

TITLE

Understanding Key Constraints and Practice Design in Rugby Union Place Kicking: Experiential Knowledge of Professional Kickers and Experienced Coaches

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EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

1 Running Head: EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

2 Understanding Key Constraints and Practice Design in Rugby Union Place Kicking:
3 Experiential Knowledge of Professional Kickers and Experienced Coaches

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EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

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Abstract

Place kicks present valuable opportunities to score points in Rugby Union, which are typically performed under varying constraints in competitive performance environments. Previous quantitative studies suggest these interacting constraints can influence fluctuations in place kick success. To further the understanding of how fluctuations in place kicking success emerge, our aim was twofold: i) to explore and identify the key constraints that professional place kickers and experienced place kicking coaches perceive to influence the difficulty of a place kick and ii) to understand the level to which current place kicking practice environments represent these key constraints experienced in performance environments. Six professional place kickers and six experienced place kicking coaches were interviewed. Using a deductive thematic analysis, 11 key constraints were identified: individual constraints of expectation for success and fatigue, task constraints of angle and distance to goalposts, environmental constraints of wind, weather, pitch, and crowd, and situational constraints of previous kicking performance, time remaining and current score margin. Place kicking is typically practised individually or with a small number of place kickers in isolation from team sessions. Where possible, coaches should be encouraged to include place kicking in simulated game scenarios during practice to represent key constraints from performance environments. Our study demonstrates how experiential knowledge can enrich the understanding of sport performance and inform the design of practice environments which simulate relevant constraints of competitive performance to enhance skill adaptation of athletes.

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

55 Experiential knowledge can be used in combination with quantitative research to
56 identify the key information that shapes emerging behaviours in competitive performance
57 environments. Whilst quantitative research has identified fluctuations in success percentage
58 of skills in competitive environments,¹⁻³ this type of research is limited for understanding the
59 contributing factors which interact during performance fluctuations. Recognising these
60 limitations, there has been a growing tendency in sport science and coaching research to
61 consider the experiential knowledge of expert sport performers and coaches, which has been
62 gained through years of practice and performance experiences at various levels of
63 competition.⁴⁻⁷ Informed by the theoretical framework of ecological dynamics, rich
64 experiential knowledge of expert coaches and performers can be analysed to help identify key
65 task, environmental, and individual constraints⁸ to understand how performance fluctuations
66 can occur. Identifying key constraints using experiential knowledge can also provide the
67 focus for future empirical investigations, support theoretical frameworks, and inform practice
68 design.^{5,9}

69 One of the main challenges facing coaches is to design practice environments that
70 facilitate the transfer of skills to competitive performance environments.¹⁰ One way to
71 achieve this aim is by using the theoretical framework of Representative Learning Design,¹¹
72 which proposes that practice designs should include key information sampled from
73 competitive performance environments. To inform Representative Learning Design, the
74 insights gained from experiential knowledge can be considered in combination with
75 experimental and performance analytical approaches to studying sport performance.

76 In international Rugby Union, place kicking performance fluctuates under varying
77 task constraints (e.g. distance and angle to goalposts) and under specific situational
78 constraints (e.g. previous kicking performance, current score margin, time remaining).^{2-3, 12}

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

79 For example, in the 2015 Rugby World Cup, place kicking success was 8% lower in the 10
80 minutes before half-time, compared with the mean tournament success percentage, and 7%
81 lower following a previous unsuccessful attempt, compared with following a successful
82 attempt.² These findings informed suggestions that specific situational constraints, which in
83 Rugby Union can be related to time remaining and current score within the game,¹³ may
84 influence individual constraints such as thoughts, emotions, and fatigue.² Furthermore,
85 environmental constraints (e.g. wind and weather conditions) can vary within and between
86 games, which may influence perceived affordances for place kickers.¹⁴ Understanding the
87 influence of key constraints, and their interaction in performance environments, can inform
88 explanations for emerging behaviours of place kickers.

89 Previous studies using quantitative data in isolation can only inform suggestions based
90 on observed performance outcomes.^{2-3, 12} However, this type of analysis is limited for
91 providing any clear explanations for how performance fluctuations can occur. Moreover,
92 there may be key constraints, the effects of which are not easily measurable (if at all) using
93 quantitative analysis methods only. Therefore, tapping into the experiential knowledge of
94 professional place kickers can help identify key task, environmental, and individual
95 constraints that influence perceptions of task difficulty and performance.

96 In addition to experiential knowledge of performers, coaches are perceptively attuned
97 to relevant constraints within performance environments from their experiences of observing
98 and coaching specific skills within their sport.⁵ Given their experiences of working closely
99 with place kickers to improve performance, the experiential knowledge of specialist place
100 kicking coaches is vital to understanding key constraints in competitive environments.
101 Furthermore, designing effective practice environments to improve place kicking
102 performance is critical for Rugby Union coaches, especially given the important contribution

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

103 of place kicking to the outcome of matches (e.g. 45% of all points scored in 582 international
104 matches between 2002-2011³). Despite the value of place kicking, and the great responsibility
105 of one player within a team to consistently score points with place kicks, there is currently a
106 lack of evidence-based recommendations for how to design place kicking practice
107 environments. Whilst there are previous examples of qualitative studies in Rugby Union,
108 these have typically used isolated case studies with an individual place kicker or coach, to
109 understand pre-performance routines¹⁵ or place kicking technique.¹⁶ To provide
110 recommendations for representative practice environments, there is a need to understand key
111 constraints in performance environments from the perspectives of place kickers and coaches.

112 Combining the experiential knowledge of place kickers and coaches to understand
113 their perspectives of key constraints can be aligned to concepts from the theoretical
114 framework of ecological dynamics. This rich mix of experiential and empirical knowledge
115 can inform the design of representative practice environments which seek to induce similar
116 perceptions of pressure and emotions as experienced in competitive environments.¹⁷
117 Therefore, our first aim was to explore and identify the key constraints that professional place
118 kickers and experienced place kicking coaches perceive to influence the difficulty of a place
119 kick. Our second aim was to understand the level to which current place kicking practice
120 environments represent key constraints experienced in competitive performance
121 environments, which can then inform recommendations for designing representative practice
122 environments.

123 Method

124 *Participants*

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

125 Six male place kickers and six male place kicking coaches were selected for the study.
126 Participants were selected using criterion-based purposeful sampling to identify individuals
127 that were experienced with the skill of interest: place kicking in Rugby Union. All six place
128 kickers were selected because they satisfied two key criteria: having the role of place kicker
129 within their team and having experience of place kicking in professional Rugby Union. All
130 six place kicking coaches were selected as they were all currently responsible for specialist
131 coaching of Rugby Union place kickers. The coaches satisfied this requirement because they
132 had specific experiences of observing, analysing, and designing practice environments for
133 place kicking, which other coaches (e.g. head coach, forwards coach) within Rugby Union
134 teams may not have.

135 All six place kickers were currently playing in the first team squads of English
136 Premiership teams at the time of interview (mean \pm SD age: 24.8 ± 4.1 years; career first
137 team appearances: 93 ± 94 ; career first team points scored: 548 ± 572 ; international caps: $9 \pm$
138 19 ; international points scored 25 ± 41 ; Table 1). The six specialist place kicking coaches
139 (mean \pm SD age: 38.8 ± 9.2 years; coaching experience: 11.3 ± 7.5 years; Table 2) were all
140 currently working with Super Rugby, English Premiership, English Championship, or semi-
141 professional teams at the time of interview. Ethical approval was obtained from the local
142 University ethics committee and all participants gave written informed consent.

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EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

Table 1. Participant characteristics of the six place kickers interviewed.

Place Kicker	Age	First Team League Appearances	First Team Points Scored	Senior International Appearances	Senior International Points Scored
1	19	1	0	0	0
2	27	198	1124	5	57
3	27	165	912	0	0
4	21	1	0	0	0
5	25	23	99	0	0
6	30	169	1154	48	95

Table 2. Participant characteristics of the six place kicking coaches interviewed.

Place Kicking Coach	Age	Years of Coaching Experience	Coaching Level
1	50	20	Super Rugby
2	45	12	English Premiership
3	34	13	English Championship
4	37	1	English Championship
5	24	4	English Championship
6	43	18	Semi-Professional

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

146 *Procedure*

147 A novel semi-structured interview guide was developed, based on: (i) a previous case
148 study of a place kicking coach¹⁶ and (ii), *a priori* knowledge of the topic area predicated on
149 key findings from quantitative analyses of place kicking.^{2-3, 12} Semi-structured interviews
150 were used to elicit relevant experiences and facilitate the interview process.¹⁸ As the study
151 required participants to share their experiences and perspectives on place kicking, it was
152 deemed appropriate to individually interview each participant.

153 The interview guide was split into five main sections for place kickers: career history,
154 practice, place kicking success percentages, experience of competitive place kicks, and
155 overall contribution of place kicking. The order of the interview guide was chosen to build
156 rapport by discussing the participants' career (*career history*) and how participants currently
157 trained for competitive place kicks (*practice*). Following this introduction to the interview,
158 the questions focused on the first aim of the present study by discussing the place kicker's
159 kicking success percentages and any factors that could influence their performance (*success*
160 *percentages*), and any difficult place kicks in competitive performance environments
161 (*experience of competitive place kicks*). To conclude, participants were asked to broadly
162 discuss the importance of place kicking (*overall contribution of place kicking*).

163 When interviewing coaches, the interview guide was adapted slightly to discuss
164 observing place kicking situations and designing practice environments. Both interview
165 guides (place kicker and coach) are available as supplementary files. Interview guides were
166 pilot tested on a separate sample of three participants who had experience of either
167 competitive place kicking or coaching place kicking. The pilot interviews were reflected on
168 and minor modifications were made to the order of the interview guide to improve the

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

169 structure of the five sections. Specifically, the section which discussed current practice
170 environments was moved earlier in the interview guide to help build rapport before
171 discussing difficult kicks.

172 Participants were asked open-ended questions such as: “what is the most difficult
173 place kick you/a place kicker could have within your/their kicking range?” to create
174 discussions around key constraints influencing task difficulty from the perspectives of place
175 kickers and coaches. By using these open-ended questions, this allowed place kickers the
176 opportunity to describe their own previous experiences of attempting difficult kicks and
177 coaches the opportunity to describe their previous experiences of observing players attempt
178 difficult kicks. To further understand the specific experiences of participants, clarification
179 and elaboration questions such as “why is that a difficult place kick?” and “why is practice
180 designed in that way?” were used in the interviews.

181 Mean \pm SD duration time of the interviews was 45 ± 11 minutes, with 10 interviews
182 occurring face-to-face (nine at the participants’ training facilities and one at the university
183 where the lead researcher was based), and two conducted via internet telephony. All
184 interviews were audio recorded using an mp3 storage device and were transcribed verbatim
185 for data analysis.

186 *Data Analysis*

187 Transcripts were subjected to line-by-line coding using thematic analysis to address
188 the first aim of the study: to explore and identify the key constraints that professional place
189 kickers and experienced place kicking coaches perceive to influence the difficulty of a place
190 kick. The method of thematic analysis chosen was a deductive, theory driven approach,¹⁹
191 which was based on the existing theoretical framework of Newell’s⁸ model of constraints.

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

192 Data extracts were categorised into four dimensions (Table 3). These included each of the
193 dimensions (individual, task, environmental) from Newell's⁸ model of constraints, and a
194 fourth dimension of situational constraints, based on quantitative analyses of place kicking.²⁻³
195 Lower and higher order themes were categorised into these four dimensions.

196

Table 3. Definitions of key constraints.

Dimensions	Definition
Individual Constraints	Data extracts relating to the thoughts, emotions, or body of the place kicker.
Task Constraints	Data extracts relating to distance to goalposts and angle to goalposts.
Environmental Constraints	Data extracts relating to the surrounding environment, including wind, weather, pitch, and the size and proximity of the stadium crowd.
Situational Constraints	Data extracts relating to the situation of the place kick, including opposition, status of the game, and previous events that could influence the context of the place kick.

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198 Data extracts relating to practice environments were analysed using a two-stage
199 thematic analysis approach to address the second aim of the present study: to understand the
200 level to which current place kicking practice environments represent key constraints
201 experienced in competitive performance environments, which can then inform
202 recommendations for designing representative practice environments. Following the
203 identification of higher order themes of key constraints in performance environments, these

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

204 higher order themes and the same four dimensions (Table 3) were used as a framework to
205 categorise data extracts relating to practice environments. Participant experiential knowledge
206 of practice environments was then compared with key constraints identified in competitive
207 performance environments.

208 *Methodological Rigour*

209 To enhance the methodological rigour of the study, three strategies were adopted.
210 First, criterion-based purposeful sampling of participants was employed, with specific criteria
211 (current role within team, playing experience; specialist coaching role, coaching experience)
212 used to ensure that participants had appropriate experiences to discuss for the study.²⁰
213 Second, the co-authors acted as critical friends to the first author throughout the process of
214 data analysis. This involved the first author presenting his interpretation of the data to the co-
215 authors on a regular basis, as well as providing written summaries of the findings for
216 evaluation. The co-authors provided a “sounding board” to encourage reflection on and
217 exploration of alternative interpretations and explanations of the data. As part of the process
218 of critical dialogue, the first author was required to make a defensible case that the available
219 data supported his interpretations. Finally, a sub-sample of six participants were offered the
220 opportunity for member reflections,²¹ by sending copies of transcripts, together with a
221 summary of the results. Following these member reflections, no changes were made to the
222 transcripts or data analysis.

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224 Results and Discussion

225 *Key Constraints in Performance Environments*

226 Deductive analysis of the data identified 11 higher order themes (Figure 1), which
227 were categorised into four dimensions of key constraints in competitive performance

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

228 environments (Table 3). The four dimensions will be discussed as four separate sub-sections,
229 which include key quotations from place kickers and coaches to reflect the higher order
230 themes that were identified.

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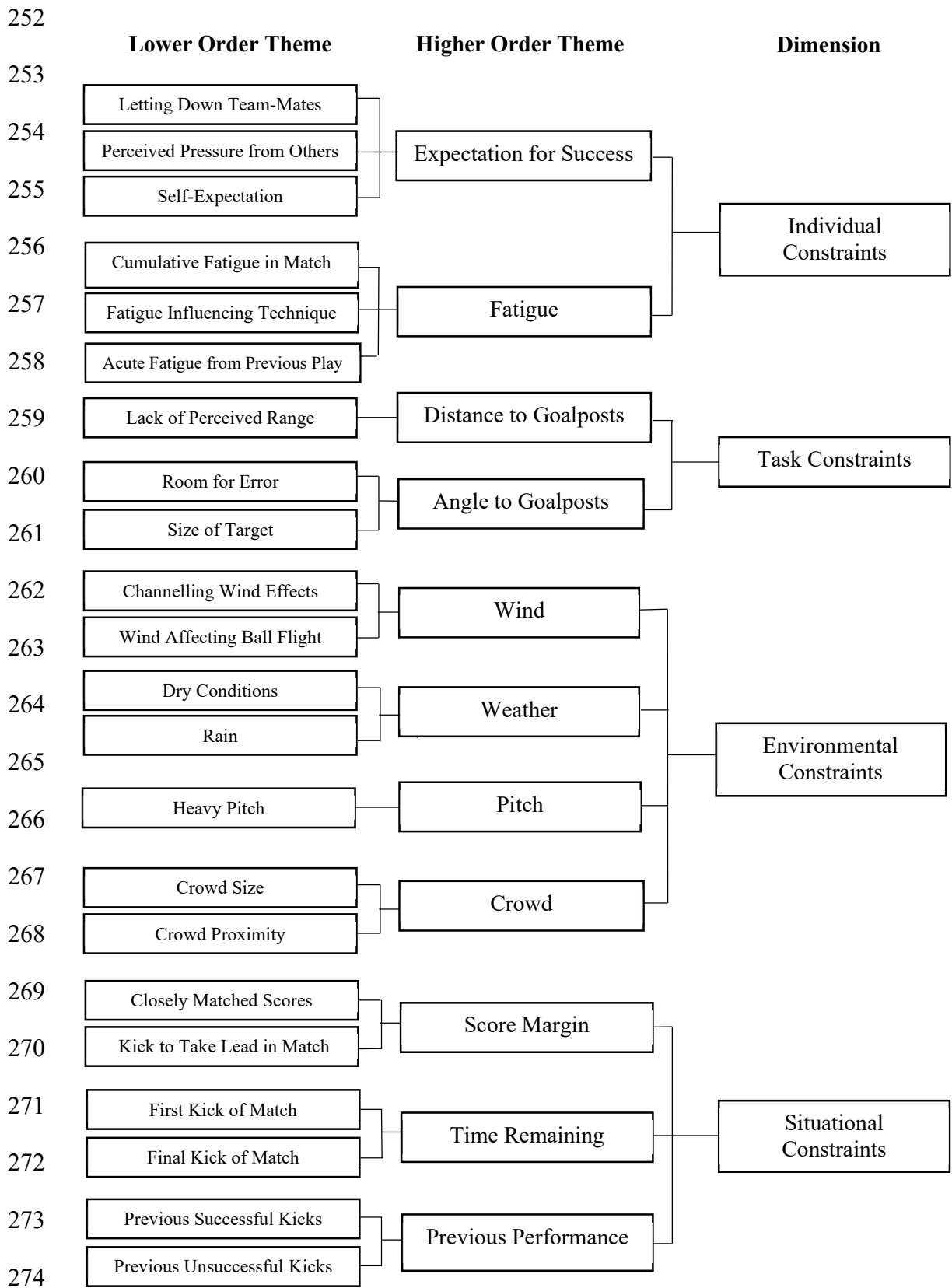
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EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING



275 Figure 1. Thematic map of key constraints on place kicking performance, from the
 276 perspectives of professional place kickers and experienced coaches.

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

277 *Individual Constraints*

278 All six place kickers referred to perceived feelings of *expectation for success*, either
279 from themselves or significant others, when discussing the perceived difficulty of a place
280 kick. All place kickers identified a specific area on the pitch for their “most difficult kick”,
281 with five place kickers describing an area between 5 and 15 m inside the touchline,
282 irrespective of *distance to goalposts*, and the other (Place Kicker 5) describing an area
283 directly in front of the goalposts. These pitch areas were identified as locations where place
284 kickers perceived a feeling of *expectation for success* from others, particularly team-mates.
285 The combination of *expectation for success* and likelihood of a successful kick (shaped by
286 task constraints of *angle and distance to goalposts*), interacted to create pitch areas where
287 place kickers perceived varying difficulty of place kicks. Essentially, place kickers perceived
288 that kicks directly in front of the goalposts have the highest expectation, but the task
289 constraints presented the highest likelihood of success. Touchline kicks are perceived by
290 place kickers to be a “challenge”, as the likelihood of success is lower due to increased *angle*
291 *and distance to goalposts* and the *expectation for success* is perceived to be considerably
292 lower. However, in between central pitch areas and the touchline is an area bordered by the 5
293 m and 15 m lines, where the majority of place kickers perceived a high *expectation for*
294 *success*, even with increased *angle to goalposts* (because of the associated shorter *distance to*
295 *goalposts*). To exemplify, one place kicker reported his experiences of *expectation for*
296 *success*:

297 “In terms of some of the hardest kicks, I think are the ones that people think
298 you should get... The ones that are, the angle’s difficult, but it’s not
299 touchline, kind of between the 5 and the 15 [m lines, infield from the

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

300 touchline] I guess, maybe closer towards the 15 [m line]. One of those
301 you're expected, as a goal kicker, you're expected to get" (Place Kicker 3).

302 Consistent with the perspectives of place kickers, place kicks on the 15 m line and
303 directly in front of the goalposts were identified by place kicking coaches as areas with high
304 *expectation for success*. One place kicking coach reported the high expectation for success in
305 these pitch areas:

306 "No-one's gonna go at the end of the game "oh we should have got that one
307 from the touchline", but if you lose by two points and you should have got
308 one from the 15 [m line] then, it's a little bit more pressure there. I know
309 that kickers do feel worse there, not worse, but they should be getting these,
310 it's kind of a lose-lose situation" (Coach 5).

311 Place kicking coaches also identified physical *fatigue*, induced by competitive
312 performance, as an individual constraint on place kicking performance. Coaches specifically
313 highlighted the influence of acute *fatigue*, induced by the previous passage of play, which
314 was perceived to be more influential than *fatigue* accumulated throughout the match. One
315 place kicking coach reported these observations of acute *fatigue*: "I suppose the biggest thing
316 really in what I've found is that fatigue level of just how long, not really how long the game's
317 gone, it's more of how long the passage of play was before" (Coach 3).

318 These expressions of experiential knowledge reveal how perceived *expectation for*
319 *success* and acute performance *fatigue* provide examples of individual constraints that
320 influence perceptions of task difficulty during competition. The powerful influence of
321 *expectation for success* on individual performance has been reported in previous qualitative
322 investigations of team sports.²²⁻²³ These studies have revealed the effects of individual

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

323 responsibility within a team, which can increase perceived pressure, when performing an
324 individual skill which contributes to the success of a team. Place kicking is a unique example
325 of an individual player performing a self-paced skill to directly score points in Rugby Union.
326 Given that place kicking can contribute 45% of all points scored in the professional game,³
327 these insights suggest *expectation for success* and *fatigue* should be recognised by coaches
328 when designing representative practice environments that seek to mimic performance
329 environments.

330 *Task Constraints*

331 Consistent with previous research,²⁻³ place kickers and coaches reported *angle and*
332 *distance to goalposts* as key task constraints which influence place kicking performance. In
333 addition to the high *expectation for success* which was perceived when place kicking 15 m in
334 from the touchline, one place kicker describes why this pitch area is challenging:

335 “I actually find the ones in and around the 15 m channel, 15 m line [infield
336 from the touchline], the hardest... probably 2 or 3 m outside the 15s. The
337 kind of ones that should be bread and butter, but you can sometimes get
338 caught between not kicking it, it’s easy to undercompensate or
339 overcompensate for either... they’re probably just a bit more difficult
340 because you get caught in two minds. Sometimes you can just jump out of
341 the kick thinking you can just chip it over, when you’re better off getting
342 through it” (Place Kicker 2).

343 Place kicking coaches also identify that the 15 m channel can be a challenge of the
344 place kicker’s accuracy, and from shorter distances to the goalposts, place kickers can “clip”
345 the ball, which supports Place Kicker 2’s reflections of “chip it over” compared with “getting

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

346 through it". The descriptions of "clipping" or "chipping" the ball imply that place kickers do
347 not attempt to kick the ball as far as maximally possible, compared with "getting through it"
348 which implies that place kickers apply maximal effort. These different descriptions of place
349 kicking imply that place kickers adapt their movement patterns to enhance their functionality,
350 shaped by task constraints of *angle and distance to the goalposts*.

351 From an ecological dynamics perspective, these insights on uniqueness and
352 functionality of kicking performance underlies how performers are conceived as dynamical
353 systems which adapt to the interacting constraints in a specific environment. The observation
354 that performers switch between different types of kick ("clipping it" vs "getting through it"),
355 which was revealed by experiential knowledge of place kickers and coaches, could be related
356 to metastability, which expresses a region where skilled performers can transition between
357 two different movement patterns.²⁴ Metastability emerges when a performer is poised
358 between multiple co-existing states and a number of movement options can be utilised, which
359 creates an area of functional instability for the performer.²⁵ These perceived changes in a
360 place kicker's movement patterns can be explored in practice environments by seeking to
361 identify metastable regions and adaptive movement patterns.

362 *Environmental Constraints*

363 Whilst most place kickers generally stated that performing in front of a large *crowd*
364 did not influence their thoughts or emotions, the *proximity* of the crowd can influence place
365 kicks near to the touchline, as one place kicker explains:

366 "Your back is against the crowd, you know, they can heckle you and you're
367 close to them... it's just one of those kicks you think "ah I've got to go to

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

368 the touchline now and kick, in front of all those people” ... because like I
369 said, they’re [the crowd] right next to you” (Place Kicker 5).

370 The *pitch* condition, *weather* and *wind* were also identified by place kickers as key
371 environmental constraints that are perceived to increase task difficulty. One place kicker
372 describes varying environmental constraints: “There’s obviously weather dictating and stuff
373 like that, if you wake up and it’s [expletive] down with rain and blowing a gale, you know, I
374 want all kicks as central and as close to the posts as possible” (Place Kicker 2).

375 The potential influence of environmental constraints has been highlighted in previous
376 research,³ with a 10% difference reported between the stadiums with the highest and lowest
377 success percentages for international level place kicking. Place kickers indicate a preference
378 for calm conditions and describe how *weather* conditions can alter perceptions of task
379 difficulty and affordances for place kicking. However, the reality is that *wind* and *weather*
380 conditions can change within and between competitive matches. Therefore, when aiming to
381 practice place kicking in representative conditions, the direct influence of environmental
382 constraints needs to be considered. Place kickers are encouraged to practice in varying *wind*
383 (e.g. speed and direction) and *weather* (e.g. dry, wet, humid and cold) conditions.

384 *Situational Constraints*

385 The influence of *previous performance* within the same game was identified as a key
386 situational constraint by place kickers and coaches. One place kicker reports how
387 unsuccessful *previous performance* can influence perceived *expectation for success* from the
388 *crowd* and team-mates:

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

389 “If you’ve missed a couple, and you’ve not struck them well, that’s when
390 it’s the hardest because obviously, you have the weight of the crowd, you
391 know, your team mates are probably, sort of not doubting you, but sort of
392 ‘umming and arghing’ a little bit over whether you should take the penalty
393 at goal or not, because you know, you’ve missed two” (Place Kicker 2).

394 Place kicking coaches acknowledge the importance of *previous performance* and how
395 it can influence decision-making for penalty options and confidence of place kickers for
396 future kicks. The experiential knowledge of place kickers and coaches contributes important
397 insights to support findings of quantitative analyses of place kicking. For example,
398 performance analysis of the 2015 Rugby Union World Cup revealed that success percentages
399 of place kicks were 7% lower following a previous unsuccessful attempt, compared with
400 following a successful attempt.² Therefore, *previous performance*, and its effect on the place
401 kicker’s confidence levels, should be considered when deciding whether to place kick when
402 awarded a penalty.

403 Place kickers reported always being aware of the *score margin* when place kicking,
404 with the most difficult scenario perceived to be when their team are trailing. More
405 specifically, a scenario when the outcome of the place kick can change their team’s standing
406 in the game, as one place kicker reports:

407 “Yeah, it’s probably a kick to take the lead... so that’s a difficult kick when
408 it’s, when the kick directly affects your standing in the game, when you go
409 to being 1 point up if it’s a conversion, or to bring you back into losing bonus
410 point range [losing by 7 points or fewer] or something like that...yeah
411 there’s probably a bit more pressure on that” (Place Kicker 6).

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

412 This experiential knowledge can potentially explain performance decrements
413 observed in quantitative analyses¹⁻³ that have showed drops in performance when there is an
414 opportunity to take the lead or win the game. For example, in 582 international matches
415 between 2002-2011, success percentage was 61%, compared to 72% mean success, when the
416 match outcome hinged on the success of a single place kick for a team trailing by one or two
417 points, after which no further points were scored.³

418 Place kickers reported that situations with little *time remaining* have increased
419 pressure because of the consequence of little or no further play, therefore, offering few
420 opportunities to rectify a potential unsuccessful kick in play or with another kick. Critically,
421 these situations are shaped by an interaction between *time remaining* and *score margin*, with
422 place kickers only citing an increased pressure with little *time remaining* if the place kick is
423 an opportunity to change their team's standing in the game. Place Kicker 6 explains the
424 effects of *time remaining*: "When it gets closer toward the 80 minutes, you know like after
425 that, your chances to make amends for it is getting smaller and smaller". Coaches are
426 therefore encouraged to use these insights to design practice tasks which simulate
427 performance contexts with little *time remaining* (i.e. little opportunity to rectify a potential
428 error), containing meaningful consequences for successful or unsuccessful performance to
429 represent game-deciding place kicks as faithfully as possible.

430 ***Practice Design***

431 Current place kicking practice typically takes place after team sessions, either
432 individually or with a small number of place kickers, due to a perceived lack of time in team
433 sessions. Therefore, place kicking is not seen as a priority during team practice and is
434 typically separate from team sessions, as one coach described:

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

435 “I know [place] kicking only takes you about a minute, so in theory you
436 could put that in the rest period between blocks of training, but erm, I think
437 because there’s always a big time limit on training. I think the [place]
438 kicking will be the last thing to put in, or the first thing to be thrown out”
439 (Coach 4).

440 Following the identification of 11 key constraints in performance environments earlier
441 in the present study, experiential knowledge of practice environments will now be presented
442 and discussed in relation to these key constraints.

443 *Individual Constraints*

444 As place kicking practice is typically performed separately from team sessions, this
445 reduces the perceived *expectation for success* from team-mates. One coach explained the
446 difference between place kicking practice and competitive environments:

447 “I think it’s an assumption that it’s the same thing, that people just assume
448 that kicking after [training] is the same as kicking in a game, and well I’m
449 certainly starting to realise that it’s not, and we could probably do more...
450 there’s no pressure from team-mates or opposition. Erm, the more I think
451 about it, the more I think it’s just so different” (Coach 5).

452 Whilst place kicks are not usually incorporated into team sessions, place kickers and
453 coaches revealed examples of increasing *expectation for success* in practice, such as one
454 place kick a week in front of all team-mates. To increase *expectation for success*, all players
455 within the team would have to complete a fitness forfeit if the place kicker were unsuccessful.

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

456 As place kicking practice is typically organised after team sessions, it is suggested
457 that place kickers are practising under cumulative *fatigue* from the preceding session.
458 However, the majority of place kicking practice is completed with no representation of acute
459 *fatigue*, or phases of play, in between each place kick. One place kicking coach describes the
460 differences between place kicking in practice and competitive environments:

461 “Not much kicking training is done under *fatigue*. Because they just have a
462 block of it so you’re walking around in between... You just practice this
463 technique you don’t actually use in games. This fresh technique where you
464 use your knee, and then you go out to games and you start using your hip
465 more, so it’s a different, erm technique” (Coach 1).

466 Place kicking coaches should therefore consider representing acute fatigue between
467 each place kick in practice, to represent passages of play from competitive performance
468 environments. For example, place kicking could be integrated during game play situations in
469 practice to mimic the physical demands of a passage of play preceding a place kick.

470 *Task Constraints*

471 In practice environments, place kickers typically represented key task constraints of
472 *angle and distance to goalposts* by kicking towards full sized goalposts from various pitch
473 locations. Within a typical place kicking practice session of 12 kicks, place kickers will kick
474 from several different kicking locations, which can either be determined by personal routine
475 or random locations. Randomising the *angle and distance to goalposts* of practice place kicks
476 is designed to represent a penalty, which can be awarded by the referee for an infringement
477 by the opposition in any pitch location, or a conversion, which varies depending on the
478 position of the ball being grounded for a try. One place kicking coach describes the varying

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

479 task constraints of place kicking and how these should be represented in practice
480 environments:

481 “Balls could be anywhere, so it’s very difficult to, to know exactly where
482 those, the right sweet spot is to practice, because in Union it could be
483 anywhere... you don’t know where you’re going to score, you don’t know
484 where you’re going to get penalties from, it’s very difficult to be really
485 focused on where you do the practice, and therefore it has to be a bit more
486 sporadic and dotted around” (Coach 4).

487

488 Place kickers should consider a random order of place kicking routines to represent
489 the varying *angle and distance to goalposts* in competition. In this way, place kicking
490 practice could involve ‘repetition without repetition’ as advocated by Bernstein²⁶ (p. 134),
491 which allows place kickers to solve performance problems by adapting movement patterns
492 under varying task constraints in each practice kick.

493 *Environmental Constraints*

494 Whilst kicking towards full sized goalposts in outdoor conditions, place kicking is
495 always practised in varying *wind and weather* conditions and typically on a *pitch* that is
496 representative of competitive surfaces. Unlike competitive performance environments, place
497 kickers typically practice without a watching *crowd* of people due to the logistical difficulties
498 of faithfully representing any effects of a large *crowd*. One place kicking coach reported
499 using headphones with *crowd* noise during practice, similar to previous research,²⁷ which has
500 played crowd noise over a tannoy: “Some of the boys have done, maybe in private sessions,
501 things like headphones in and crowd noise” (Coach 3).

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

502 *Situational Constraints*

503 Place kickers typically adopt a practice strategy of taking multiple attempts from each
504 location in practice, which minimises any effects of *previous performance* on thoughts or
505 preparation of future kicks. Unlike performance environments, place kickers tend to make
506 corrections to unsuccessful kicks before moving to a different location in practice. Place
507 Kicker 4 describes taking multiple attempts to overcome unsuccessful *previous performance*:
508 “Probably around two [attempts], but if I miss my first one, like if I miss them or I keep
509 missing from the same spot... I’ll carry on doing that until I get one”.

510 Taking multiple consecutive attempts from the same location in practice is not
511 representative of the one attempt from each location that place kickers will have in
512 competition. However, there were some examples of place kickers and coaches applying a
513 “one repetition focus” in practice to represent competition pressure and demands. Place
514 Kicker 1 describes this practice strategy: “They’re calling it a “one rep focus” so I’ll kick a
515 ball from a spot... No matter where it goes, pick it up and we’ll walk to a completely
516 different spot and we’ll talk about the last kick”.

517 A “one repetition focus” approach to practice aligns with the Representative Learning
518 Design framework,¹¹ as this strategy represents the demands of competitive performance
519 environments, in which a kicker has only one attempt at each kick. This focus also
520 encourages place kickers to practice in a random order using varying task constraints of *angle*
521 *and distance to goalposts*, which better represents the pressures of competitive place kicking.

522 There were only a small number of reported examples of coaches using scenarios of
523 little *time remaining* with a close *score margin* to represent game context in practice.
524 However, partly influenced by training loads, coaches and players viewed a limited number

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

525 of place kicks in each session as a source of pressure. Limiting practice to a small number of
526 kicks, typically 10-12 each day, can increase pressure on the place kicker to perform
527 successfully, similar to the pressure associated with limited *time remaining* in matches.
528 Coaches can also use scenarios of *time remaining* and *score margin* for place kicking in
529 practice environments, as one coach explains:

530 “I would set the score, and say “right, so you’ve got 3 minutes left on the
531 clock until the end of the game”, or just say “until half-time”... and the score
532 is that you’re 3 points down”... or it could be “you’re 8 points down”, so it
533 is scenario based in what we’re gonna face on a Saturday” (Coach 6).

534 Currently, as place kicking practice is typically isolated from simulated game
535 situations, place kickers regularly use scored competitions with other place kickers. However,
536 coaches can also consider how to incorporate place kicking into team sessions. One coach
537 reflects on place kicking practice:

538 “I can’t quite get my head around how we spend so much time around the
539 pitch working incredibly hard to win penalties at scrum time, or win lineout
540 penalties, or march our way up the field to get points, and then spend so
541 little time actually executing that skill that gets you the points. There’s no
542 point getting a penalty because you don’t get anything for it, you have to
543 then kick the ball through the posts [to score points]” (Coach 5).

544 Recommendations for Practice Design

545 Using an ecological dynamics framework, and recommendations from Representative
546 Learning Design,¹¹ coaches are encouraged to incorporate the key constraints from

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

547 performance environments identified in this study into practice environments. Focusing on
548 one attempt per kicking location can represent the random and unpredictable task constraints
549 of penalties and conversions. Place kicking coaches are encouraged to break up routines of
550 moving to set pitch locations in sequential orders at walking pace, and to prioritise putting
551 place kickers into areas of uncertainty by using randomised pitch locations which are
552 integrated into game-related activities.^{13,27} Using varying pitch locations in practice can also
553 promote learning in metastable regions, where place kickers can develop adaptive movement
554 solutions. Coaches could also challenge place kickers following previous unsuccessful
555 performance in practice, by putting the following place kick in difficult pitch areas (e.g. 15 m
556 line).

557 One way which place kicking coaches could mimic individual constraints of acute
558 *fatigue* and *expectation for success* is to incorporate place kicking into game situations in
559 training, such as following a try, or as a penalty option. Traditionally, coaches will design
560 dynamic practice environments which include interactions between attacking and defending
561 players to shape representative affordances to pass, carry the ball, and score a try.¹³ However,
562 typical team sessions do not include place kicking due to a perceived lack of time and the
563 focus on scoring tries. Given the importance of place kicking to the outcome of matches, and
564 the experiential knowledge identified in this study, this provides a strong rationale for
565 including place kicking in team practice sessions.

566 Using the framework of Affective Learning Design,¹⁷ coaches are encouraged to use
567 vignettes which represent *expectation for success* (i.e. meaningful consequences for a
568 successful or unsuccessful kick) which could induce emotions during practice. Potential
569 methods for representing expectation for success include a team forfeit (e.g. fitness related
570 forfeit) following unsuccessful place kicking performance in practice, and place kicking for

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

571 points in gameplay situations where the winning team is rewarded. Identifying specific
572 situational constraints in performance environments (e.g. time remaining, score margin,
573 previous performance) can inform the design of specific vignettes in practice. Therefore,
574 coaches are encouraged to design place kicking practice environments with clear purposes
575 and consequences to avoid the dangers of athletes performing below competition intensity in
576 practice, which creates different thoughts, emotions and emerging perception-action
577 couplings.¹⁴

578 Conclusion

579 This study has explored and identified the key constraints that professional place
580 kickers and experienced place kicking coaches perceive to influence the difficulty of a place
581 kick. Through experiential knowledge, this study has also increased understanding of how
582 current place kicking practice environments represent these key constraints and makes
583 recommendations for representative practice design. Professional place kickers perceived
584 individual constraints, such as feelings of *expectation for success*, to influence their
585 perceptions of task difficulty in specific pitch locations (e.g. 15 m in from touchline). Place
586 kickers revealed experiences of unsuccessful *previous performance*, little *time remaining* and
587 close *score margins*, as situational constraints which influence perceptions of task difficulty
588 when preparing to place kick. Place kicking coaches and place kickers reported observations
589 of individual constraints (e.g. *fatigue*) and task constraints (*angle and distance to goalposts*)
590 influencing place kicking movement patterns. The novel insights gained from experiential
591 knowledge of professional place kickers and experienced place kicking coaches enrich
592 current understanding of key constraints on place kicking, which have only previously been
593 speculated about using statistical data from performance analyses.^{2-3, 12}

EXPERIENTIAL KNOWLEDGE OF RUGBY PLACE KICKING

594 The findings of this study clarify the multiple interacting constraints that can
595 influence a place kicker, such as task constraints (e.g. *distance and angle to goalposts*),
596 environmental constraints (e.g. *wind, weather, pitch, and crowd*), individual constraints (e.g.
597 *expectation for success and fatigue*), and situational constraints (e.g. *previous performance,*
598 *score margin, and time remaining*). The multiple interacting constraints highlighted in this
599 study should be considered when designing practice environments. Coaches are encouraged
600 to include place kicking in team sessions with relevant scenarios to represent the pressures
601 and demands of place kicking in competitive performance environments.

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Interview Guide for Place Kickers

1. Career History

QUESTION	PROBE	AIM
<p>Could you tell me a little about your rugby career?</p> <p>Could you tell me a little about your place kicking career?</p> <p>What is your role within your current team?</p>	<ul style="list-style-type: none"> • How many years have you been playing Rugby Union and how much of this has been as a professional? • How many years have you been kicking penalties and conversions? • Could you give an overview of your main responsibilities in the team? 	<ul style="list-style-type: none"> • How much experience does the individual have of place kicking?

2. Practice

<p>Could you describe your current training, specifically for place kicking?</p> <p>How have your preparations for kicks developed since you first started kicking?</p>	<ul style="list-style-type: none"> • Could you describe your current pre-match preparations for place kicking? • Have your pre-match preparations changed over the years? • How many hours a week do you practice place kicking? • How (and when) do you practice in training sessions? • Why do you prepare for place kicking situations using your current techniques? • How does your current training differ from your training in the past? • What are your memories of your first experiences of kicking? 	<ul style="list-style-type: none"> • How do kickers currently practice place kicking, and how was this shaped by developmental experiences?
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3. Place Kicking Success Percentages

<p>On average, do you know how many kicks you tend to take per match?</p>	<ul style="list-style-type: none"> • Do you know your kicking success percentage this season? • How does this compare to your kicking success percentage in previous season(s)? • Do you consciously keep score of your kicks during the match? • Have you had experiences of being on a run of successful kicks? • Could you describe how it feels when you have successfully kicked several kicks in a row? • Does your approach to a kick change when you have been kicking successfully? • On the other hand, have you had experiences of missing consecutive kicks? • Does your approach to a kick change when you have missed your previous kick(s)? • Do you reflect or think about missed kicks during matches? 	<ul style="list-style-type: none"> • What impact does the outcome of a previous kick have on the preparation for a subsequent kick?
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4. Experience of Competitive Place Kicks

<p>From your experience of place kicking, could you describe the most difficult kick/kicks possible within your kicking range?</p> <p>Are there specific situations in which you feel kicks are more important?</p>	<ul style="list-style-type: none"> • What are the key features that make these kicks difficult? • Could you describe your own experiences of approaching difficult kicks? • Do you approach every kick with the same routine? • Do you prefer kicking in certain situations? • From your experiences, could you recall a situation in which you felt under elevated pressure to successfully convert a kick? • Are there any experiences in which you have been distracted from your routine? • Before preparing for each kick, do you think about the current score of the match? • When preparing for a kick, do you think about your responsibility to the team to score points? 	<ul style="list-style-type: none"> • What are the key variables that influence the difficulty of a place kick?
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5. Overall Contribution of Place Kicking

How important do you think place kicking is to the outcome of matches?	<ul style="list-style-type: none">• Has the importance of place kicking in Rugby Union changed in recent years?	<ul style="list-style-type: none">• How important does the kicker feel place kicking is to the match outcome?
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Interview Guide for Place Kicking Coaches

1. Career History

QUESTION	PROBE	AIM
<p>Could you tell me a little about your rugby coaching career?</p> <p>What is your current role at the club?</p>	<ul style="list-style-type: none"> • Were you playing rugby prior to becoming a coach, and at what level? • Could you tell me a little bit about how you first got into coaching? • What experiences and qualifications do you have in coaching rugby? • Do you have any specific training or qualifications in coaching kicking? • Could you explain what the main roles of your job as a coach are? 	<ul style="list-style-type: none"> • How much and what experience does the coach have?

2. Practice

<p>In your own words, could you describe the most important aspects for coaching place kicking?</p>	<ul style="list-style-type: none"> • How do you develop these aspects in your practice sessions? • Why is practice designed in this way? • How do you practice for difficult kicks in training? • Could you give an overview of your instructions for a pre-match preparation? • Which technical aspects of a kick typically contribute to an unsuccessful kick? • How do you provide feedback to your kickers following unsuccessful kick(s)? 	<ul style="list-style-type: none"> • How do coaches currently train place kicking? • How do coaches prepare their kickers for difficult kicks?
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3. Place Kicking Success Percentages

<p>On average, do you know how many place kicks your team tends to have per match?</p>	<ul style="list-style-type: none"> • Do you consciously keep score of your place kicker's performance during the match? • Have you had experiences of a place kicker missing several kicks in a row? • How have you previously dealt with a kicker experiencing a poor run of form? • Have you observed a difference in approach and/or technique for kickers when on a good run of form compared to a poor run of form? • Do you reflect on or discuss place kicking performance with your kicker? • How important is the recent place kicking form in selecting a place kicker for the team? 	<ul style="list-style-type: none"> • How important is the recent form of the kicker to place kicking performance?
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4. Experience of Competitive Place Kicking

<p>From your experience of coaching place kicking, could you describe the most difficult kick possible (within range) for a place kicker?</p> <p>Are there specific situations which you feel are more important for your kicker to score points?</p>	<ul style="list-style-type: none"> • What are the key features that make this kick difficult? • Do you encourage kickers to approach every kick with the same routine? • What are the key features of these situations that make them more important to the match? • How do you feel when watching place kicks for your team from the side line? • Could you describe your emotions when watching place kicks? • Are there specific situations in which you feel more nervous when watching a place kick? • Before a place kick, do you think about the current score of the match? 	<ul style="list-style-type: none"> • What are the key variables that the coach perceives to influence the difficulty of a place kick?
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5. Overall Contribution of Place Kicking

<p>How important do you think place kicking is to the outcome of matches?</p>	<ul style="list-style-type: none"> • Has the importance of place kicking in Rugby Union changed in recent years? 	<p>How important does the coach feel place kicking is to the match outcome?</p>
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