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# Perceptions and Practices of Accredited Tennis Coaches When Teaching Foundational Grip Development

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**Abstract:** This study aimed to understand how tennis coaches perceive and approach the development of grip positions, a foundational skill in tennis. Professionally accredited coaches, classed as less (n = 140) or more (n = 86) experienced, participated in an online survey where they provided their perspectives on the importance of developing grip positions and their opinions on using physically constraining tools for coaching. Irrespective of coach experience level, the findings revealed that technique development and grip position training were ranked as the two most important components in foundational tennis skill development. The Semi-western grip for forehand (less: 68%; more: 65%), a combination of Continental and Eastern grips for double-handed backhand (less: 59%; more: 48.8%), and the Continental grip for serves (both: 94%) were identified as the most commonly taught positions for different shots. Perceived barriers to developing grip positions were out of habit (less: 62%; more: 56%), discomfort (less: 58%; more: 50%), and lack of confidence (less: 44%; more: 21%). Notably, 65% of coaches expressed an openness to incorporating physically constraining tools to enhance grip-specific skill development. Overall, this study serves as a foundational resource, guiding coaches in optimising their strategies for foundational tennis development, prompting further research in this area.

**Keywords:** coaching; pedagogy; tennis; grip positions



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## 1. Introduction

Individuals require the parallel development of effective shot mechanics, motor coordination, physical conditioning, and tactical development for sport-specific skills. In tennis, sport-specific skills include, but are not limited to the serve, groundstrokes (forehand and backhand) and volleys [1]. One skill that is highly important to racket- and club-based sports is the use of different grip positions, as they provide a fundamental contribution to effective techniques [1,2]. Grip positions in tennis orientate the hand around the racket's handle to execute a stroke. Each grip position (e.g., Continental, Western, Semi-Western, Eastern) has different implications for both performance and injury [3–5], which have been shown to affect upper limb, racket, and ball kinematics in the forehand and double-handed backhand tennis strokes [3,6,7]. Specifically, the Eastern grip position has been featured with increased horizontal racket head velocity across the forehand and backhand, suggesting an improvement in hitting performance [3,7], whereas the Continental and Western grip positions are featured with increased ulnar deviation [3,6], a rotation which if excessive is suggested to increase extensor carpi ulnaris-based injuries [5,6]. These differences are also evident in golf, where grip positions have been associated with changes in ulnar deviation

and clubhead velocity [2,8], suggesting that grip positions have a fundamental contribution to shot performance.

During the early years of foundational tennis development, grip positions inherently evolve through methodology by coaches that encourage discovery. Traditionally, these grip positions were predominantly trained during the initial stages of tennis development, with specific positions selected and taught by coaches [9]. Common skill development methods used by coaches include skill decomposition, optimal technique demonstration, utilising feedback strategies, and skill isolation from the performance environment [10–12]. An additional method that coaches employ is the utilisation of physically constraining tools (PCTs). These are devices that physically constrain and/or guide an athlete's movement [13] and are used to facilitate skill development. PCTs may be considered traditional tools in coaching, fixing movement to predefined movement planes and positions. Past research has reported that training with a PCT improves shot accuracy during a golf drive compared with training without a PCT [13]; however, such devices do not provide practicality and possibly remove learners from a representative performance environment. To date, there is a limited understanding of the use of PCTs, with a recent scoping review reporting zero studies on the efficacy of PCTs for grip-specific skill development [14]. Grip positions and their effects on performance and injury has been a growing body of research [3,5–8,14]; however, little is known about coaches' considerations when developing grip positions. Understanding the considerations of accredited tennis coaches when developing grip positions may provide essential information for best-practice recommendations in aiding foundational tennis development.

Grip positions of established tennis players have been documented in relation to performance [15] and injury association [5]; however, limited research details the perceptions and related practices of accredited tennis coaches when teaching grip positions during foundational tennis development. The experiential knowledge of expert coaches has previously been suggested to provide complementary information to support the empirical understanding of performance in sports and to guide future research questions [16,17]. Exploring the perceptions and practices of accredited tennis coaches provides the opportunity to understand the current insights across experience levels, and initially understand the practical considerations about grip positions to develop practitioner-led research.

The purpose of this exploratory study was to understand the current perceptions and practices of accredited tennis coaches regarding the development of grip positions, and their opinions on using PCTs to assist development. It was hypothesised that more experienced coaches would have similar priorities during foundational tennis development compared with less experienced coaches. It was also hypothesised that only a limited number of coaches, irrespective of experience level, would not use a physically constraining tool for grip-specific skill development.

## 2. Materials and Methods

### *2.1. Study Design*

The following study was an online questionnaire that was approved by the La Trobe University Human Ethics Committee (#HEC20336).

#### 2.1.1. Questionnaire Development

An online questionnaire was developed comprising questions related to important factors in tennis stroke development, grip positions, and perceptions of the use of PCTs for grip positions. The questionnaire was piloted in the form of cognitive interviews [18–20] with eight professional tennis coaches who were not included in the final sample. The purpose of cognitive interviewing is to pre-test and validate questionnaires, which is a valuable process when surveying specific groups to ensure that meaning of concepts and terms are shared between the researcher(s) and participants, and to help reduce participant questionnaire non-completion [18]. Based on feedback, changes were made to improve

the clarity of instructions within the online form to create the final online version of the questionnaire.

The questionnaire was divided into three categories. Section one asked for background information, including the participants' demographics, tennis coaching experience and qualifications, educational qualifications, and athlete demographics/ability level. Section two asked for information about participants' current practices when teaching grip positions, and probed both student adherence to and difficulties with these positions. Section three asked for the participant's opinions on the use of PCTs for grip-specific skill development in tennis. Participants were asked for their opinion on the utility and efficacy of PCTs to help athletes learn and transfer new grip positions into match-play and their likelihood of using a PCT in their coaching should it be readily available.

#### 2.1.2. Procedure

An a priori goodness-of-fit test for contingency tables was conducted using G*Power (V 3.1.9.7, Keil, Germany). With an effect size (w) of 0.3, an $\alpha$ error probability of 0.05, 80% power, and 2 degrees of freedom, a sample size of 108 participants would be required ($\chi^2 = 5.99$, $\lambda = 9.72$). Participants completed a 15 min, anonymous online questionnaire in REDCap (Research Electronic Data Capture, Fort Lauderdale, FL, USA; [21]). The data collection period was from 1 October 2020 to 30 March 2021. Prior to beginning the questionnaire, participants were provided with relevant study information, a consent form via email, and an optional link to the questionnaire. As this was an optional link, consent was implied when the participant chose to begin the questionnaire. The questionnaire was distributed via email to national tennis organisations, inviting their member coaches to participate, as well as through the personal social media channels of the researchers. Snowball sampling [22] was also used, encouraging coaches to forward the questionnaire to their colleagues. Participants were above 18 years of age, held professionally recognised tennis coaching certificates/qualifications, were previously and/or currently involved in tennis coaching, and could read and understand English.

#### 2.1.3. Analysis

Data obtained through the online questionnaire were exported to Microsoft Excel (V. 2112, Microsoft 365, MSO, Redmond, WA, USA) and formatted for statistical and descriptive analysis. A cluster analysis (R Package Version 1.0.7; [23]) categorised participants into 'less' and 'more' experienced coaches. Within this analysis, coaching and educational qualifications, and the total number of years and hours per week of coaching was used to determine the level of experience. The cluster analysis revealed that on average, less experienced coaches had lower levels of formal coaching education (Level 1 or 2 coaching accreditation) and eight years of coaching experience ranging between 11 and 20 h per week, whereas more experienced coaches had higher levels of formal coaching education (Level 3 or 4 coaching accreditation) and twenty-eight years of coaching experience ranging between 21 and 30 h per week. For questions where participants were able to select multiple responses, answers were grouped into 'single' or 'multiple' responses for analysis. For example, when coaches were asked what specific forehand grip positions they taught in their lessons, only selecting the 'Eastern forehand' was considered a single response, whereas selecting both 'Eastern forehand' and 'Semi-Western' was considered a multiple response.

#### 2.1.4. Coach Demographics

Two hundred and twenty-six accredited tennis coaches (less experience: n = 140; more experience: n = 86; Male 86.7%, female 12.4%, prefer not to disclose 0.9%; age: 41.1 $\pm$ 13.9 years; experience coaching: 15.8 $\pm$ 11.8 years) across 40 countries took part in this study, with 65% of respondents from United States, Austria, Slovenia, Australia, and the United Kingdom (Table 1). Most participants were male, the age and number of years

coaching was lower for less experienced coaches, and more experienced coaches coached a greater percentage of athletes between the ages of 11 and 17 (Table 1).

**Table 1.** Demographics of coaches across experience levels.

| | Coaching Experience | |
|---|---|---|
| | **Less (n = 140)** | **More (n = 86)** |
| *Gender (%)* | | |
| Male | 85.0 | 89.5 |
| Female | 14.3 | 9.3 |
| Not disclosed | 0.7 | 1.2 |
| Age (years, mean ± SD) | 34.4 ± 11.3 | 52.0 ± 10.6 |
| Coaching time (years, mean ± SD) | 8.1 ± 4.6 | 28.4 ± 9.0 |
| *Coached age group (years, %)* | | |
| 3 to 6 | 21.4 | 22.1 |
| 7 to 10 | 61.4 | 44.2 |
| 11 to 14 | 63.6 | 79.1 |
| 15 to 17 | 41.4 | 55.8 |
| 18+ | 42.1 | 48.8 |

Statistical analysis was performed in Jamovi (V 2.3.12.0, Jamovi Project, 2022). Data normality was checked via visual inspection of Quantile–Quantile plots, and based on this inspection, data were analysed using non-parametric statistics. For categorical variables (as expressed in the example above), the Chi-Squared test ($\chi^2$) was used to assess the statistical association between groups, and Cramer's $V$ to calculate effect sizes (0.10 small; 0.30 medium; 0.50 large), as previously used within a cohort of tennis coaches [24]. Where appropriate, the Kruskal–Wallis test was used to assess the statistical significance specifically for the likelihood of using PCTs during the coach's training sessions. All analyses were compared between less and more experienced coaches, with the alpha level set at 0.05.

## 3. Results

### 3.1. Coach Perceptions of Foundational Development

When asked to rank foundational athlete development concepts (training grip positions; physical conditioning; technique development; court movement; transferring concepts from training to match-play) on a scale of 1 (most important) to 5 (least important), there were no statistical associations between those ranked 1–4 among less and more experienced coaches ($p > 0.050$). There was a significant association at ranking level five ($\chi^2 = 13.7$, $p = 0.008$, $V = 0.246$), where less experienced coaches indicated that for foundational development, transferring concepts from training to match-play was the least important (56.5%) compared with more experienced coaches, who stated that physical conditioning was least important (41.7%). Technique development was either the first or second most important aspect of foundational development, irrespective of experience level (Table 2). Of these concepts, there was a significant association for how challenging these aspects are during foundational development ($\chi^2 = 3.9$, $p = 0.047$, $V = 0.132$). Compared with more experienced coaches, less experienced coaches responded with a lower percentage of singular responses (less experienced: 52.9%; more experienced: 66.3%) and a higher percentage of multiple responses (less experienced: 47.1%; more experienced: 33.7%). Approximately half of the coaches selected that transferring concepts from training into match-play was difficult, whereas physical conditioning was chosen the least (Table 3).

**Table 2.** Contingency table of accredited tennis coaches' responses to what aspects are most important during foundational tennis player development.

| | Less Experienced | | | | | More Experienced | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Level of Importance (1 Most; 5 Least)** | **TGP** | **PC** | **TD** | **CM** | **MP** | **TGP** | **PC** | **TD** | **CM** | **MP** | ***p*** |
| *Percentage (%)* | | | | | | | | | | | |
| 1 | 37.2 | 8.6 | 40.7 | 8.6 | 4.9 | 29.1 | 5.8 | 46.5 | 11.5 | 7.1 | 0.584 |
| 2 | 21.5 | 12.1 | 42.8 | 19.2 | 4.4 | 19.7 | 5.9 | 34.9 | 30.3 | 9.2 | 0.092 |
| 3 | 21.4 | 15.7 | 10.8 | 44.3 | 7.8 | 17.5 | 13.0 | 11.5 | 41.7 | 16.3 | 0.371 |
| 4 | 9.3 | 35 | 5.1 | 24.2 | 26.4 | 14.0 | 33.6 | 5.8 | 10.6 | 36.0 | 0.087 |
| * 5 | 10.6 | 28.6 | 0.6 | 3.7 | 56.5 | 19.7 | 41.7 | 1.3 | 5.9 | 31.4 | 0.008 * |

TGP = training grip positions; PC = physical conditioning; TD = technique development; CM = court movement; MP = transferring concepts from training to match-play. Asterisk (*) refers to a significant association $p < 0.050$.

**Table 3.** Frequency count (expressed as percentages) of accredited tennis coaches' perceptions of what aspects are most challenging during foundational tennis player development.

| | Experience Level | |
|---|---|---|
| **Developmental Concepts** | **Less** | **More** |
| *Percentage (%)* | | |
| TGP | 30.7 | 23.3 |
| PC | 22.9 | 15.1 |
| TD | 45.0 | 39.5 |
| CM | 30.0 | 31.4 |
| MP | 46.4 | 54.7 |

TGP = training grip positions; PC = physical conditioning; TD = technique development; CM = court movement; MP = transferring concepts from training to match-play. The presented test of association result ($\chi^2 = 3.9$, $p = 0.047$) represents answers that were grouped into 'single' or 'multiple' responses for each developmental concept.

#### 3.1.1. Grip Position Practices by Coaches and Associated Perceptions

Irrespective of experience level, coaches indicated that grip positions should be adhered to between the ages of 7 and 10 years old (less experienced = 66.7%; more experienced = 68.4%); however, there was no significant association. For coaching grip positions in the serve, forehand, and double-handed backhand, there were no significant associations between experience levels for singular (e.g., Continental) or multiple (e.g., Continental and Eastern forehand) taught grips, or the age at which they were implemented by coaches ($p > 0.050$). A trend was observed that the Continental, Eastern forehand, and Semi-western forehand grip positions are mainly taught by coaches. In the serve and dominant hand for double-handed backhands, the Continental was the taught grip position, whereas in the forehand and non-dominant hand for double-handed backhands, the Eastern forehand and Semi-western grip position were the most taught by coaches. When asked at what age they (the coach) would implement the specific grip position for an athlete, the serve grip was predominantly taught between 7 and 10 years of age (less experienced coaches) or between 11 and 14 years old (more experienced coaches), and between 7 and 10 years for the forehand and backhand, irrespective of coach experience level (Tables 4 and 5). Less experienced coaches (61.4%) indicated that their athletes use their own grip positions rather than the coach's suggested grip compared with more experienced coaches (55.8%); however, there was no significant association. There was a significant association for the perceived reasons why athletes 'revert' from their coach-instructed grip positions ($\chi^2 = 6.4$, $p = 0.011$, $V = 0.219$). More experienced coaches responded with singular causes more (less experience: 33.6%; more experience: 56.1%; e.g., discomfort from suggested grip use) compared with less experienced coaches who responded with multiple responses more (less experienced: 66.4%; more experienced: 43.9%; e.g., discomfort from suggested grip use and not confident). The most frequent perceived causes (by the coach) for 'reverting'

grip positions by athletes are hand discomfort (less experienced: 58.1%; more experienced: 50%) and out of habit (Table 4; less experienced: 61.6%; more experienced: 56.3%).

**Table 4.** Frequency count (expressed as percentages) of accredited tennis coaches' practices for grip positions across strokes, and the perceptions of reasons why athletes revert to their preferred grip positions.

| Strokes and Grip Position Variables | Experience Level | | *p* |
|---|---|---|---|
| | Less | More | |
| *Percentage (%)* | | | |
| ***Serve*** | | | 0.852 |
| Continental | 93.6 | 93.9 | |
| ***Forehand*** | | | 0.936 |
| Eastern forehand | 48.6 | 48.8 | |
| Western | 5.7 | 8.1 | |
| Semi-western | 67.9 | 65.1 | |
| Continental | 4.3 | 2.3 | |
| Other | 5.0 | 9.3 | |
| ***Double-handed backhand*** | | | 0.394 |
| Continental/Eastern forehand | 59.3 | 47.7 | |
| Continental/Semi-western | 25.7 | 31.4 | |
| Eastern backhand/Semi-western | 12.9 | 14.0 | |
| Eastern backhand/Continental | 8.6 | 9.3 | |
| Eastern backhand/Eastern forehand | 7.1 | 10.5 | |
| Continental/Continental | 6.4 | 3.5 | |
| Other | 5.7 | 7.0 | |
| ***Perceived causes of reverting grip*** | | | 0.011 * |
| Discomfort from suggested grip use | 58.1 | 50.0 | |
| Hand grip not strong enough | 20.9 | 22.9 | |
| They refuse to | 3.5 | 6.3 | |
| Out of habit | 61.6 | 56.3 | |
| Not confident | 44.2 | 20.8 | |
| Other | 10.5 | 18.8 | |

Presented test of association ($\chi^2$) results represent answers that were grouped into 'single' or 'multiple' responses for each variable of the serve, forehand, double-handed backhand, and perceived causes of reverting grip. Asterisk (*) refers to a significant association $p < 0.050$.

**Table 5.** Frequency count (expressed as percentages) of accredited tennis coaches' practices for what age they implement grip positions across strokes.

| Age Range | Experience Level | | | | | |
|---|---|---|---|---|---|---|
| | Serve | | Forehand | | Backhand | |
| | Less | More | Less | More | Less | More |
| *Percentage (%)* | | | | | | |
| 3 to 6 | 17.9 | 0.0 | 32.1 | 36.0 | 31.4 | 26.7 |
| 7 to 10 | 67.9 | 15.3 | 55.0 | 57.0 | 55.7 | 66.3 |
| 11 to 14 | 12.1 | 68.2 | 10.0 | 4.7 | 10.0 | 4.7 |
| 15 to 17 | 0.7 | 15.3 | 0.7 | 1.2 | 0.7 | 1.2 |
| 18+ | 1.4 | 1.2 | 2.1 | 1.2 | 2.1 | 1.2 |
| *p* | 0.946 | | 0.936 | | 0.446 | |

Presented test of association ($\chi^2$) results represent answers that were grouped into 'single' or 'multiple' responses for each variable of the serve, forehand, and backhand strokes.

### 3.1.2. Coach Perceptions from Using a Physically Constraining Tool

There was no statistical association ($p > 0.050$) between less and more experienced coaches for any question regarding the use of PCTs. Approximately half of the coaches indicated that using a grip position tool would facilitate improved learning of tennis strokes. Of the coaches that responded with either 'yes' or 'unsure' for the previous question, slightly less (less experienced: 43.0%; more experienced: 49.3%) indicated that using a PCT would

facilitate skill transfer from training into match-play environments, with 'unsure' responses increasing irrespective of coach experience (Table 6). Of the same participants, 65% of coaches indicated that they would use a PCT during their training if readily available.

**Table 6.** Frequency count (expressed as percentages) of accredited tennis coaches' perceptions on using a physically constraining tool to facilitate learning and transfer from training into match-play, and the likelihood of coaches implementing a physically constraining tool into their training.

| | Experience Level | | | | | | *p* |
|---|---|---|---|---|---|---|---|
| | Less | | | More | | | |
| **Training Tool Scenario** | **Yes** | **Unsure** | **No** | **Yes** | **Unsure** | **No** | |
| *Percentage (%)* | | | | | | | |
| Learn | 51.5 | 35.1 | 13.6 | 44.1 | 36.0 | 19.7 | 0.392 |
| Transfer | 43.0 | 43.8 | 13.2 | 49.3 | 39.1 | 11.6 | 0.703 |
| *Mean ± SD* | | | | | | | |
| Likelihood of use | | 64.2 ± 23.5 | | | 66.3 ± 24.2 | | 0.532 |

Likelihood of use variable represents the test of association results (Kruskal–Wallis one-way ANOVA, $p = 0.532$).

## 4. Discussion

The purpose of this study was to explore the current perceptions of accredited tennis coaches regarding foundational development, including grip positions in youth athletes, and opinions on using a PCT for developing grip positions. Our hypotheses were supported as coaches, irrespective of experience level, and the priorities during foundational tennis development were similar from levels 1 to 3; however, more experience indicated that physical conditioning is the least important component during foundational development, whereas less experienced coaches stated that transferring concepts from training to match-play is the least important. In relation to grip positions, the coaches' main perceived reasons for why their athletes 'revert' their grip positions were hand discomfort and habit, with 65% of coaches would use a PCT device to develop grip positions if readily available.

### 4.1. Foundational Tennis Development

Tennis is a complex sport that requires the cohesive development of technical, physical, mental, and tactical characteristics from an early age. Conventionally, a coach takes on the role of an instructor to help develop these characteristics through purposeful and deliberate practice [25]. The results of this study showed that irrespective of the experience level, coaches emphasised the importance of technical training, as technique development and training grip positions were indicated as the most important areas during foundational tennis development. This implies that many coaches may initially focus on stroke execution with new athletes, which is a fundamental aspect in tennis to create efficient and effective shot mechanics [1]. Well-developed shot mechanics are crucial for shot performance so that favourable outcomes (e.g., winners and forced errors) can be achieved, as well as to reduce the risk of overuse and acute injuries [4,26,27]. To develop shot mechanics, coaches use purposeful methods that are likely constrained by their own experiences and knowledge. For example, common tennis coaching practices include instructing athletes to 'arabesque' or perform ball throwing, actions that are designed to develop serve technique [28,29]. These studies, using task and instructional constraints of technique instruction and representative actions, demonstrate the complex nature of developing a tennis serve, which may extend into other areas of foundational tennis development including the use of certain grip positions.

Coaches indicated that transferring concepts from training into match-play is the most challenging area of foundational tennis development. This may suggest that coaches struggle with certain practices in relation to skilful transfer during foundational tennis training for match-play performance. The ability to perform well in tennis can be dependent on (but not limited to) physical development [30], effective shot mechanics [1], and

game (tactical) understanding [31]. Developing game understanding, which is arguably a difficult developmental process, can be achieved through early exposure to 'game sense' activities. The game sense approach is associated with a modal for 'Teaching Games for Understanding' [32], with an integration/addition of contextual information for learning within games or game-like scenarios [31]. Game sense differentiates from the traditional pedagogical framing of sports teaching as a technical-to-tactical progression [32], and rather involves 'game-context' skill development which integrates technical and tactical development synchronously [31]. Game-context, commonly used in contemporary skill development methods, involves training the ability to cope with pressure, decision making, timing for technique, the use of space, and managing risk [33]. Irrespective of coach experience level, this may reflect the persistence of traditional and linear pedagogical practices to skill development for the current cohort of coaches. This possibly alludes to a lack of 'game sense' practices being used by the current cohort of coaches; however, without assessing the direct perceptions of coaches about their understanding of game sense and practices for skill transfer from training into match-play, this cannot be confirmed.

### 4.2. Grip Positions

Grip positions are a fundamental contribution to effective techniques that are developed during the initial stages of learning tennis [1]. The serve may be considered the most complex of strokes performed in tennis. Classed as a serial skill, the serve relies on the interplay between shot selection, ball-toss positioning, temporal organisation of key kinematic events, and coordinated shot mechanics [12,34,35]. This complexity may explain why more experienced coaches may not enforce adherence to the continental grip position for the serve until later in development, compared with less experienced coaches. Despite the fundamental nature of grip positions for effective serve performance, more experienced coaches may rather focus on the temporal and kinematic attributes for effective serves, which include (but are not limited to) 'leg drive' coordination with shoulder mechanics [36], and dominant-arm long-axis internal rotation [37]. These results may also reflect the ages of athletes taught by the coaches as demographic backgrounds have previously been shown to affect survey responses [38]. Less experienced coaches predominantly taught athletes between 7 and 10 years old compared with more experienced coaches who taught athletes between 11 and 17 years old. Given coaches indicated that they teach grip positions for the serve in different age groups, this presents a possible response bias.

Adapting to a new grip position or stroke technique in tennis is important to continue developing with evolving physical and tactical match-play characteristics. Over half of coaches indicated that students 'revert' their grip positions from what they were instructed to use, with the primary perceived causes being discomfort and out of habit. In more experienced coaches, the frequency of used grip positions across the forehand and double-handed backhand is greater compared with less experienced coaches, who are still in favour of the Eastern and Semi-Western grips. This is consistent with the previous literature as the majority of the top 100 professional players (male and female) use the Eastern and Semi-Western grips as the top hand in the double-handed backhand [15]. Also evident in sub-elite tennis, athletes reported using the Eastern (24.9%) and Semi-Western (60.5%) grips for the forehand stroke [5]. It is important to note that grip influences the kinematics of the swing and subsequently post-impact ball characteristics [1,27]. The Eastern is considered to be a "traditional" forehand grip, featured with greater horizontal racket head velocity contribution to ball speed, compared with the Semi-Western, which features increased vertical racket head velocity [3], possibly imparting greater ball spin compared with the Eastern grip. Both are considered versatile to use across playing surfaces as they allow athletes to adapt their swing technique with varying incoming ball speeds and heights. It would be most appropriate to conceptualise the athlete in a nonlinear nature, and that their movement behaviour emerges as an adaptive pattern. Athletes are constantly interacting with affordances, resulting in self-organised movement responses in a complex and dynamic performance environment [10,11]. In relation to grip positions in tennis,

every stroke exchange between opponents (e.g., serve and return, forehand to backhand on the baseline) provide critical sources of information that athletes engage with to prepare and perform effective task outcomes (e.g., returning the serve), commonly requiring an adaptive grip position. Naturally emerging a grip, an approach that involves using multiple grip positions during a stroke, could benefit athletes, allowing them to naturally build grip positions across different scenarios with associated techniques through discovery and movement exploration.

Interestingly, a lower number of coaches (up to 8% for the forehand) expressed that they use/allow the Western grip in their methods for tennis development. These results are consistent with anecdotal coaching practices as there is a negative connotation associated with the Western grip; it is deemed detrimental to tennis performance as no professionals at the time used the Western grip for the double-handed backhand, as evidenced in [15]. This may align with traditional tennis development, where coaches may subconsciously express 'an ideal model' for their athletes [39], which possibly extends to the use of the Eastern forehand or Semi-Western grips. This is supported by the larger percentage of coaches that use the Eastern or Semi-Western grip positions in their practice across all strokes. The current data may imply that the knowledge of stroke execution, both benefits and restrictions when using a Western grip position, is limited. Should coaches not restrict stroke development to only Eastern forehand and Semi-Western grips in groundstrokes and permit the Western grip within their acceptable grip range, then this may provide the opportunity for their athletes to develop a grip naturally. Coaching requires a mixture of instinctive and intuitive processes to inform decision making for effective development [40], possibly requiring an interplay between traditional and contemporary coaching methods.

### *4.3. Physically Constraining Tools for Grip Positions*

The use of PCTs for stroke development is a common practice in sports coaching that has previously been assessed during the golf drive [13]; however, to date, there is no empirical evidence on the efficacy of PCTs in relation to grip-specific skill development [14]. Almost half of coaches (less experienced: 51.5%; more experienced: 44.1%) believed that using a grip position training device would improve the learning and performance of grip positions, with a smaller number unsure about the learning effects of the tool (less experienced: 35.1%; more experienced: 36.0%). Coaches welcome the use of PCTs in their practice as 65% of coaches indicated that they would use such device if readily available. Only up to 20% of coaches also indicated that the tool would not facilitate the ability to learn or transfer a new grip position from training and into a match-play. This might suggest that coaches have reservations about the effectiveness of PCTs for skill development in regard to grip positions.

A PCT could be used to blend traditional and contemporary based coaching methods. Haptic (vibration or tactile information) and kinaesthetic (instantaneous information about the "feeling" of movement) feedback are fundamentally incorporated into PCTs. Physically constraining tools encourage athletes to maintain a consistent grip position during training under different task or environmental constraints, facilitating an adaptation towards the preferred grip position. It is currently unknown how effective these devices are in creating biomechanical or performance changes in either acute or longitudinal settings. If PCTs deliver constructive, permanent changes in grip position, they would enable coaches to focus their attention on other aspects of tennis performance.

### *4.4. Limitations and Future Directions and Practical Applications*

A limitation of this study was that participants possibly did not have English as their first language, which may have led to possible misinterpretations of questions. However, the authors made their best attempt to minimise interpretations through the piloting process. In addition, being able to read and understand English was a requirement for participation and was expected when the questionnaire was completed. In future, the context for responses from coaches in the form of semi-structured interviews will be important for

gaining a better understanding of the thought processes underpinning coaching decisions. This research demonstrated that coaches welcome the idea of using PCTs in practice, with approximately 65% indicating that they would use a PCT in training if readily available. However, there are possible reservations about the ability of PCTs to facilitate skilful learning and transfer. Therefore, it is important to assess the efficacy (biomechanics and skill acquisition) of PCTs for sport-specific skill development.

From a practical application perspective, these findings contribute to a greater understanding of the perceptions of and methods for grip position development within tennis. It also provides an initial perspective regarding the use and implementation of PCTs for skill development. It has previously been expressed that the experiential knowledge of coaches is a highly valuable resource which provides complementary information to support the empirical understanding of performance in sports and to guide future research questions [16,17]. Collectively, these findings provide valuable insights for tennis practitioners by detailing the perspectives of accredited tennis coaches' on grip positions and various aspects of foundational tennis development. This study explored the best practices for grip positions tailored to specific strokes, as well as coaches' opinions on using a PCT. These findings serve as a compass for future investigations, emphasising the importance of aligning research with current coaching practices. Furthermore, the inclusion of coach-led questioning contributes to the ongoing evolution of best practices in developmental-level tennis coaching.

## 5. Conclusions

This study investigated the perspectives and considerations of accredited tennis coaches on grip positions and foundational development. Irrespective of the experience level, this study showed that coaches rated the importance of technique development as coaches indicated that the Continental, Semi-western, and Eastern forehand grip positions were the most predominantly taught grips and that grip positions are the second-most important contributor to foundational development. There was a significant association between less and more experienced coaches for the reasons why their students revert grip positions, with more experienced coaches only having singular causes compared with less experienced coaches, who responded more often with multiple responses. The most frequent reasons given for reverting grip positions were hand discomfort and out of habit, a common barrier for foundational tennis development. Approximately 65% of coaches would use a PCT to assist in coaching their preferred grip positions to athletes; however, there are possibly reservations about skilful learning and transfer when using a PCT for grip positions. The perceptions and considerations of more experienced coaches may offer practical guidance for less experienced coaches aiming to develop grip positions effectively, similarly for other racket- and club-based sports that require effective grip positions for shot performance. Future research should aim to determine further context behind coaching decisions with regard to grip positions during foundational development, and to assess the efficacy and both the acute and longitudinal effects of PCTs for sport-specific skill development in tennis.

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