Accepted Manuscript

Title: Physiological and performance effects of carbohydrate gels consumed prior to the extra-time period of prolonged simulated soccer match-play

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Please cite this article as: Harper LD, Briggs MA, McNamee G, West DJ, Kilduff LP, Stevenson E, Russell M, Physiological and performance effects of carbohydrate gels consumed prior to the extra-time period of prolonged simulated soccer match-play, *Journal of Science and Medicine in Sport* (2015), http://dx.doi.org/10.1016/j.jsams.2015.06.009

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3 **Running title:** Carbohydrate gel and extra-time

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17 Word Count: 2999

18 Abstract Word Count: 249

19 Number of Tables: 2

20 Number of Figures: 1

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Abstract

Objectives: The physiological and performance effects of carbohydrate-electrolyte gels consumed before the 30 min extra-time period of prolonged soccer-specific exercise were investigated.

Design: Randomised, double-blind, crossover.

Methods: Eight English Premier League academy soccer players performed 120 min of soccer-specific exercise on two occasions while consuming fluid-electrolyte beverages before exercise, at half-time and 90 min. Carbohydrate-electrolyte (0.7 ± 0.1 g·kg^{-1} BM) or energy-free placebo gels were consumed ~5 min before extra-time. Blood samples were taken before exercise, at half-time and every 15 min during exercise. Physical (15-m and 30-m sprint speed, 30-m sprint maintenance and countermovement jump height) and technical (soccer dribbling) performance was assessed throughout each trial.

Results: Carbohydrate-electrolyte gels improved dribbling precision ($+29 \pm 20\%$) and raised blood glucose concentrations by 0.7 ± 0.8 mmol·l^{-1} during extra-time (both $p < 0.01$). Supplementation did not affect sprint velocities (15-m and 30-m), 30-m sprint maintenance or dribbling speed as reductions compared to 0-15 min values occurred at 105-120 min irrespective of trial (all $p < 0.05$). Plasma osmolality and blood sodium concentrations increased post-exercise versus the opening 15 min ($p < 0.05$) but no effect of supplementation existed. Selected markers of physical performance (jump height, 30-m sprint velocity and 30-m repeated sprint maintenance) also reduced by >3% during half-time (all $p < 0.05$).

Conclusions: Carbohydrate-electrolyte gel ingestion raised blood glucose concentrations and improved dribbling performance during the extra-time period of simulated soccer match-play. Supplementation did not attenuate reductions in physical performance and hydration status that occurred during extra-time.

45   *Keywords:* fatigue, football, skill, glucose, intermittent, hydration

46   **Introduction**

47   When scores are tied at the end of specific soccer tournament matches, a 30 min extra-time (ET)

48   period is played. According to official match data (www.FIFA.com), 22% and 35% of knockout

49   phase matches played between 2002 and 2014 at U17 and senior FIFA World Cup competitions

50   required ET, respectively. Given the importance of ET in soccer tournaments, the dearth of literature

51   profiling, 1) the demands of this additional period of play, and 2) the effects of ergogenic

52   interventions throughout 120 min of soccer-specific exercise, is surprising.

53   Reductions in performance capacity have been observed following intense periods of competition, [1]

54   after a passive half-time period, [2] and during simulated and actual soccer match-play. [3, 4] Although a

55   topic of debate, [5, 6, 7] the mechanisms of reduced performance have primarily been attributed to

56   physiological responses that are either central (i.e., central nervous system) [5] or peripheral (i.e.,

57   disturbances in acid-base balance, blood glucose concentrations, muscle ion homeostasis, hydration

58   status, muscle temperature and/or fibre-specific glycogen content) in origin. [6, 7, 8] Notably, the

59   physiological effects of 120 min of soccer-specific exercise have not been reported despite indices of

60   physical and skill performance reducing during ET. [9, 10]

61   Ergogenic effects have been observed following provision of carbohydrates on physical and skilled

62   actions performed throughout simulated soccer match-play. [4, 11, 12] Increased exogenous energy

63   provision, [14] maintenance of blood glucose concentrations, and improved intermittent exercise

64   capacity have been reported following carbohydrate gel ingestion. [11, 13] Although the ingestion of

65   carbohydrate gels prior to ET is common in professional soccer, the physiological and performance

66   responses to this nutritional strategy are unknown.

67   Therefore, the aim of this study was to evaluate the physiological and performance responses to

68   carbohydrate-electrolyte gels consumed before the ET period of a simulated soccer match. We

69   hypothesised that carbohydrate provision would influence physiological and performance responses

70   during   ET.

4

71

72 **Methods**

73 This study received ethical approval from the Health and Life Sciences Ethics Committee at

74 Northumbria University. Male soccer players recruited from an English Premier League club (n = 8,

75 age: 16 ± 1 years, mass: 68.5 ± 5.3 kg, stature: 1.73 ± 0.05 m, estimated $\dot{V}O_{2\,max}$: 55 ± 9 ml·kg^{-1}·min^{-1})

76 provided written informed consent (and parental consent where players <18 years). Players trained for

77 ~16 h per week and played for a professional academy for >12 months before the study started. Two

78 main trials (carbohydrate: CHO and placebo: PLA), separated by 9 ± 4 days, were completed using a

79 double-blind, randomised, counterbalanced and cross-over design.

80

81 A preliminary visit included estimation of $\dot{V}O_{2\,max}$ [15] and procedural habituation, with main trials

82 performed on two subsequent visits. Players performed a light 45 min training session (involving

83 positional and tactic-specific drills), refrained from caffeine consumption and recorded all food

84 consumed (analysed retrospectively; Nutritics Ltd., UK) in the 24 h preceding each main trial.

85 Following an overnight fast, players arrived at 08:00 h and provided a mid-flow urine sample. A

86 resting fingertip capillary blood sample was taken before players consumed a standardised breakfast

87 (2079 kJ, 77.1 g carbohydrates, 12.3 g fats, and 14.3 g proteins) including 500 ml of a fluid-

88 electrolyte beverage (Mineral Water, Highland Spring, UK). Body mass and stature (Seca GmbH &

89 Co., Germany) were then measured.

90

91 A pre-exercise blood sample was taken after players rested for ~90 min following breakfast. A

92 standardised warm-up (including multidirectional and linear speed drills, dynamic stretching and

93 dribbling practice), during which players consumed 200 ml of the fluid-electrolyte beverage, was then

94 performed. Performance testing (PT) preceded exercise, with countermovement jump (CMJ) height [16]

95 and 30-m repeated sprint maintenance (RSM) [17] assessed. Players performed three CMJ's interspersed

96 with 10 s passive recovery and three 30-m sprints with 25 s of active recovery. These assessments

97 were repeated on a further four occasions (i.e., post-first half; P2, pre-second half; P3, post-second

98 half; P4, post-exercise; P5).

99 Using a modified version of the Soccer Match Simulation (SMS), [18] participants performed 120 min

100 of soccer-specific exercise; consisting of two 45 min halves and two additional 15 min periods (ET).

101 The repeatability of the physiological and performance responses to the original SMS have been

102 determined. [19] Directed by audio signals, the SMS required players to cover ~14.4 km (reflecting

103 actual match-play requiring ET) [10] at various running intensities, with backwards and sideward

104 movements over a 20-m distance, while intermittently performing 15-m timed sprints and 18-m ball

105 dribbles (assessed for precision, percentage success, and average speed). [4] Participants were required

106 to dribble a ball between cones as fast and as accurately as possible with a cone being unsuccessfully

107 negotiated if touched by the ball or not completed in the required direction. Video footage (50 Hz;

108 DCR-HC96E; Sony Ltd, UK) and digitisation (Kinovea version 0.8.15; Kinovea Org., France)

109 techniques yielded speed (time taken to successfully complete the distance) and precision (distance of

110 the ball from each cone) data. Dribbling performance was expressed as an average per 15 min of

111 exercise (epochs; EN): 0-15 min (E1), 16-30 min (E2), 31-45 min (E3), 46-60 min (E4), 61-75 min

112 (E5), 76-90 min (E6), 91-105 min (E7) and 106-120 min (E8).

113

114 A 15 min half-time (HT) passive recovery period, where players consumed 500 ml of a fluid-

115 electrolyte beverage, separated the two 45 min halves. Five min of rest followed the end of normal

116 time and a two min period separated each half of ET. Body mass assessment and gel consumption

117 (with 300 ml of fluid-electrolyte beverage) preceded the start of ET. Gels were professionally

118 manufactured and were taste and texture matched (IsoGel, High5 Ltd., UK). Sachets providing 0.7 ±

119 0.1 g·kg^{-1} BM carbohydrates derived from glucose and maltodextrin (808 kJ; 46 g carbohydrates, 0 g

120 fats, 0 g proteins, 0.14 g salt; CHO) or placebo (0 kJ; 0 g carbohydrates, fats and proteins 0.14 g salt;

121 PLA) were consumed using a double-blind, randomised and counterbalanced design.

122

123 Fingertip capillary blood samples (170 μl) were collected at rest, P1, HT and at the end of each epoch

124 (i.e., E1-E8) and analysed for blood glucose, lactate and sodium concentrations (GEM Premier 3000;

6

125   Instrumentation Laboratory, UK; CV's: 0.6-2.2%). [20] Urine and plasma osmolality (Advanced Model

126   3300 Micro-Osmometer; Advanced Instruments Inc., USA), urine-corrected mass changes, ratings of

127   perceived exertion (RPE) [21] and abdominal discomfort (AD; similar to the methods of: [22]) were

128   recorded during each trial. Environmental conditions were measured during exercise (Technoline

129   WS-9032; Technotrade GmbH, Germany) and heart rate (HR) was recorded (Polar RS400; Polar

130   Electro, Finland). A mid-flow urine sample was collected post-exercise and body mass was measured.

131   Statistical analyses were carried out using SPSS Statistics software (IBM Inc., USA) with significance

132   set at $p \leq 0.05$. Data are reported as mean ± standard deviation (SD). Statistical power was calculated

133   using commercially available software (GPower v3.1, Germany) and a sample size of eight was

134   deemed sufficient for >80% power to detect statistical differences in blood glucose and dribbling

135   precision. For parametric data (confirmed by normality and variance assessments), paired sample t-

136   tests were performed for single time-point data. For parametric data expressed over multiple time-

137   points, two-way repeated measures analysis of variance (within-participant factors: treatment x time)

138   were performed. Where significant interactions were observed, supplementation was deemed to have

139   influenced responses and simple main effects were performed. Partial eta-squared (η^2) values were

140   calculated and LSD corrected *post-hoc* tests (with 95% Confidence Intervals; CI) with Cohen's *d*

141   calculations examined between-trial differences. Non-parametric data were analysed using a Friedman

142   test with *post-hoc* Wilcoxon Signed Ranks tests (ES calculated using the Z distribution value) to

143   identify effects. [23] For effect size data, thresholds of 0.2, 0.5, and 0.8 were considered small, medium

144   and   large,   respectively.   [23]

7

145

146 **Results**

147 Ambient temperature ($18.5 \pm 1.5°C$), humidity ($74 \pm 7\%$) and barometric pressure (1017 ± 3 mmHg)

148 were similar between trials ($p > 0.05$). Players reported to each trial in a similar hydration state

149 (plasma osmolality: 312 ± 6 mOsmol·kg^{-1}, $p = 0.936$). Energy intake (8.6 ± 0.7 MJ·d^{-1}) and

150 macronutrient content (carbohydrate, fats, proteins: 3.7 ± 0.4, 2.7 ± 0.8, 2.2 ± 0.3 MJ·d^{-1}, respectively)

151 was similar across trials ($p > 0.05$).

152 Supplementation influenced mean dribbling precision ($p = 0.015$, $\eta^2 = 0.287$) with dribbles performed

153 during E8 being $29 \pm 20\%$ more accurate in CHO than PLA ($p = 0.014$, $d = 1.3$, CI: 3.2-21.0 cm;

154 Figure 1A). Dribbles were also more accurate during E5 in CHO than PLA ($p = 0.002$, $d = 1.0$, CI:

155 3.8-11.3 cm; Figure 1A). Although dribbling speed ($p = 0.671$, $\eta^2 = 0.091$) and success ($p = 0.677$, η^2

156 $= 0.070$) were not affected by supplementation (Figure 1C), dribbling speed was lower ($p < 0.001$, η^2

157 $= 0.500$) during E7 and E8 compared to E1 ($-12.3 \pm 3.8\%$, $-10.1 \pm 6.6\%$, respectively, both $p < 0.001$)

158 (Figure 1B). Dribbles in E8 were $4.6 \pm 5.9\%$ slower than E6 ($p = 0.046$) and $5.7 \pm 4.7\%$ slower during

159 E6 versus E1 ($p = 0.012$) (Figure 1B).

160 Supplementation did not influence 15- or 30-m sprint velocities ($p = 0.772$, $\eta^2 = 0.044$ and $p = 0.599$,

161 $\eta^2 = 0.091$, respectively). Likewise, 30-m RSM and CMJ height were similar between trials ($p =$

162 0.528, $\eta^2 = 0.104$ and $p = 0.389$, $\eta^2 = 0.133$, respectively). However, exercise influenced these

163 variables ($p < 0.001$, $\eta^2 = 0.640$; $p < 0.001$, $\eta^2 = 0.501$; $p < 0.001$, $\eta^2 = 0.527$ and $p = 0.053$, $\eta^2 = 0.370$,

164 respectively). Sprint velocities over 15-m reduced during E7 (5.52 ± 0.57 m·s^{-1}) and E8 (5.37 ± 0.56

165 m·s^{-1}) when compared to E1 (5.92 ± 0.47 m·s^{-1}) (both $p < 0.01$) and during E8 compared to E6 ($5.63 \pm$

166 0.58 m·s^{-1}) ($p = 0.001$). Sprint velocities over 30-m ($-4 \pm 2\%$, $p = 0.003$) and RSM scores ($-4 \pm 3\%$, p

167 $= 0.003$) were lower at P5 versus P1 (Table 2). Decrements between E6 and E1 existed for 15-m

168 sprint velocities ($-5 \pm 4\%$, $p = 0.010$) and between P4 and P1 for 30-m sprint velocities ($-3 \pm 3\%$, $p =$

169 0.036) and 30-m RSM ($-3 \pm 3\%$, $p = 0.018$) (Table 2). Compared to other time-points, CMJ height

170 was not different at P5, however; CMJ height, 30-m sprint velocities and 30-m RSM were dampened

171   at P3 compared to both P1 (-7 ± 4%, -4 ± 2%, -5 ± 3%, respectively, all p < 0.05) and P2 (-5 ± 4%, -3

172   ± 3%, -3 ± 3%, respectively, all p < 0.05) (Table 2).

173   Supplementation did not influence RPE (p = 0.623, η^2 = 0.098), however; timing effects were present

174   (p < 0.001, η^2 = 0.858), with significantly higher RPE values during E7 (15 ± 3) and E8 (17 ± 3)

175   compared to E1 (11 ± 3) and E6 (14 ± 3) (all p < 0.01). Similarly, increases were found in RPE during

176   E6 versus E1 (p < 0.001). The pattern of response for mean HR (HR_{mean}) was not influenced by

177   supplementation (p = 0.852, η^2 = 0.023) or exercise (p = 0.086, η^2 = 0.297).

178   Both supplementation (p = 0.026, η^2 = 0.354) and exercise (p < 0.001, η^2 = 0.656) influenced blood

179   glucose concentrations with CHO values being 16 ± 17% greater than PLA during E7 (5.6 ± 0.9

180    $mmol\cdot l^{-1}$ vs. 4.6 ± 0.2 $mmol\cdot l^{-1}$, p = 0.028, d = 4.2, CI: 0.18-1.93 $mmol\cdot l^{-1}$) (Table 1). Supplementation

181   did not affect blood lactate or sodium concentrations (p = 0.188, η^2 = 0.208 and p = 0.282, η^2 = 0.162,

182   respectively) but exercise did (p = 0.006, η^2 = 0.500, and p < 0.001, η^2 = 0.583, respectively) (Table

183   1). During E7, blood lactate concentrations were lower than E1 (-94 ± 57%, p = 0.004) and E6 (-25 ±

184   25%, p = 0.048). Blood lactate was also lower during E6 versus E1 (-32 ± 17%, p = 0.001) (Table 1).

185   Blood sodium concentrations were 1.6 ± 1.9% higher during E8 compared to E1 (p = 0.045) and 1.0 ±

186   0.7% higher during E7 compared to E1 (p = 0.005) (Table 1). Blood sodium concentrations were

187   similar at E6 and E1 (p > 0.05) (Table 1).

188   Urine osmolality was similar between treatments (p = 0.716, η^2 = 0.020) remaining unchanged from

189   pre- to post-exercise in both trials (-10 ± 37%, p = 0.391). Supplementation did not affect plasma

190   osmolality (p = 0.936, η^2 = 0.001) or body mass (p = 0.913, η^2 = 0.003); however, post-exercise

191   plasma osmolality was 7 ± 4% greater (p < 0.001, η^2 = 0.882) than pre-exercise (332 ± 8 vs. 312 ± 6

192    $mOsmol\cdot kg^{-1}$, p < 0.001). Post-exercise body mass (67.8 ± 4.7 kg) was reduced (p < 0.001, η^2 = 0.921)

193   compared to resting (69.4 ± 5.0 kg; p < 0.001) and P4 values (68.2 ± 4.8 kg; p = 0.001).

194   Supplementation did not affect AD (p > 0.05), but exercise did (p < 0.001); with E8 (5 ± 3) and E7 (5

195   ± 3) values being greater than E1 (2 ± 1) (p < 0.05, r = 0.8 for both). During E6, AD was higher

196   compared   to   E1   (p   =   0.024, r =   0.8).

197

Discussion

199   This is the first study to examine the physiological and performance effects of carbohydrate-

200   electrolyte gels consumed prior to the ET period in soccer. In agreement with our hypotheses,

201   increased blood glucose concentrations and improved dribbling precision occurred during ET in CHO.

202   Additionally, we observed reductions in physical performance throughout 120 min of soccer-specific

203   exercise with evidence highlighting further performance reductions during ET compared to the end of

204   normal time. Therefore, consumption of carbohydrate-electrolyte gels offers an ergogenic strategy for

205   players preparing to engage in an ET period, however; not all performance decrements were

206   ameliorated by carbohydrate provision.

207   Improved skill performance (i.e., shot velocity and success) has been observed following

208   carbohydrate ingestion. [4, 12] However, the efficacy of carbohydrate provision is unknown when 120

209   min of soccer-specific exercise is performed. In eight professional academy soccer players, a 0.7 ± 0.1

210      $g \cdot kg^{-1}$ BM dose of carbohydrate raised blood glucose concentrations by $16 \pm 17\%$ (large effect; $d =$

211   4.2; Table 1) and resulted in a $29 \pm 20\%$ improvement (large effect; $d = 1.3$; Figure 1A) in dribbling

212   precision throughout E8. Although we found an unexplainable difference prior to carbohydrate

213   ingestion (Figure 1), improved performance of sports skills following carbohydrate consumption has

214   previously been associated with enhanced cerebral glucose supply and preserved central nervous

215   system integrity, [24, 25] even when participants remain euglycaemic. [4] Additionally, elevated blood

216   glucose concentrations induce muscle glycogen sparing, [14] augmented neuromuscular function, [24]

217   attenuated central fatigue *via* serotonergic neurotransmitter release [12] and modified motor output

218   resulting from stimulation of afferent brain signals *via* oropharyngeal receptor activation. [26] Although

219   the precise mechanisms of skill performance regulation have yet to be delineated and are likely

220   multifaceted in origin, our data expands the findings of previous studies that have observed enhanced

221   skill performance with carbohydrate supplementation [4, 12] by demonstrating ergogenic effects of

222   carbohydrate ingested prior to ET on dribbling precision.

223   Ostensibly, additional fatigue occurs throughout ET as further diminutions in performance were

224   observed after 90 min (Table 2). This finding is corroborated by observations that further reductions

225   in high-intensity distance covered and accelerations occur throughout ET. [10] Moreover, concomitant

226   increases in RPE, a subjective marker of exercise intensity, occurred after 90 min. Notably, the

227   supplementation strategy used in this study did not attenuate the physical performance decrements

228   observed throughout 120 min of soccer-specific exercise. Future research opportunities therefore exist

229   to optimise the hydro-nutritional strategies of players competing in matches requiring ET. In

230   agreement with previous authors, [27, 28] we observed deleterious effects of a passive HT recovery

231   period on CMJ height, 30-m sprint velocities and RSM (Table 2). Therefore, the efficacy of

232   intervention strategies administered over HT also warrants further investigation. [28]

233   Temporal match-related fatigue development is a complex phenomenon, with a multitude of putative

234   factors, [7] including depletion of endogenous fuel stores, [8] compromised excitation-contraction

235   coupling, [7] and dehydration. [29] Logistical constraints prevented the assessment of each of these

236   factors in isolation in the current investigation. Nevertheless, the timings of fluid and treatment

237   ingestion were reflective of the hydro-nutritional practices of professional players. [29] In ambient

238   conditions, a $1.6 \pm 0.6\%$ BM loss at P4 indicates that provision of a fluid-electrolyte beverage with

239   breakfast, during the warm-up and at HT was sufficient to prevent reductions in mass losses that

240   exceed 2%; a threshold commonly associated with onset of reduced performance. [29] However, ET

241   elicited a further 0.5 ± 0.3 kg mass loss as well as increases in plasma osmolality and blood sodium

242   concentrations (Table 1); possibly indicating compromised hydration status. This may be partly due to

243   slower gastric emptying and/or intestinal absorption, as highlighted by elevated abdominal discomfort

244   scores during ET compared to the first 90 min of exercise. [11] Such changes are likely components of a

245   milieu of factors contributing to match-related fatigue and highlight the need for further research to

246   optimise the hydro-nutritional strategies of players involved in 120 min of soccer-specific exercise.

11

247

Conclusions

249   Providing carbohydrate gel (0.7 ± 0.1 g·kg^{-1} BM) before ET increased blood glucose concentrations

250   and improved dribbling precision thereafter but this intervention did not appear to benefit physical

251   performance indices which reduced throughout 120 min of exercise. Alterations in dribbling

252   performance can influence the outcome a match,[30] highlighting the potential benefits of carbohydrate

253   provision prior to ET. Moreover, ET caused additional perturbations in physical and physiological

254   responses compared to the previous 90 min. Therefore, given the role of ET in determining

255   tournament progression, further work is needed to develop intervention strategies that attempt to

256   preserve physical performances throughout 120 min of soccer-specific exercise.

257

Practical Implications

259   • Strategies (e.g., nutritional interventions, training programme design, tactical changes etc.)

260   that enable soccer players to cope with the additional demands of the extra-time period are

261   recommended

262   • Provision of 0.7 ± 0.1 g·kg^{-1} BM of carbohydrate (in gel form) prior to the soccer extra-time

263   period provides an ergogenic strategy for augmented technical (i.e., dribbling precision), but

264   not physical (i.e., sprinting and jumping ability), performance

265   • Half-time intervention strategies warrant investigation as a passive half-time recovery period

266   elicited reductions in subsequent jump and sprint performance

267

Acknowledgements

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Table 1   Blood metabolite data as a function of timing and trial

Variable	Trial	Timing										
		Rest	**Pre**	**E1**	**E2**	**E3**	**HT**	**E4**	**E5**	**E6**	**E7**	**E8**
Glucose (mmol·l⁻¹)	CHO	5.0 ± 0.6	5.7 ± 0.6	5.1 ± 0.5	4.7 ± 0.5	4.8 ± 0.4	4.5 ± 0.6	4.3 ± 0.4	4.3 ± 0.2	4.5 ± 0.5	5.6 ± 0.9[a]	5.0 ± 0.6
	PLA	4.9 ± 0.3	5.7 ± 0.5	4.9 ± 0.3	4.7 ± 0.3	4.7 ± 0.3	4.8 ± 0.4	4.6 ± 0.2	4.6 ± 0.4	4.5 ± 0.4	4.6 ± 0.2	4.7 ± 0.5
Lactate (mmol·l⁻¹)	CHO	0.8 ± 0.2	1.4 ± 0.5	5.1 ± 3.1	3.7 ± 3.6	4.8 ± 3.3	3.0 ± 1.1	3.9 ± 3.3	4.0 ± 2.7	3.4 ± 2.7	2.4 ± 1.8	2.9 ± 2.2
	PLA	0.7 ± 0.2	1.6 ± 0.7	3.4 ± 1.6	3.0 ± 1.2	3.1 ± 1.7	2.4 ± 0.5	2.4 ± 0.7	2.3 ± 0.7	2.4 ± 1.0	2.2 ± 0.7	3.3 ± 2.2
Sodium (mmol·l⁻¹)	CHO	138 ± 2	139 ± 1	141 ± 0	142 ± 1	143 ± 2	142 ± 2	142 ± 1	143 ± 1	142 ± 4	142 ± 1	143 ± 3
	PLA	139 ± 1	140 ± 1	141 ± 1	143 ± 1	143 ± 2	141 ± 2	140 ± 2	141 ± 1	143 ± 3	142 ± 1	144 ± 3

Pre represents pre-exercise and E1-8 represents 0-15, 16-30, 31-45, 46-60, 61-75, 76-90, 91-105 and 106-120 min respectively. HT represents half-time. CHO = carbohydrate-electrolyte gel trial, PLA = placebo gel trial. a = significant difference between trials ($p < 0.05$). Data presented as mean ± SD.

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Table 2   Performance variables as a function of timing and trial

Variable	Trial	Timing					Formatted Table
		P1	**P2**	**P3**	**P4**	**P5**	
30-m Sprint Velocities (m·s⁻¹)	CHO	6.95 ± 0.25	6.80 ± 0.23	6.61 ± 0.33	6.70 ± 0.31	6.76 ± 0.19	
	PLA	6.97 ± 0.31	6.92 ± 0.16	6.72 ± 0.30	6.83 ± 0.34	6.63 ± 0.51	
30-m Repeated Sprint Maintenance (%)	CHO	99 ± 1	96 ± 4	93 ± 6	95 ± 4	96 ± 3	
	PLA	98 ± 1	98 ± 2	94 ± 5	96 ± 4	93 ± 7	
CMJ Height (cm)	CHO	34.5 ± 3.2	33.9 ± 2.8	32.3 ± 3.2	33.5 ± 2.5	33.8 ± 2.5	
	PLA	35.5 ± 3.7	35.2 ± 4.4	33.2 ± 3.9	35.6 ± 5.0	33.8 ± 6.2	

P1-5 represents pre-exercise, post-first half, pre-second half, post-second half and post-exercise, respectively. CMJ = countermovement jump. CHO = carbohydrate-electrolyte gel trial, PLA = placebo gel trial. Data presented as mean ± SD.

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Figure Legends

Figure 1   Dribbling precision (A), speed (B) and success (C) throughout each trial (mean ± SD). E1-8 represents 0-15, 16-30, 31-45, 46-60, 61-75, 76-90, 91-105 and 106-120 min respectively and HT represents half-time. a = significant difference between CHO and PLA ($p < 0.05$) at corresponding time-point.

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