consider remote coaching (i.e., online environments) as unique coaching contexts, and there is a need to reconceptualise and extend what we mean by the coaching environment. Indeed, findings from this work highlighted benefits for athlete development through creativity and adaptations to coach delivery. Future research should continue exploring the use of online environments to challenge coaching approaches and help address calls in research for the integration and implementation of advancing technologies within coach development and education (Cushion & Townsend, 2019; Jones & Toner, 2016; McCosker et al., 2022).

Conclusions

Our findings support the use of online and digital technologies as a medium to help facilitate an increase in opportunities for coach-athlete interactions in Paralympic Sports, aligning with previous findings (Bennett, 2020a; Bennett, 2020b; Szedlak et al., 2022). Coaches identified and acknowledged challenges that had an impact on how they may approach and deliver sessions, overall, their responses were positive and support the use of online technologies. At a basic level, coaches were able to increase the frequency, and immediacy in which they were able to connect and communicate with their athletes allowing them an opportunity to get to know athletes, build rapport and interpersonal relationships that may not have been achievable with minimal contact. However, more interestingly, remote coaching may provide an opportunity for creativity as coaches explore the online environment and discover new sources of training information that may not have previously been considered or accessible when coaching in person. In addition, there may be opportunities to further utilise remote coaching for coach development and informal learning by facilitating increased interactions with other coaches' and practitioners within the specific sport context, but also across other sports and even non-disabled sports. The use of remote coaching may help to significantly alleviate some of the challenges experienced in Paralympic sport (Pinder & Renshaw, 2019), and provide innovative examples for all sport contexts. However, future research should continue to explore key differences between contexts and how these impact coaches'

perception of the environment and subsequent behaviours (i.e., how this may impact those coaches that rely heavily on instruction and demonstration). A deeper understanding of how remote coaching technology may impact or change the coaching process would be of great value to enhance our understanding of the relationship between coaching pedagogies, the development of coaching expertise and coach-athlete interactions.

References

- Alexander, D., Bloom, G. A., & Taylor, S. L. (2019). Female Paralympic Athlete Views of Effective and Ineffective Coaching Practices. *Journal of Applied Sport Psychology*, 32(1), 48-63.
<https://doi.org/10.1080/10413200.2018.1543735>
- Allan, V., Evans, M. B., Latimer-Cheung, A. E., & Côté, J. (2019). From the Athletes' Perspective: A Social-Relational Understanding of How Coaches Shape the Disability Sport Experience. *Journal of Applied Sport Psychology*, 32(6), 546-564. <https://doi.org/10.1080/10413200.2019.1587551>
- Askew, G.A., Pinder, R.A., Renshaw, I., & Gorman, A.D. (2023). Supporting coach learning in Paralympic sport: Rich environments for innovation. *International Sport Coaching Journal*, 1 (Advance online publication), 1-8. <https://doi.org/10.1123/iscj.2022-0041>
- Atkinson, M. (2017). Ethnography. In B. S. Smith., & A. C. Sparkes (Ed.), *Routledge Handbook of Qualitative Research in Sport and Exercise* (pp. 49-61). Routledge.
- Bennett, B. C. (2020a). My video coach - a phenomenographic interpretation of athlete perceptions of coaching through a live video feed. *Qualitative Research in Sport, Exercise and Health*, 13(3), 455-472. <https://doi.org/10.1080/2159676X.2020.1733643>
- Bennett, B. C. (2020b). The video coach - reflections on the use of the ICT in High-Performance sport *International Sport Coaching Journal*, 7(2), 220-228. <https://doi.org/10.1123/iscj.2019-0048>
- Bentzen, M., Alexander, D., Bloom, G. A., & Kenttä, G. (2021). What Do We Know About Research on Paraspport Coaches? A Scoping Review. *Adapated Physical Activity Quartely*, 38, 109-137.
<https://doi.org/10.1123/apaq.2019-0147>
- Braun, V., & Clarke, V. (2013). *Successful Qualitative Research*. SAGE Publication.

- Braun, V., Clarke, V., & Weate, P. (2017). Using thematic analysis in sport and exercise research. In B. S. Smith., & A. C. Sparkes (Ed.), *Routledge Handbook of Qualitative Research in Sport and Exercise* (pp. 191-205). Routledge.
- Button, C., Ludovic, S., Chow, J. Y., Araújo, D., & Davids, K. (2019). *Dynamics of Skill Acquisition: An ecological dynamics approach* (2nd Edition ed.). Human Kinetics.
- Chow, J. Y., Davids, K., Button, C., & Renshaw, I. (2022). *Nonlinear Pedagogy in Skill Acquisition* (2nd ed.). Routledge.
- Clarke, V., Braun, V., & Hayfield, N. (2015). Thematic Analysis. In J. A. Smith (Ed.), *Qualitative Psychology: A practical guide to research methods* (3rd ed.). SAGE Publication.
- Cregan, K., Bloom, G. A., & Reid, G. (2007). Career evolution and knowledge of elite coaches of swimmers with a disability. *Research Quarterly for Exercise and Sport*, 78(4), 339-350.
<https://doi.org/10.1080/02701367.2007.10599431>
- Cushion, C. J., & Townsend, R. C. (2019). Technology-enhanced learning in coaching: a review of literature. *Educational Review*, 71(5), 631-649. <https://doi.org/10.1080/00131911.2018.1457010>
- Duarte, T., & Culver, D. (2014). Becoming a coach in adaptive sailing: a lifelong learning perspective. *Journal of Applied Sport Psychology*, 26(4), 441-456.
<https://doi.org/10.1080/10413200.2014.920935>
- Erickson, K., Bruner, M. W., MacDonald, D. J., & Côté, J. (2008). Gaining Insight into Actual and Preferred Sources of Coaching Knowledge. *International Journal of Sports Science & Coaching*, 3(4), 527-538.
- Gibson, J. (1986). *The ecological approach to visual perception*. Lawrence Erlbaum Associates.
- Glaser, B. G. (2003). *The Grounded Theory Perspective II: Description's Remodeling of Grounded Theory Methodology*. Sociology Press.
- Glaveanu, V. P. (2011). Is the lightbulb still on? Social representations of creativity in a Western context. *The International Journal of Creativity & Problem Solving*, 21(1), 53-72.

- Headrick, J., Renshaw, I., Davids, K., Pinder, R. A., & Araújo, D. (2015). The dynamics of expertise acquisition in sport: The role of affective learning design. *Psychology of Sport and Exercise, 16*, 83-90.
- Holt, N., & Tamminen, K. (2010). Moving forward with grounded theory in sport and exercise psychology. *Psychology of Sport and Exercise, 11*, 419-422. doi:10.1016/j.psychsport.2010.07.009
- Jones, L., & Toner, J. (2016). Surveillance technologies as Instruments of discipline in the elite sports coaching context: A cautionary post-structural commentary. *Sensoria: A Journal of Mind, Brain & Culture, 12*(2), 13-21.
- Jowett, S. (2017). Coaching effectiveness: the coach-athlete relationship at its heart. *Current Opinion in Psychology, 16*, 154-158. <https://doi.org/10.1016/j.copsyc.2017.05.006>
- Lepage, P., Bloom, G. A., & Falcão, W. R. (2020). Development and acquisition of knowledge of youth parasport coaches. *Adapted Physical Activity Quarterly, 37*, 72-89. <https://doi.org/10.1123/apaq.2019-0017>
- Liebermann, D. G. H., Michael, T., & Franks, I. M. (2019). Video-Based Technologies. In M. Hughes, I. M. Franks, & H. Dancs (Eds.), *Essentials of performance analysis of sport* (3rd ed., pp. 41 - 50). Routledge.
- Lyle, J., & Cushion, C. (2016). *Sport coaching concepts: A framework for coaching practice* (2nd ed). Taylor & Franics.
- Manley, A., & Williams, S. (2022). 'We're not run on Numbers, We're People, We're Emotional People': Exploring the experiences and lived consequences of emerging technologies, organizational surveillance and control among elite professionals. *Organization, 29*(4), 692-713. <https://doi.org/10.1177/1350508419890078>
- McCosker, C., Otte, F., Rothwell, M., & Davids, K. (2022). Principles for technology use in athlete support across the skill level continuum. *International Journal of Sports Science & Coaching, 17*(2), 437-444.

- McMaster, S., Culver, D., & Werther, P. (2012). Coaches of athletes with a physical disability; a look at their learning experiences. *Qualitative Research in Sport, Exercise and Health*, 4(2), 226-243. <https://doi.org/10.1080/2159676X.2012.686060>
- Nelson, L. J., Cushion, C. J., & Potrac, P. (2006). Formal, Nonformal and Informal Coach Learning: A Holistic Conceptualisation. *International Journal of Sport Science & Coaching*, 1(3), 247-259.
- Orth, D., van der Kamp, J., & Button, C. (2019). Learning to be adaptive as a distributed process across the coach–athlete system: situating the coach in the constraints-led approach. *Physical Education and Sport Pedagogy*, 24(2), 146-161. <https://doi.org/10.1080/17408989.2018.1557132>
- Paulson, T., & Goosey-Tolfrey, V. (2017). Current perspectives on profiling and enhancing wheelchair court-sport performance. *International Journal of Sports Physiology and Performance* 3(2), 275-286. <http://dx.doi.org/10.1123/ijsp.2016-0231>
- Pinder, R., & Renshaw, I. (2019). What can coaches and physical education teachers learn from a constraints-led approach in para-sports. *Physical Education and Sport Pedagogy*, 24(2), 190-205. <https://doi.org/10.1080/17408989.2019.1571187>
- Rollnick, S., Fader, J., Breckon, J., & Moyers, T. B. (2020). *Coaching athletes to be their best: Motivational interviewing in sports*. Guilford Publications.
- Russell, S., Renshaw, I., & Davids, K. (2019). How interacting constraints shape emergent decision-making of national-level football referees. *Qualitative Research in Sport, Exercise and Health*, 11(4), 573-588. DOI: 10.1080/2159676X.2018.1493525
- Russell, S., Renshaw, I., & Davids, K. (2022). Sport arbitration as an emergent process in a complex system: Decision-making variability is a marker of expertise in national-level football referees. *Journal of Applied Sport Psychology*, 34(3), 539-563. DOI: 10.1080/10413200.2020.1831651
- Smith, B., & Sparkes, A. C. (2020). Qualitative research. In G. Tenenbaum & R. C. Eklund (Eds) *Handbook of Sport Psychology* (4th ed., pp. 999-1019). John Wiley & Sons Inc.
- Syggall, D. (2020, August). Connecting in the new world of social distancing. *The Australian Paralympian: official magazine of Paralympics Australia*, 4, 13-15.

- Szedlak, C., Smith, M.J., & Callary, B. (2022). "Nothing was lost sailing-wise and lots is gained on a personal level": Practitioners' behaviours and athletes' perceptions of working in online environments. *Psychology of Sport & Exercise*, 83, 1-8.
<https://doi.org/10.1016/j.psychsport.2022.102285>
- Townsend, R. C., Smith, B., & Cushion, C. (2015). Disability sports coaching: towards a critical understanding. *Sport Coaching Review*, 40(2), 80-98.
<https://doi.org/10.1080/21640629.2016.1157324>
- Taylor, S., Pinder, R., Renshaw, I., & Polman, R. (2021, November 18 – December 16). Experiences of elite coaches in Para Sports use of digital/online technologies for remote coaching: Key Learnings and insights [Conference Session]. VISTA Conference, online.
- Taylor, S., Wether, P., Culver, D., & Callary, B. (2015). The importance of reflection for coaches in parasport. *Reflective Practice*, 16(2), 269-284.
<https://dx.doi.org/10.1080/14623943.2015.1023274>
- Walker, L. F., Thomas, R., & Driska, A. P. (2018). Informal and nonformal learning for sport coaches: A systematic review. *International Journal of Sport Science & Coaching*, 13(5), 694-707.
<https://doi.org/10.1177/1747954118791522>
- Wareham, Y., Burkett, B., Innes, P., & Lovell, G. P. (2018). Sport coaches' education, training and professional development: the perceptions and preferences of coaches of elite athletes with a disability in Australia. *Sport in Society*, 21(12), 2048-2067.
<https://doi.org/10.1080/17430437.2018.1487955>
- Wareham, Y., Burkett, B., Innes, P., & Lovell, G. P. (2019). Coaches of elite athletes with a disability: senior sports administrators' reported factors affecting coaches' recruitment and retention. *Qualitative Research in Sport, Exercise and Health*, 11(3), 398-415.
<https://doi.org/10.1080/2159676X.2018.1517388>

Williams, S., & Manley, A. (2016) Elite coaching and the technocratic engineer: thanking the boys at Microsoft!. *Sport, Education and Society*, 21(6), 828-850.

<https://doi.org/10.1080/13573322.2014.958816>

Wood, M. A., Mellalieu, S. D., Araújo, D., Woods, C. T., & Davids, K. (2023). Learning to coach: An ecological dynamics perspective. *International Journal of Sports Science & Coaching*, 18(2), 609 – 620. <https://doi.org/10.1177/17479541221138680>