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22 **Abstract**

23 *Purpose:* To quantify and compare the maximum running intensities during rugby union match-play.

24

25 *Methods:* Running intensity was quantified using micro-technology devices (S5 Optimeye, Catapult)
26 from 202 players during 24 matches (472 observations). Instantaneous speed was used to calculate
27 relative distance ($\text{m}\cdot\text{min}^{-1}$) using a 0.1 s rolling mean for different time durations (15 and 30 s and 1, 2,
28 2.5, 3, 4, 5, and 10 min). Data were analysed using a linear mixed-model and assessed with
29 magnitude-based inferences and Cohen's *d* effect sizes (ES).

30

31 *Results:* Running intensity for consecutive durations (e.g., 15 s vs. 30 s, 30 s vs. 1 min, etc.) decreased
32 as time increased (ES = 0.48-2.80). Running intensity was lower in forwards than backs during all
33 durations (-0.74 ± 0.21 to -1.19 ± 0.21). Running intensity for the second row and back row positions
34 was greater than the front row players at all durations (-0.58 ± 0.38 to -1.18 ± 0.29). Running intensity
35 for scrum-halves was greater (0.46 ± 0.43 to 0.86 ± 0.39) than inside and outside backs for all durations
36 besides 15 and 30 s.

37

38 *Conclusions:* Front rowers and scrum-halves were markedly different from other sub-positional
39 groups and should be conditioned appropriately. Coaches working in academy rugby can use this
40 information to appropriately overload the intensity of running, specific to time durations and positions.

41

42 *Keywords:* Worst case scenario; GPS; Physical preparation; Running demands

43 **Introduction**

44 The quantification of match-play using global positioning systems (GPS) allows the appropriate
45 planning, ‘live’ monitoring and retrospective analysis of training practices (Weaving et al. 2017). Both
46 research and practice have helped evolve the quantification of team sport match-play, in particular
47 regarding the maximum running intensity (Varley et al. 2012). The maximum running intensity is
48 established using a novel rolling mean method to analyse the raw instantaneous speed from a GPS
49 device for a given time duration. Recent studies have established the maximum running intensities for
50 several team sports including Australian football (Delaney et al. 2017), rugby league (Delaney et al.
51 2015) and professional rugby union (Delaney et al. 2017a). However, the use of data from
52 professional players might not be applicable for academy rugby union players (e.g., under-18 (U18))
53 given the difference in physical characteristics (Argus et al. 2012; Darrall-Jones et al. 2015) and length
54 of matches (i.e., 70 vs. 80 min).

55

56 The whole-match physical characteristics of several playing standards in age-grade rugby union have
57 been quantified (Hartwig et al. 2011; Read et al. 2017, 2017a), including academy (Read et al. 2018)
58 and international competition (Cunningham et al. 2016). Academy rugby is one of the final steps prior
59 to youth international representation and professional squads. Players have been shown to cover 5639
60 ± 368 m during a full academy match, which equates to ~ 75.2 $\text{m}\cdot\text{min}^{-1}$ (Read et al. 2018). Previous
61 research has also quantified the intensities of attacking ($112.2 - 114.6$ $\text{m}\cdot\text{min}^{-1}$) and defensive ($114.5 -$
62 109.0 $\text{m}\cdot\text{min}^{-1}$) phases during academy match-play for forwards and backs (Read et al. 2016), which
63 exceed the whole-match intensities (Read et al. 2018). The intensities were similar between forwards
64 and backs during attacking phases, and greater in forwards during defensive phases (Read et al. 2016).
65 However, attack and defence analysis does not necessarily capture the maximum running intensities as
66 the most intense periods of play might come from action containing both phases of play. It is therefore
67 vitally important to quantify the maximum running intensities of match-play so practitioners can
68 appropriately prepare players for the most intense periods of play. In addition, the majority of previous
69 research on academy rugby has only split players into forwards and backs, often due to a small sample
70 size of players (Read et al. 2017, 2017a, 2018). This is despite research in professional players

71 highlighting differences between sub-positional groups (e.g., front row, second row and back row)
72 (Lindsay et al. 2015) and therefore should be applied to academy players so practitioners can prescribe
73 position-specific training.

74

75 Previous research has used a predefined time duration (i.e., 1, 5, and 10 min) to highlight the
76 fluctuations in running intensity during a match, with the first 10 min shown to be the most intense
77 (Jones et al. 2015; Tee et al. 2017). More recently, research has investigated the maximum running
78 intensities of international rugby union using the rolling mean method for time durations between 1
79 and 10 min (Delaney et al. 2017a). For example, half-backs (scrum halves and fly halves) have a
80 greater maximum running intensity at all time durations, including 1 min ($184 \pm 28 \text{ m}\cdot\text{min}^{-1}$) and 10
81 min ($93 \pm 12 \text{ m}\cdot\text{min}^{-1}$) than all other sub-positional groups (Delaney et al. 2017a). The use of 1 min
82 intervals between 1 and 10 min is a logical analysis to use for training prescription and monitoring, as
83 training efforts and games are often prescribed by the minute (e.g., 4 min). In addition to these
84 traditionally used time durations (i.e., 1, 5 and 10 min) practitioners may want to replicate training that
85 is specific to the ball in-play cycles of academy rugby matches (Read et al. 2016). The mean and
86 maximum ball in-play cycles for academy rugby are $33 \pm 24 \text{ s}$ and 149 s , respectively; therefore,
87 including 30 s and 2.5 min as time durations in this analysis is applicable. Moreover, given the current
88 use of conditioning practices in rugby such as high-intensity interval training (HIIT), providing
89 practitioners with data from appropriate time durations (i.e., short $<30 \text{ s}$ and long 2-4 min HIIT bouts)
90 will allow the prescription of training for the appropriate physiological adaptations (Buchheit &
91 Laursen 2013b).

92

93 The purpose of the study was to quantify the maximum running intensities during match-play from
94 multiple English rugby union academies. The study aimed to compare: 1) the differences in running
95 intensity between consecutive time durations (e.g., 15 s vs. 30 s, 30 s vs. 1 min, etc.) within forwards
96 and backs 2) the difference in running intensity at each time duration between forwards and backs and
97 3) the difference in running intensity at each time duration among six sub-positional groups.

98

99 **Methods**

100 **Participants**

101 A total of 472 observations were collected from 202 male rugby union players (age: 17.7 ± 0.6 years;
102 height: 183.3 ± 6.3 cm; body mass: 90.8 ± 12.0 kg) across seven rugby union regional academies in
103 England. The players were initially split into forwards ($n = 109$, 263 observations) and backs ($n = 93$,
104 209 observations). Players were then split into six sub-positional groups: front row (props and hooker,
105 $n = 51$, 117 observations), second row (locks, $n = 19$, 47 observations), back row (flankers and number
106 8, $n = 39$, 99 observations), scrum half ($n = 14$, 38 observations), inside backs (fly half and centres, n
107 = 35, 81 observations) and outside backs (wingers and fullback, $n = 44$, 90 observations) (Cahill et al.
108 2013). Ethics approval was granted by the Leeds Beckett University ethics committee.

109

110 **Design**

111 An observational research design was used to determine the position and time-specific maximum
112 running intensities. A total of 24 matches were analysed from the U18 annual competitive league
113 fixtures during the 2014/2015, 2015/2016 and 2016/2017 seasons. All matches were 35 min per half.

114

115 **Procedures**

116 Players wore a micro-technology device that contained a 10 Hz GPS (S5 Optimeye, Catapult
117 Innovations, Melbourne, Australia). When repeated measurements on individual players were
118 conducted they were assigned the same device. The units were worn in a customised vest provided by
119 the manufacturer, with the unit positioned on the upper back. The validity and reliability of 10 Hz
120 Catapult units for assessing team sport movements have previously been reported (Varley et al. 2012a;
121 Johnston et al. 2014). Optimeye S5 devices have shown a *small* typical error of the estimate (1.8%)
122 compared to a radar gun for assessing maximal sprint speed (Roe et al. 2017) although to the authors'
123 knowledge there is no further data available for other speeds. The horizontal dilution of precision and
124 satellites connected (mean \pm standard deviation (SD)) from all data files in the study was 0.61 ± 0.11
125 and 14.2 ± 0.8 , respectively.

126

127 The data were downloaded to the manufacturer's software (Sprint 5.1.7, Catapult Innovations,
128 Melbourne, Australia) and trimmed so it only included actual playing time. A playing time of 10 min
129 was used as the minimum requirement for participants to be included in the study (Delaney et al.
130 2016). Using instantaneous speed ($\text{m}\cdot\text{s}^{-1}$) downloaded at 10 Hz, relative distance ($\text{m}\cdot\text{min}^{-1}$) was
131 calculated through the use of a 0.1 s rolling mean for numerous time durations (15 and 30 s and 1, 2,
132 2.5, 3, 4, 5, and 10 min) relevant to academy rugby union match-play and training. The maximum
133 relative distance for each player and time duration from each match were calculated using the *zoo*
134 package with R (version 3.3.1, R Foundation for Statistical Computing, Vienna, Austria). These
135 calculations were made by establishing the maximum value during each half of play; then, the
136 maximum of the two was retained and the lower value was discarded. This analysis of each half is
137 vital as the maximum running intensity could occur from data during the end of the first and beginning
138 of the second half. The mean and range are reported so the 'maximum' value for each time duration
139 and position can be used by coaches to prepare players for the most intense periods of play instead of
140 solely using the mean data.

141

142 **Statistical Analyses**

143 Descriptive data are reported as mean \pm SD. Prior to analysis the data were checked for normality
144 using the Shapiro-wilk test. All data were then log-transformed to reduce the error occurring from
145 non-uniform residuals that is typical of GPS data in athletic performance (Hopkins et al. 2009) and
146 then analysed using a linear mixed-model (SPSS v.22, NY: IBM Corporation). Three separate
147 analyses were conducted; first for the consecutive time durations, second for the comparisons between
148 forwards and backs and, finally, between the six sub-positional groups. In the first two models, the
149 'time duration' and 'position' of the player (i.e., forwards or backs) were treated as the fixed effects.
150 In the second analysis, 'sub-positional group' (i.e., front row, second row, back row, scrum half, inside
151 back or outside back) was treated as the fixed effect, whereas the random effects were 'individual
152 player-code' and 'match-code' for all analyses. Relative distance was used throughout as the
153 dependent variable. Magnitude-based inferences were used to assess the practical importance via a
154 spreadsheet (Batterham & Hopkins 2006). A value equivalent to 0.2 of a Cohen's *d* effect size (ES)

155 was set as the smallest worthwhile difference and then assessed qualitatively as follows: 25-74.9%,
156 *possibly*; 75-94.9% *likely*; 95-99.5%, *very likely*; and >99.5%, *almost certainly* (Hopkins et al. 2009).
157 Where the confidence interval (CI) crossed both the upper and lower boundaries of the smallest
158 important effect, the difference was reported as *unclear* (Batterham & Hopkins 2006). Cohen's *d* ES
159 are shown with $\pm 90\%$ CI with thresholds of <0.20, 0.20-0.59, 0.60-1.19, 1.20-1.99 and 2.00-3.99 used
160 for *trivial*, *small*, *moderate*, *large* and *very large* effects, respectively (Hopkins et al. 2009).

161

162 **Results**

163 The differences in consecutive time durations between forwards and backs are shown in Figure 1.
164 There were *almost certain* differences between all consecutive time durations for both forwards and
165 backs. In the second analysis, the difference in running intensity at all time durations was *almost*
166 *certainly* lower in the forwards than backs. The ES \pm CI (forwards-backs) were -1.19 ± 0.21 (15 s), -
167 1.18 ± 0.24 (30 s), -0.85 ± 0.24 (1 min), -0.74 ± 0.21 (2 min), -0.82 ± 0.21 (2.5 min), -0.83 ± 0.22 (3
168 min), -0.90 ± 0.24 (4 min), -0.84 ± 0.24 (5 min) and -0.84 ± 0.23 (10 min).

169

170 ***** INSERT FIGURE ONE NEAR HERE *****

171

172 The descriptive data (mean \pm SD and range) of the running intensities for each of the six sub-
173 positional groups and time durations are reported in Table 1. All front row, second row and back row
174 comparisons are shown with an ES \pm CI in Figure 2(A). The difference in second row and back row
175 players was either *very likely* or *almost certainly* greater at all time durations than front row players.
176 Second row and back row players had *possibly trivial* differences at 2 and 3 min. The difference in
177 relative distance was *likely* greater in back row players than second row players at 15 and 30 s, with
178 *unclear* differences found for 1, 2.5, 4, 5 and 10 min.

179

180 All scrum half, inside back and outside back comparisons are shown with an ES \pm CI in Figure 2(B).
181 Differences between scrum halves and inside backs were *unclear* for 15 s, whereas the differences
182 were *possibly* and *likely* greater in scrum halves for 30 s and 10 min. All other time duration

183 differences were *very likely* greater in scrum halves compared to inside backs. The differences
184 between scrum halves and outside backs were *unclear* for 15 s, and *possibly* and *likely* greater in
185 scrum halves for 30 s and 10 min, respectively. The difference in time durations of 1, 2, 4 and 5 min
186 was *very likely* greater in scrum halves, and *almost certainly* greater for 2.5 and 3 min compared to
187 outside backs. In the inside backs and outside backs comparison, 15 s, 30 s, 1 min and 4 min
188 differences were *unclear*, while all other time durations were *possibly trivial* between the same
189 positions.

190

191 ***** INSERT TABLE ONE NEAR HERE*****

192 ***** INSERT FIGURE TWO NEAR HERE *****

193

194 **Discussion**

195 The aims of the study were to compare the difference in running intensity between consecutive time
196 durations (e.g., 15 s vs. 30 s, 30 s vs. 1 min, etc.) within forwards and backs. Second was to compare
197 the difference in running intensity at each time duration between forwards and backs. The final aim
198 was to compare the difference in running intensity at each time duration between six sub-positional
199 groups during academy rugby union match-play. The findings show that running intensity decreased
200 as time increased, with all comparisons between consecutive time durations showing clear changes.
201 The comparisons show that forwards had a lower running intensity in all time durations than backs.
202 Further sub-positional comparisons show that running intensities of front row players are markedly
203 different from those of second and back row players at the U18 age, whereas back row and second row
204 players were largely similar. In addition, scrum halves were greater than both inside and outside backs
205 at all time durations besides 15 and 30 s, whereas inside and outside backs were largely similar. These
206 data provide time specific reference values in maximum intensity running for coaches preparing
207 academy rugby union players for the most intense periods of play.

208

209 The analysis between consecutive time durations in the current study indicates that as the time
210 duration increases, the maximum running intensity decreases. The greatest decreases in both positions

211 were seen during 15 s, 30 s, 1 min and 2 min, all showing *very large* ES. Similar findings have also
212 been shown by Delaney et al (2015) where the greatest difference in running intensity for consecutive
213 times was between the shortest durations (i.e., 1 vs. 2 min) in professional rugby players. Previous
214 research in rugby league has shown that longer ball in play durations was associated ($r = -0.67$) with a
215 lower running intensity (Gabbett 2015). Collectively, this highlights not only the fluctuations in
216 running during rugby union but also the relationship between length of physical effort and intensity
217 that can be maintained (Buchheit & Laursen 2013a).

218

219 In the current study, the difference in running intensity was *almost certainly* greater in backs
220 compared to the forwards group at all time durations, showing *moderate* ES (-0.74 ± 0.21 to -1.19
221 ± 0.21). Previous research has shown lower magnitudes of difference between the two positions in
222 academy rugby for total distance covered (5639 ± 368 vs. 5461 ± 360 m, ES = 0.67 ± 0.57) (Read et al.
223 2018). Furthermore, *trivial* (-0.00 ± 0.23) and *small* (0.32 ± 0.23) ES were observed between the two
224 positions during the attacking and defending phases (Read et al. 2016). This demonstrates that the use
225 of the rolling mean method highlights greater differences between forwards and backs in academy
226 rugby players than previous whole match and phase of play analyses. These findings suggest this
227 method can be employed to establish the positional demands of match-play and used to prescribe
228 position-specific training (Phibbs et al. 2018).

229

230 Within the front row, second row and back row comparisons, the difference in running intensity was
231 either *very likely* or *almost certainly* lower for front row players. Similar maximum running intensity
232 distances are apparent for front row players in this study compared to international players, despite the
233 previous research using slightly different sub-positional groupings (e.g., tight five; front and second
234 row together) (Delaney et al. 2017a). In addition, second row players had a greater running intensity in
235 the current research study for multiple time durations (e.g., 1 min: international 154 ± 21 m·min⁻¹,
236 front row 154 ± 17 m·min⁻¹, second row 165 ± 12 m·min⁻¹; 5 min: international 91 ± 12 m·min⁻¹, front
237 row 93 ± 14 m·min⁻¹, second row 100 ± 12 m·min⁻¹; 10 min: international 79 ± 11 m·min⁻¹, front row
238 80 ± 12 m·min⁻¹, second row 87 ± 9 m·min⁻¹) (Delaney et al. 2017a). The greater anthropometric and

239 physical characteristics of professional players such as body mass might contribute towards the similar
240 or lower running intensities in international players (Argus et al. 2012; Darrall-Jones et al. 2016). The
241 shorter halves of academy rugby might also contribute to differences compared to professional
242 players, while it is also worth noting the difference in GPS manufacturers used by Delaney et al
243 (2017a) and the current study as the differences between these are unknown. In summary, it appears
244 academy front row and second row players experience similar or greater maximal running intensities
245 during match-play as international players. This has implications for how practitioners prepare players
246 in progression for a transition into professional rugby, as it appears players need to maintain their
247 running intensity during match-play while increases in height and body mass are likely.

248

249 In the current study the second row and back row players were similar for all time durations besides
250 15 and 30 s, in which the back row players had a *likely* greater difference. This difference might be
251 explained by the greater maximum speed (5.72 vs. 4.90 m·s⁻¹) and high speed running (6.0 vs. 4.9
252 m·min⁻¹) that back row professional players have been shown to complete in the longest ball in play
253 periods during match-play (Reardon et al. 2017). Overall, these data suggest that second row players
254 are more comparable to back row players at the U18 age, whereas studies in professional players show
255 more similarities between front and second row players (Delaney et al. 2017a; Quarrie et al. 2013).
256 Second row players are typically the tallest players in rugby union teams; however, the difference in
257 anthropometric measures between positions is far greater at the professional level than academy
258 (Lindsay et al. 2015; Wood et al. 2018). Therefore, as previously stated, this lack of difference
259 between positions (e.g., height and body mass) might be linked to the similar running intensity during
260 match-play.

261

262 Scrum halves in the current study had either *very likely* or *almost certainly* greater differences in all
263 time durations between 1 and 5 min compared to inside backs and outside backs. Differences in the
264 shorter durations (i.e., 15 and 30 s) were not as clear and suggests that the running intensity is similar
265 between all back positions during durations <1 min. This might be due to the negligible difference
266 between the positions in speed over shorter distances (Wood et al. 2018), while differences in longer

267 durations are likely to be attributed to scrum halves continually getting to rucks to pass the ball
268 (Quarrie et al. 2013). Measures from scrum halves in this study were similar to international players
269 for shorter durations (e.g., 1 min: 185 ± 20 vs. 184 ± 28 $\text{m}\cdot\text{min}^{-1}$), while measures showed a trend to
270 be greater in the current study for longer time durations (e.g., 5 min: 116 ± 14 vs. 108 ± 15 $\text{m}\cdot\text{min}^{-1}$)
271 (Delaney et al. 2017a). Notably, inside and outside backs were both comparable to each other and
272 international players (Delaney et al. 2017a). The similar or greater running intensity shown in the
273 current study may be because of greater defensive structures in the international level and defences in
274 academy rugby might provide more space for players to run.

275

276 Researchers should make coaches aware of the ‘true maximum’ values that are provided in this
277 research, and have previously been omitted from studies. However, the use of the rolling mean method
278 provides limited context such as location on the pitch, time of the match and the current phase of play
279 (i.e., attack or defence). Despite this, maximum running intensity should be used as one of the metrics
280 to analyse match-play data in order to prepare players for the most intense periods of play. It is also
281 recommended for coaches to use it for its use in discriminating between positions, whereas other
282 analyses might not provide this. Future research should look to quantify the maximum collision
283 exposures during academy match-play, as the current study only examined running, which is
284 acknowledged as a limitation.

285

286 **Conclusion**

287 This study is the first to quantify the maximum running intensities from academy rugby union match-
288 play. In addition, seven of the 14 regional academies are included in this study and thus is a substantial
289 representation of U18 academy players in England. Within both forwards and backs, there were clear
290 differences between each consecutive time duration, with greater changes shown in the short durations
291 (i.e., 15 s, 30 s, 1 min and 2 min). The results highlight the substantial differences between forwards
292 and backs at all time durations, whereas previous studies using different types of analyses have shown
293 a smaller disparity between the two positions for U18 players. The further sub-positional comparisons
294 show that front row players are markedly different from both second and back row players. Equally,

295 scrum halves were distinctly different from inside and outside backs besides 15 and 30 s time
296 durations. Notably, it appears academy players experience similar or greater maximal running
297 intensities during match-play as international players. These data provide time specific reference
298 values for maximum running intensity so coaches can prepare English academy rugby union players
299 for the most intense periods of play.

300

301 **Practical Applications**

302 Coaches working in rugby union can use the information provided to appropriately replicate and
303 overload the intensity of match-play running through the use of traditional conditioning practices or
304 small-sided games specific to relevant time durations and positions. For example, coaches might wish
305 to perform a drill in training for 2.5 min, which corresponds to the longest ball in-play cycle during
306 academy match-play. The reference values provided in this study for 2.5 min in front row (112 ± 15
307 $\text{m}\cdot\text{min}^{-1}$), scrum halves ($138 \pm 18 \text{ m}\cdot\text{min}^{-1}$) and all players (range: 71-179 $\text{m}\cdot\text{min}^{-1}$) can be used to
308 either monitor 'live' or retrospectively analyse ensuring the appropriate stimulus is provided. In
309 addition, practitioners working with U18 squads could group second row and back row players
310 together within the forwards, while also grouping inside and outside backs together for conditioning.
311 Front row and scrum halves are distinctly different from other sub-positional groups. Coaches should
312 also be aware that substantial changes in anthropometric measures (e.g., height and body mass) occur
313 between U18 and professional levels and therefore practitioners should look to maintain and increase
314 maximal running intensities alongside this where applicable.

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320

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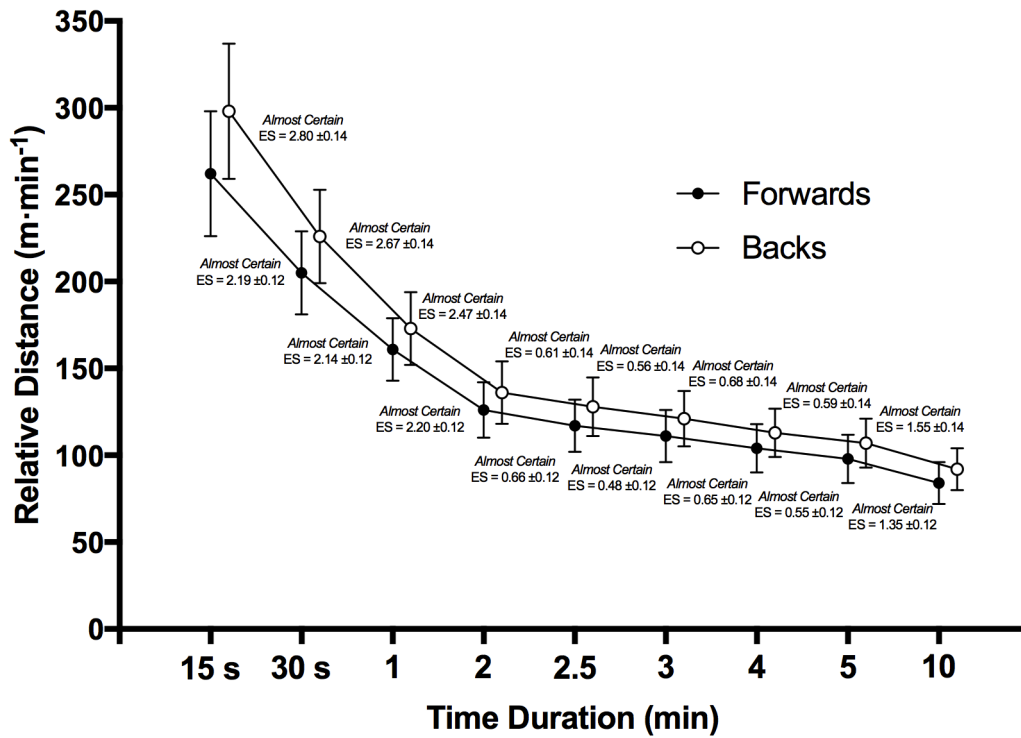
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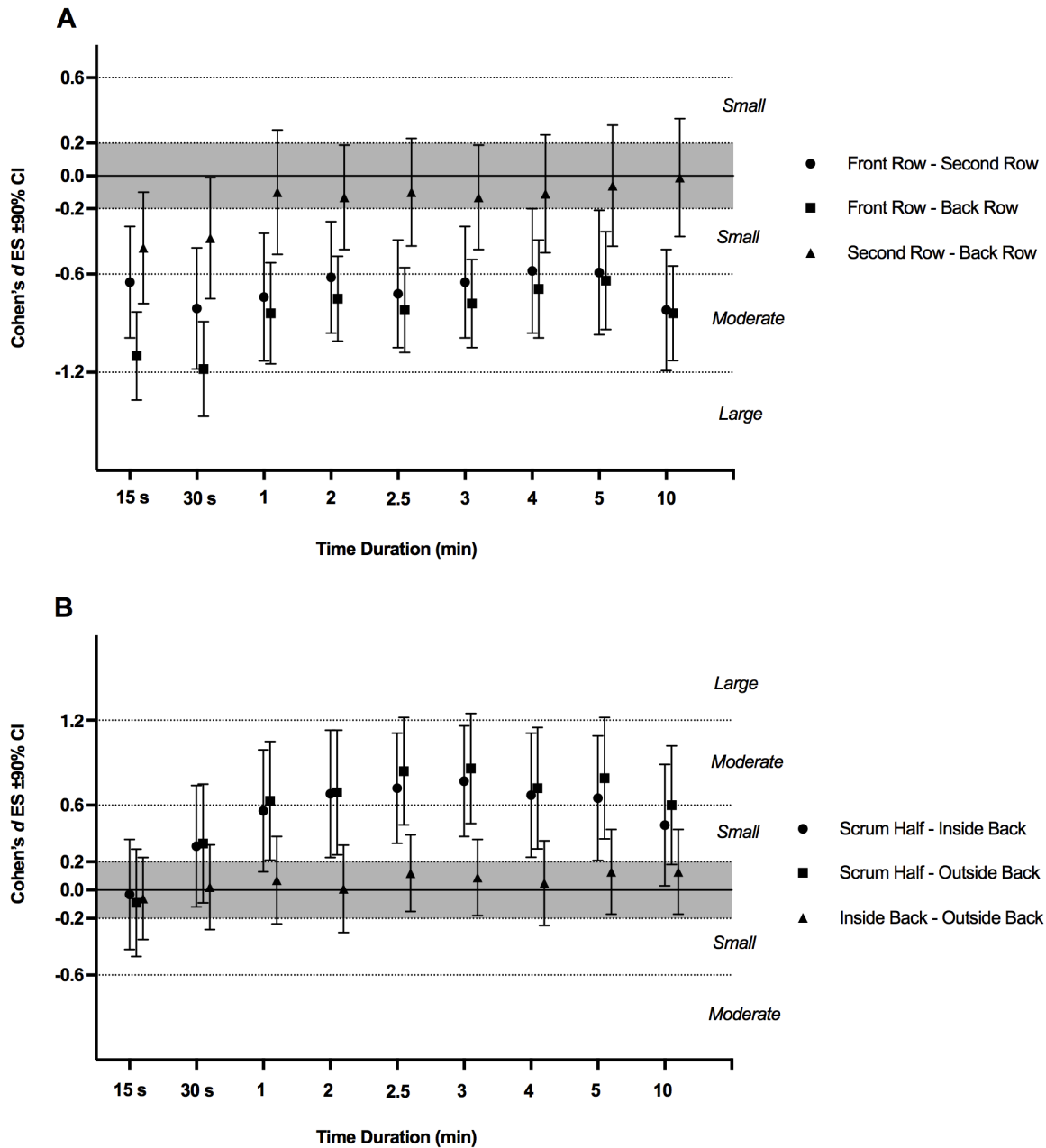


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398 **Figure 1.** Maximum relative distance ($\text{m}\cdot\text{min}^{-1}$) of forwards and backs during academy rugby union
 399 match-play. Comparisons for consecutive time durations (e.g., 15 s vs. 30 s, 30 s vs. 1 min, etc.)
 400 within each position are shown with magnitude-based inferences and Cohen's d effect sizes $\pm 90\%$
 401 confidence intervals. Differences are calculated as A-B. Effect size thresholds are <0.20 = trivial,
 402 $0.20-0.59$ = small, $0.60-1.19$ = moderate, $1.20-1.99$ = large and $2.00-3.99$ = very large.

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406 **Figure 2.** Positional comparisons for front row, second row and back row (A) and scrum half, inside

407 backs and outside backs (B) in relative distance ($\text{m} \cdot \text{min}^{-1}$). Data are reported as Cohen's *d* effect sizes

408 $\pm 90\%$ confidence intervals. Differences are calculated as A-B. Effect size thresholds are $<0.20 =$

409 trivial, $0.20-0.59 =$ small, $0.60-1.19 =$ moderate and $1.20-1.99 =$ large.

1 **Table 1.** Maximum relative distance ($\text{m} \cdot \text{min}^{-1}$) during academy rugby union match-play for six positional groups

	Front Row	Second Row	Back Row	Scrum Half	Inside Backs	Outside Backs
15 s	245 ± 32 [175 - 342]	264 ± 29 [219 - 345]	280 ± 36 [202 - 377]	298 ± 44 [212 - 383]	297 ± 33 [170 - 380]	299 ± 42 [166 - 389]
30 s	193 ± 21 [149 - 251]	207 ± 19 [164 - 242]	217 ± 23 [166 - 273]	233 ± 25 [193 - 297]	245 ± 23 [153 - 283]	224 ± 30 [148 - 302]
1 min	154 ± 17 [111 - 201]	165 ± 12 [141 - 198]	168 ± 19 [121 - 205]	185 ± 20 [136 - 217]	172 ± 19 [102 - 219]	170 ± 22 [111 - 231]
2 min	121 ± 16 [72 - 151]	130 ± 12 [106 - 158]	132 ± 15 [86 - 163]	146 ± 19 [105 - 183]	135 ± 16 [84 - 180]	133 ± 17 [81 - 167]
2.5 min	112 ± 15 [71 - 144]	121 ± 13 [96 - 152]	123 ± 14 [81 - 157]	138 ± 18 [103 - 179]	128 ± 16 [73 - 168]	124 ± 15 [75 - 162]
3 min	106 ± 14 [67 - 138]	115 ± 14 [87 - 145]	116 ± 14 [76 - 147]	132 ± 17 [98 - 178]	120 ± 14 [69 - 158]	118 ± 15 [71 - 157]
4 min	99 ± 14 [56 - 137]	106 ± 12 [84 - 137]	108 ± 14 [73 - 143]	122 ± 15 [82 - 148]	112 ± 13 [63 - 142]	111 ± 14 [67 - 142]
5 min	93 ± 14 [49 - 129]	100 ± 12 [80 - 134]	102 ± 14 [64 - 139]	116 ± 14 [80 - 138]	106 ± 12 [54 - 131]	104 ± 14 [60 - 129]
10 min	80 ± 12 [47 - 102]	87 ± 9 [70 - 105]	88 ± 11 [54 - 110]	97 ± 13 [62 - 120]	92 ± 10 [50 - 112]	89 ± 11 [53 - 113]

2 Data are reported as mean ± SD. [range].

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