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Recovery following the extra-time period of soccer: Practitioner perspectives and applied practices

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1 **Manuscript Title:** Recovery following the extra-time period of soccer: Practitioner
2 perspectives and applied practices

3 **Running Title:** Recovery following the extra-time period of soccer

4

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28

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33

34 **Conflict of interest statement**

35 The authors report no conflict of interest.

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47 **Abstract**

48 Research has demonstrated that the extra-time (ET) period of soccer negatively impacts
49 recovery. However, it is not known to what extent recovery practices are being adapted by
50 practitioners following ET and where gaps exist between research and practice. Therefore, this
51 study explored soccer practitioner perceptions of recovery practices following ET matches. A
52 total of 72 practitioners from across different levels of soccer and several countries completed
53 a bespoke online survey. Inductive content analysis of the responses identified five higher-
54 order themes: ‘conditioning’, ‘player monitoring’, ‘recovery practices’, ‘training’, ‘and ‘future
55 research directions’. Mixed responses were received in relation to whether practitioners
56 condition players in preparation for ET, though 72% allowed players to return to training based
57 on fatigue markers following this additional 30-min period. Sixty-three (88%) practitioners
58 believed that ET delays the time-course of recovery, with 82% highlighting that practices
59 should be adapted following ET compared with a typical 90-min match. Forty-nine
60 practitioners (68%) reduce training loads and intensities for up to 48 hr post ET matches,
61 though training mostly recommences as ‘normal’ at 72 hr. Sixty-three (88%) practitioners
62 believed that more research should be conducted on recovery following ET, with ‘tracking
63 players physiological and physical responses’, ‘nutritional interventions to accelerate recovery’
64 and ‘changes in acute injury-risk’ being the three areas of research that practitioners ranked as
65 most important. These data suggest practitioners and coaches adjust recovery practices
66 following ET matches compared to 90 min. Further research on the efficacy of recovery
67 strategies following ET matches is required to inform applied practice.

68 **Keywords**

69 football · applied environment · survey · coaches · qualitative research

70 **Introduction**

71 Soccer matches are typically contested over 90 min, though when scores are tied, in the
72 knockout phase of some major competitions (e.g., FIFA World Cup and UEFA Champions
73 League), matches progress into an additional 30 min period of extra-time (ET). The prevalence
74 of ET has increased in recent years in the knockout phase of major international tournaments.
75 Notably, 41% of knockout phase matches proceeded to ET at the 2014 and 2018 FIFA World
76 Cup competitions [1]. At the 2018 World Cup held in Russia, the finalists Croatia competed in
77 three consecutive knockout phase ET matches (round of 16, quarter-final and semi-final) en
78 route to the final [2]. Simulated and actual match-play observations have shown that ET elicits
79 additional central fatigue [3] and reduces physical performance capacity [4]. Recovery
80 strategies are key to alleviate the debilitating effects of fatigue [5].

81 Players compete in 50—80 games per season and are exposed to fixture congested schedules
82 [6], with insufficient between-match recovery periods impeding a player's ability to perform
83 optimally in consecutive matches [5, 7]. Extra-time matches are often competed amid
84 congested schedules across a season and during tournaments [1]. The delay in returning players
85 to homeostasis following ET matches may have harmful implications for recovery and
86 performance in consecutive matches [8]. In contemporary elite soccer, practitioners are
87 responsible for implementing evidence-informed strategies designed to accelerate recovery [9].
88 However, recovery in response to ET is under-researched, and as such, practitioners are faced
89 with challenges concerning whether to remain with common (90-min) modalities or adapt
90 practices to aid recovery following ET matches. Accordingly, collecting practitioner survey
91 data is a useful method to explore perceptions and practices employed in an attempt to 'bridge
92 the gap' between evidence-based research and applied practice in soccer [10].

93 Over recent years, there has been an increasing number of competitive matches across a season,
94 resulting in a lower availability of time to train between matches [6]. Although, there is no

95 information available concerning whether players are adequately conditioned to be able to cope
96 with the additional demands of ET [1], practitioners may have limited time to prescribe
97 appropriate training sessions across a season to maintain adequate physical conditioning
98 between matches. This could be problematic as players that are not physically prepared for the
99 additional 30-min period of ET are likely at an increased injury susceptibility, given
100 epidemiological data suggests that injury incidence is increased during ET [11]. Monitoring
101 athlete fatigue to minimise the negative implications associated with non-functional
102 overreaching, injury and illness [12], appears appropriate following ET matches. However, it
103 is unknown whether practitioners monitor fatigue following ET matches to assist with the
104 decision-making processes involved with returning players to training or traditional 90 min
105 approaches are employed. Therefore, such data may assist with identifying fatigued individuals
106 following 120 min of match-play to enable appropriate periodisation of individualised training
107 regimes [5] and inform substitution strategies [13]. Acute spikes in training and competition
108 loads are associated with an increased injury and illness risk [14]. Given matches that proceed
109 to ET are not able to be anticipated, practitioners may have to adapt subsequent training loads
110 and intensities to accommodate the additional weekly loads and stressors associated with ET
111 [1]. Therefore, investigations to determine the extent to which training loads and intensities are
112 tapered following ET matches appear warranted. An operational framework has been proposed
113 for conducting soccer science studies, which implies that gaining an insight into the barriers
114 impacting uptake is key to effective and applicable research [15]. Furthermore, explicit
115 questions asking practitioners to provide future research ideas is likely to assist with increasing
116 the implementation of ecologically valid study designs and facilitate the translation of findings
117 within a 'real-world' context [13, 16].

118 Given the paucity of research exploring practitioners approaches to recovery following ET
119 matches, the purpose of this study was to explore practitioner perceptions and practices with
120 reference to ET and recovery.

121 **Materials and methods**

122 *Participants*

123 Upon receiving institutional ethical approval, 208 soccer club/federation representatives were
124 contacted between January 2020 — June 2020 (Table 1). Each recipient received a short
125 description of the research, a web-link to the survey as well as a password required for access.
126 Representatives were encouraged to share the survey with the most appropriate practitioner
127 within their team with responsibility for implementing recovery practices. Upon obtaining
128 access, the procedures involved with completion were outlined, and informed consent and
129 confirmation that respondents were ≥ 18 years of age was required to progress to the survey
130 questions. Practitioners were asked to provide information relating to their job role, competitive
131 level, as well as the tier and country their team competed, though anonymity was otherwise
132 maintained.

133 ***INSERT TABLE 1***

134 *Survey design*

135 The survey was constructed using Qualtrics.^{XM} online software (Utah, USA;
136 <https://www.qualtrics.com/uk/>). Two professional practitioners and a researcher with previous
137 experience of constructing surveys of this nature, piloted and reviewed the questions to check
138 usability and face validity [17]. Several alterations were then carried out: three questions were
139 rephrased, or a description added to provide clarity, three questions were amended to ensure
140 practitioner relatability, and the wording of one question was adjusted as it was potentially
141 'leading'. The final version of the survey comprised relevant background information, followed

142 by an informed consent section and a page whereby practitioners were required to enter a
143 unique I.D which could later be used to withdraw responses. The survey contained 14 main
144 questions and five sub-items, each taking either a scaled, rank, multiple-choice or open-ended
145 format allowing practitioners to expand on four individual questions. Respondents were asked
146 to consider their practices, and future research recommendations specific to ET matches
147 compared with the approaches ordinarily taken in relation to a 90-min match.

148 *Survey analyses*

149 Upon cessation of survey data uptake, raw data were exported to Microsoft Excel (Microsoft
150 Corp., Redmond, WA, USA). Native speakers, proficient in translation checked open responses
151 to ensure content accuracy. We adhered to the checklist for reporting results of internet e-
152 surveys (CHERRIES) for both survey design and analyses [18].

153 For Likert-scale questions, 5- and 7-point scale questions were used, asking practitioners to
154 indicate their perceived level of importance or extent of agreement. All points were labelled
155 with qualitative anchors for importance (i.e., ‘not at all important’ [1], ‘slightly important’ [2],
156 ‘moderately important’ [3], ‘important’ [4], and ‘very important’ [5]) and agreement (i.e., ‘very
157 strongly agree’: 3, ‘strongly agree’: 2, ‘agree’: 1 ‘neither agree nor disagree’: 0, ‘disagree’: -1,
158 ‘strongly disagree’: -2, ‘very strongly disagree’: -3) [19]. Frequency analysis was used to
159 determine the percentage of practitioners that endorsed each response [13]. Other items
160 involved participants ranking (from ‘1’ to ‘5’) their order of perceived importance from a list
161 of available responses, with the accumulation of scores for each option used to determine the
162 mean order of importance (i.e., the choice rated first was scored 5 points, second—4 points,
163 third—3 points, fourth—2 points, and fifth—1 point) [16].

164 In order to facilitate elaborative answers, open-ended questions were used to offer participants
165 the opportunity to ‘explain’ the reasons underpinning certain responses. These qualitative

166 responses were systematically arranged and read diligently by the lead researcher (AF) on
167 several occasions to develop a deep sense of the content and context of the data [16]. An
168 inductive content analysis approach was used [20], with raw data open coded and grouped into
169 larger and more general dimensions in a higher order concept [21]. This process was repeated
170 until theoretical saturation was achieved [22]. The list of themes were discussed at each stage
171 and validated independently by two researchers (AF and LDC) until a consensus was reached
172 regarding data interpretation and theme credibility [21].

173 **Results**

174 A total of 72 completed all questions and were included in analyses. A total of 87 practitioners
175 initially returned the survey, though as all questions were not completed, a further 15
176 practitioners were omitted. These numbers represent a 42% survey return rate and a completion
177 rate of 83%. Table 2 shows the role and level of employment for each practitioner. Five general
178 dimensions emerged from the survey data including ‘conditioning’, ‘player monitoring’,
179 ‘recovery practices, ‘training’ and ‘future research directions’.

180

181 ***INSERT TABLE 2***

182 ***Conditioning***

183 When practitioners were asked if they ‘*condition players outside of peak periods to be able to*
184 *cope with the demands of extra-time*’, the most prevalent responses were ‘no’ ($n = 35$; 49%),
185 ‘yes’ ($n = 26$; 36%) and ‘sometimes’ ($n = 11$; 15%), respectively. ‘Infrequency’ (e.g., ‘extra-
186 time is a rarely experienced event’), ‘time’ (e.g., “time restrictions make player access
187 difficult”), ‘expectation that normal practice is sufficient’ (e.g., “training loads are usually
188 geared at the normal game exposure which should indirectly condition them to face extra-time
189 periods”) and ‘other appropriate methods’ (e.g., “verbal encouragement and substitution

190 strategies”) were identified as second-order themes. Conditioning work involved ‘exceeding
191 duration’ (e.g., “we conduct training matches comprising of 4 x 25 min halves”), ‘within week
192 preparation’ (e.g., “training load is increased approx. 4-5 days prior to extra time games”), and
193 ‘strength and conditioning practices’ (e.g., “structured injury prevention sessions are used to
194 prepare for extra-time”).

195 ***Player monitoring***

196 The frequency with which practitioners ‘*track player fatigue markers following ET matches*
197 *and return to training based on such feedback*’ is reported in Figure 1. Players were returned
198 to training based on ‘physical performance metrics’ (49%; e.g., “countermovement jump”,
199 “peak power output (watt bike)”, “isometric hamstring test”, “GPS data”), ‘subjective
200 assessments’ (31%; e.g., “fatigue scales”, “wellness questionnaires”, “conversations with the
201 players”), and their ‘physiological status’ (20%; e.g., “creatin kinase analysis”, “heart rate
202 variability”, “hydration and saliva samples”). ‘Logistical constraints’ (e.g., “financial reasons,
203 time restrictions lack of staff and equipment etc.”) were identified for lack of adaption to
204 monitoring practices.

205 ***INSERT FIGURE 1***

206 ***Recovery practices***

207 Practitioners were asked if they agreed with the following statement: ‘*extra-time further delays*
208 *the time-course of recovery when compared to a 90 min match*’ with no respondents ‘very
209 strongly disagreeing’ (Figure 2).

210 ***INSERT FIGURE 2***

211 Most practitioners either ‘very strongly agreed’ ($n = 10$; 14%), ‘strongly agreed’ ($n = 28$; 39%)
212 or ‘agreed’ ($n = 21$; 29%) that ‘*recovery practices should be adapted following an extra-time*
213 *match vs. a typical 90-minute match*’, while the remaining practitioners ‘neither agreed nor

214 disagreed' ($n = 6$; 8%) or 'disagreed' ($n = 7$; 10%). Practitioners were asked to expand on why
215 they held this viewpoint; with the second-order themes established for those in support of
216 adapting recovery practices in response to ET presented in Table 3.

217 ***INSERT TABLE 3***

218 Figure 3 shows the percentage of practitioners that adapt practices (i.e., 'cool down',
219 'nutritional intake', 'additional specific recovery modalities', 'no change to practice')
220 following matches that proceed to ET versus traditional 90-min approaches.

221 ***INSERT FIGURE 3***

222 *Cool down*

223 Among practitioners that adapted their post-match cool downs, bespoke practice in the sense
224 of 'duration' (e.g., "prolonged cool down", "more work around mobility") was employed.

225 *Rest period*

226 It was highlighted that 'additional rest' (e.g., "we promote 1 day + 1/2 day off instead of the
227 normal 1 day off", "start the matchday +1 session later. Normally +1 to 2 hours") was given to
228 players post ET matches which was largely based upon 'individual game-time' (e.g.,
229 "depending on duration each individual player plays another day of recovery may be planned")
230 and 'manager discretion' (e.g., "possibly yes if the manager is happy with the result he will
231 give extra days off to recover").

232 *Nutritional intake*

233 Adapting nutritional intake immediately post-match mainly resides around modifying
234 'macronutrient intake' (80%; e.g., "increase quantities of carb intake to replenish depleted
235 glycogen stores, as well as increased protein intake to account for the additional tissue damage
236 sustained"), 'hydration' (12%; e.g., "electrolyte sachets for rehydration purposes"),

237 ‘supplementation’ (5%; “creatine”, “omega 3”) and ‘polyphenols’ (3%; e.g., “beetroot/ tart
238 cherry juice to help with inflammation”). Similar second-order themes were identified for the
239 24 and 24—48 hr post-match period with the addition of ‘individualised nutritional provision’
240 (e.g., “depends on each player’s physiological profile”), ‘inter-disciplinary communication’
241 (e.g., “where possible we talk with the club chef”), and ‘player education’ (e.g., “players aren’t
242 usually at the club but are advised to increase calorie intake”). A reduction in adaption to
243 nutritional practice was observed 48—72 hr post ET, with the 15 practitioners (21%) that
244 persisted with modifying nutritional intake being largely ‘schedule dependent’ (e.g.,
245 “periodisation to previous match and subsequent training/match schedule”).

246 *Additional specific recovery modalities*

247 Non-nutritional recovery modalities identified as being adapted immediately post ET matches
248 were mainly “cryotherapy”, “massage”, “compression garments”, and “active recovery” with
249 an increased emphasis on ‘duration’ (e.g., “longer time spent in an ice bath”) and ‘intensity’
250 (“more intensive manual massage”). Adjusting ‘hydrotherapy’ (e.g., “cryotherapy”,
251 “swimming”, “contrasting bathing”) practices were prevalent among practitioners at 24—72
252 hr post-match in response to ‘individual preferences’ (e.g., “each individual player decides the
253 modality”).

254 *No change to practice*

255 Second-order themes identified as to why practice was not adjusted immediately post-match
256 were ‘time’ (e.g., “the delay to the end of the match puts us behind”), ‘finance’ (“we are
257 financially stretched with our usual practices”), and ‘away matches’ (“often difficult to
258 implement on away games”). For 24—72 hr following ET matches, ‘recovery protocols
259 deemed sufficient’ (e.g., “we feel we use the best protocols in this period irrespective of 90 or
260 120 min games”), ‘player access’ (e.g., “do not have access to the players”), and ‘squad

261 rotation' (e.g., "most competitions with extra-time we would rotate the squad in order to
262 compensate for the next game") were highlighted as key reasons for no change to practice.

263 *Training*

264 Practitioners were asked how important they believed it was to '*adapt training loads and*
265 *intensities following an ET match*'. No practitioners considered adapting training loads as 'not
266 important', although six (8%) believed that doing so was 'slightly important'. 'Moderately
267 important', 'important' and 'very important' received seven (10%), six (8%) and 53 (74%)
268 responses, respectively. Adapting training intensities was of 'no importance' to one practitioner
269 (1%), 'slight importance' to four (6%), while a further 14 (19%) respondents attributed
270 'moderate importance' to this adaption. Nine (13%) believed it was 'important' to adapt
271 intensities and the remaining 44 (61%) indicated this was 'very important'.

272 A total of 33 (46%), 49 (68%) and 28 (39%) out of the 72 practitioners adapted training loads
273 and/or intensities at 24, 24—48 and 48—72 hr, respectively.

274 *Training load/intensity adaption at 24 hr*

275 Training loads and/or intensities were 'reduced' (e.g., "volumes and intensities are decreased")
276 by all 33 respondents at 24 hr with the primary motive behind tapering training loads and
277 intensities being associated with 'player health and well-being' (e.g., "players health status
278 takes priority", "managed according to well-being").

279 *Training load/intensity adaption at 24—48 hr*

280 Responses indicated that adapting training loads and/or intensities at 24—48 hr was dependent
281 on player 'physiological status' (e.g., "dependent on recovery markers") and 'match
282 completion' (e.g., "reduce loads on players who completed the full game") as well as the
283 'preceding schedule' (e.g., "dependent on accumulative output from the week") and 'upcoming
284 schedule' (e.g., "what competitions we have coming up"). 'Training variables' (e.g.,

285 “manipulation of pitch sizes and drill times to restrict high-speed running, accelerations and
286 decelerations”) and ‘training type’ (e.g., “players will have an extended off-feet recovery day
287 (bike & pool)”, “tactical sessions used for starters”) represented the most prevalent adaption to
288 training.

289 *Training load/intensity adaption 48—72 hr*

290 The 28 practitioners that continued to adapt training at 48—72 hr post ET matches outlined
291 that though training loads and/or intensities were “lesser than a normal training session; they
292 were “gradually built back up”. An ‘individual approach’ (e.g., “adaptation according to the
293 recovery status of each athlete”) was reflective of the key second-order theme for 48—72 hr.

294 *Future research directions*

295 Sixty-three (88%) practitioners believed that *‘further research should be conducted on the*
296 *recovery response following the extra-time period’*, whilst the remaining nine (12%) did not
297 believe that conducting research of this nature was required. The 63 practitioners were provided
298 with a list of options (Figure 2) and were asked to rank which they *‘believed warranted further*
299 *investigation following an extra-time match’*. When given the opportunity to indicate any
300 ‘other’ areas aside from those provided, ‘sleep’ (e.g., “sleep study”), ‘cognitive aspect’ (e.g.,
301 “mental aspect of recovery and fatigue”), ‘away match logistics’ (e.g., “effects of mode of
302 travel and overnight stay vs travel on day”) and ‘subsequent performance’ (e.g., “performance
303 in the following match”), were identified amongst the small number of practitioners (n = 6).

304 ***INSERT FIGURE 4***

305 **Discussion**

306 The present study develops knowledge in relation to applied practice and recovery strategies
307 associated with the additional 30-min ET period. These survey data offer novel practitioner
308 insights, enhance understanding of applied practice, and highlight future research

309 considerations for recovery following ET soccer matches. Collectively, these findings suggest
310 that practitioners adapt recovery practices following ET matches, though support further
311 research in this area.

312 While half of the practitioners surveyed condition players outside of peak periods in
313 preparation for matches that proceed to ET, the other half indicated that changes to conditioning
314 practices were not implemented. Practitioners revealed existing difficulties with maintaining
315 training volumes across an entire season, especially during periods of fixture congestion [7].
316 This challenge may impede maintenance of within-season training loads that are sufficient to
317 prepare players for ET, whilst also ensuring adequate regeneration periods. It appears that some
318 practitioners implement acute ‘within-week preparation’; however, it is unlikely that such
319 strategies elicit the desired adaptations in such a short timeframe [16]. Therefore, since fatigue-
320 induced injuries are likely to occur during the latter stages of 90-min matches [23, 24], players
321 that are inadequately conditioned for the prolonged ET period may be susceptible to injury.
322 Since practitioners in the current survey highlighted ‘changes in acute injury-risk’ as an
323 important area for future investigation, epidemiological research is warranted to determine
324 whether players are at an increased risk of injury during ET and consecutive matches.

325 Most practitioners ‘agreed’ to ‘very strongly agreed’ with the proposition that ET prolongs
326 recovery and that practices should be adjusted appropriately. It was highlighted that
327 practitioners extend the cool-down duration post ET matches, despite evidence that prolonged
328 cool down durations have no effect on muscle soreness or glycogen resynthesis [25]. Those
329 who do not change practice immediately post-match reportedly lack ‘time’ (e.g., “you have to
330 get on the bus as sometimes the driver may go over his hours with the delay to the end of the
331 game”). This issue may be problematic following away matches from a logistical viewpoint,
332 particularly for lower-league and semi-professional practitioners who have fewer resources
333 available and are unable to intervene with acute strategies that are targeted at enhancing

334 recovery immediately post matches that proceed to ET. This could be detrimental to player
335 recovery considering ET has shown to evoke additional central fatigue, increase perceived
336 muscle soreness and reduce blood glucose concentrations [3, 8, 26]. This highlights the
337 importance of appropriate feeding strategies that can be implemented whilst travelling. ‘Away
338 match logistics’ following ET matches was a topic of interest to a small number of practitioners
339 and requires investigation.

340 A variety of practices were observed in relation to practitioners modifying nutritional intake
341 immediately post and up to 24 hr following an ET match. The majority largely modulated
342 carbohydrate and protein intake, rehydration practices, and used supplementation and
343 polyphenols strategically in line with current evidence-based recommendations when limited
344 time separates matches [27]. Though it has yet to be measured directly, ET matches could
345 require greater liver and muscle glycogen utilisation than 90 min and could have implications
346 for adjusting carbohydrate guidelines following 120-min matches [26]. While evidence
347 suggests that consuming carbohydrate in the 5 min break prior to ET attenuates the reduction
348 in dribbling performance [28]; there remains a dearth of clear evidence-informed guidelines
349 for adapting consumption to aid recovery following this additional period of match-play. The
350 survey respondents ranked this area of research as the second most important following ET
351 matches and thus should be explored.

352 Increasing the massage duration and intensity post-match was a notable adjustment made to
353 post ET practice by approximately 15% of practitioners, despite its efficacy for recovery being
354 largely ambiguous (for a review see Poppendieck, Wegmann [29]). Similarly, an increased
355 duration with which cold water immersion and cryotherapy practices are employed were
356 highlighted among ~20% of practitioners. Although, little evidence is available to support a
357 dose-response relationship, recovery benefits after exercise are better established following
358 cryotherapy [30]. Nevertheless, practitioners individualised player recovery protocols, which

359 is advised given that high inter-individual variations exist with recovery [5]. This is an
360 encouraging finding considering most of what is currently known about and adopted in relation
361 to post ET match recovery modalities is derived from anecdotal observations or practices that
362 have demonstrated efficacy following 90-min matches [31]. Therefore, non-nutritional
363 modalities and their recovery properties remain largely unexplored in response to ET and
364 presents an avenue for future research.

365 Another interesting finding in the present study was that future research should investigate the
366 impact of ET on sleep variables. Contemporary issues exist in elite tournament soccer that
367 disrupt natural circadian rhythms and recovery, such as, interstate travel across time zones, jet
368 lag and sleeping in unfamiliar environments [5, 32]. Since the ET period has shown to elicit
369 higher levels of adrenaline [26, 33], and 120 min matches delay the finish of soccer matches
370 by approximately 40 mins [1], it seems plausible to hypothesise that a delay in sleep onset
371 latency may occur following ET matches. The interference with sleep onset may also be
372 exacerbated if night matches proceed to ET, given that intense exercise performed close to
373 bedtime can impair sleep [34]. Therefore, as recommended by a proportion of the current
374 sample, the influence that competing in ET matches has on sleep parameters should be
375 explored. However, although the positive effects of optimal sleep quality are evident [35], it is
376 difficult for practitioners to regulate individual sleep schedules given the intrusive nature of
377 intervening with personal sleeping habits. Therefore, as proposed in a theoretical model for
378 conducting soccer science research [15], the major challenges for managing bedtime
379 behaviours to promote sleep enhancement should be identified for researchers to accommodate
380 practitioner barriers to carefully develop apposite study designs.

381 Reductions in training loads and intensities were most pronounced at 24—48 hr after ET
382 matches. This may also be linked with teams typically having a rest day following a match
383 regardless of duration [36]. The importance of “maintaining training intensities whilst reducing

384 loads” (i.e., overall volume) was commonly highlighted among practitioners with ‘training
385 drills’ (e.g., “pitch sizes and drill times”) manipulated to reduce physical output (e.g., “high-
386 speed running, accelerations, and decelerations”). Indeed, tapering training loads was highly
387 dependent on the proximity of previous and upcoming matches, as opposed to whether the team
388 had competed in an ET period. This could have detrimental implications for recovery
389 potentially given that biomechanical loads are increased during simulated ET matches [37].
390 Given their unforeseeable nature, adapting training loads in response to ET matches requires
391 versatility and carefully orchestrated periodisation to overcome the complexities associated
392 with maintaining aerobic fitness whilst minimising the risk of load-related injuries [38]. This
393 remains a key challenge in the applied soccer environment, though with a contemporary
394 practitioner endorsed rule change permitting the introduction of a fourth substitution during ET
395 [13], players exposed to excessive weekly loads may be identified and replaced. For those that
396 are unable to be substituted, research that involves ‘tracking the physical and physiological
397 response’ would help determine the extent to which recovery is impacted post ET. The survey
398 data highlights that practitioners support research of this nature.

399 Though the current study received a high number of survey responses compared with other
400 published works [16, 39], response rate alone may not reflect greater external validity [40]. A
401 convenience sample was used whereby personal networks were contacted, potentially
402 introducing selection bias [41], although this approach was used to ensure the dataset was
403 limited to one response per team [16]. Practitioners were made aware of the survey topic prior
404 to completion and thus, it is possible that the pool of participants had biased propensities
405 towards this area of research.

406 **Conclusion**

407 This study presents novel practitioner insights and examines how recovery practices are
408 managed following ET matches. Although ET conditioning approaches vary considerably

409 between practitioners, many respondents return players to training based on fatigue markers
410 following this period of match-play. Recovery practices are adapted in response to 120-min
411 matches as practitioners believe that the additional 30-min period has negative implications for
412 recovery. Training loads and intensities are tapered up until 48 hr post ET matches, though are
413 mostly returned to normal by 72 hr. Future research considerations were overwhelmingly in
414 support of tracking players physiological and physical responses, nutritional interventions to
415 accelerate recovery and changes in acute injury-risk following ET. It is recommended that
416 practitioners work closely with appropriate stakeholders to address barriers and ensure
417 practices are player-focused post ET match-play to optimise recovery.

418 **Figure captions**

419 **Figure 1** The proportion of practitioners that track player fatigue markers following ET
420 matches.

421 **Figure 2** Practitioner extent of agreement to the statement regarding whether extra-time delays
422 the time-course of recovery.

423 **Figure 3** Percentage of practitioners that adapt specific recovery practices following matches
424 that require extra-time compared with traditional 90-min matches.

425 **Figure 4** Practitioners perceived importance of areas for future research.

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431

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433 **References**

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Table I. Details of the competitive league and response rate of the invited clubs

League (National tier)	Responses (Invited/Responded/Included)
English Premier League (1 st tier)	17/9/8
English Championship (2 nd tier)	21/10/7
English League One (3 rd tier)	21/11/9
English League Two (4 th tier)	18/13/10
English National League (5 th tier)	17/3/1
English National League North/South (6 th tier)	17/10/6
Scottish Premiership (1 st tier)	5/2/2
League of Ireland Premier Division (1 st tier)	2/1/1
Portuguese Premeira Liga (1 st tier)	6/4/4
Portuguese LigaPro (2 nd tier)	4/1/1
Portuguese Terceira Liga (3 rd tier)	1/1/1
Campeonato de Portugal Serie A (4 th tier)	1/1/1
Italian Serie A (1 st tier)	4/2/2
French Ligue 1 (1 st tier)	3/1/1
Super League Greece (1 st tier)	1/1/1
Hungary OTP Bank Liga	1/1/1
Spain Segunda División B	1/1/1
Qatari Stars League (1 st tier)	4/2/2
Taiwan Football Premier League (1 st tier)	1/1/1
Australian A League (1 st tier)	4/2/2
Other leagues	45/2/0
International associations	
Union of European Football Associations	7/4/4
Asian Football Confederation	5/4/4
Confederation of African Football	1/1/1
Confederation of North, Central American and Caribbean Association Football	1/1/1
Total	Invited: 208, Responded: 87 Included: 72

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Table II. Practitioner roles and level of employment upon survey completion

Practitioner and coach roles	Level of current employment				Total
	Professional	International	Semi-pro	Academy	
Science Staff	27	5	4	4	41
<i>Sports scientist</i>	10	1	3	2	17
<i>Head of sports science</i>	1	0	0	0	1
<i>Head of science & medicine</i>	8	2	0	0	10
<i>Strength & conditioning coach</i>	4	1	1	1	8
<i>Head of fitness & conditioning</i>	1	0	0	0	1
<i>Nutritionist</i>	4	0	0	0	4
<i>Exercise physiologist</i>	0	1	0	1	2
Medical Staff	5	1	3	2	11
<i>Sport therapist/physiotherapist</i>	4	0	3	2	9
<i>Club Doctor</i>	1	1	0	0	2
Coaching staff	11	4	3	2	20
<i>Fitness coach</i>	8	3	1	0	12
<i>Head/assistant coach</i>	3	0	2	2	7
<i>Head of talent ID</i>	0	1	0	0	1
Total	44	10	10	8	72

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Table III. Reasons provided for adapting recovery practices following matches that proceed to extra-time compared with typical 90 min matches

Second order theme	Supporting quotations
Physical stress	“increased muscle damage”, “greater prospect of injury-risk”, “excessive physical stress and loads are being placed on player”, “extra stress on the skeletal system”, “more micro trauma”, “I believe players experience greater DOMS”.
Physiological and metabolic demands	“added physiological demand”, “a greater degree of oxidative stress”, “further glycogen depletion”, “more energy expended”, “increased metabolic demand”, “changes in substrate utilisation”, “usually we find that individual internal markers are more adverse with extra-time”.
Mental pressure	“players are not mentally able to cope”, “we should also consider the emotional pressure associated with the extra time period”, “there is likely an increased psychological demand due to increased pressure”, “an extra-time match may impact psychometrics”, “mental fatigue plays a critical part”.
External workload	“additional demands placed on the players (e.g., total distance, high-speed running and sprint distances)”, “greater incidence of changes of direction and high-speed running”, “increased external load than the typical experienced during normal 90 min games”.
Exercise duration/volume	“Players are not conditioned for 120 minutes”, “simply competing for an extended period of time”, “taking into account the higher volume”, “Depending on the duration of the match each individual player plays”.

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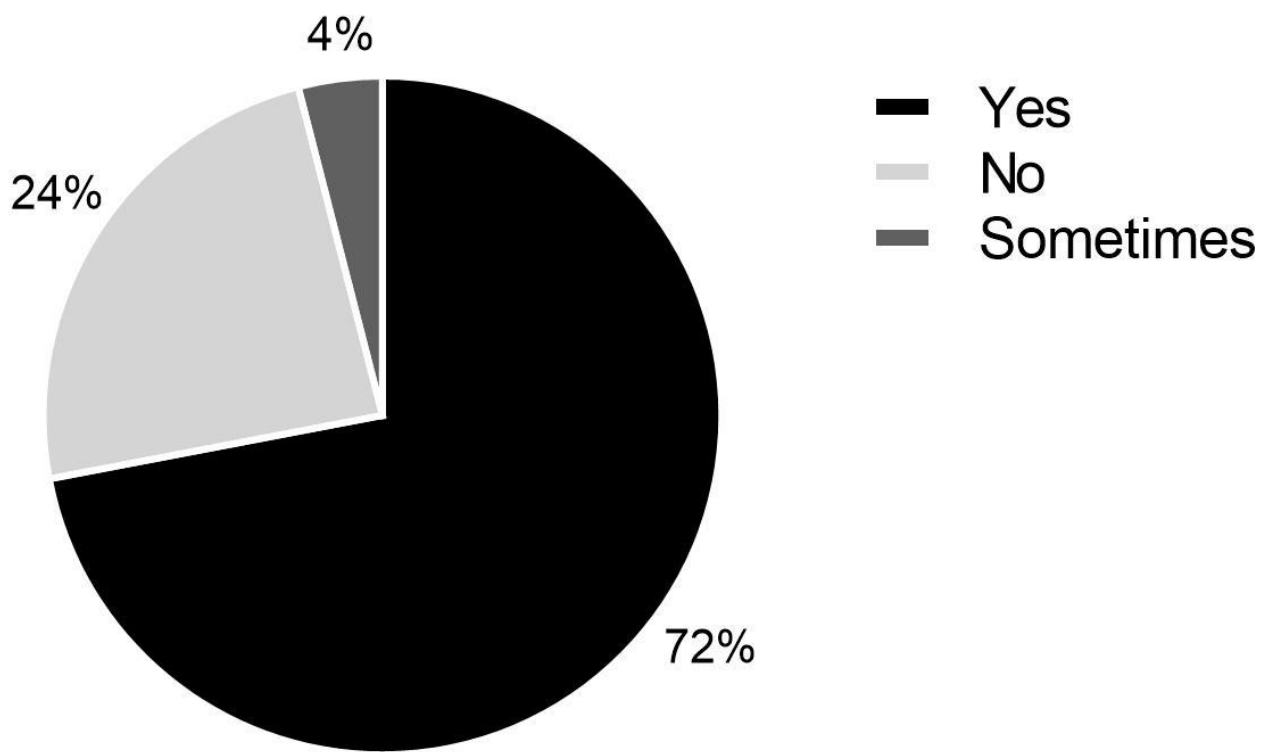
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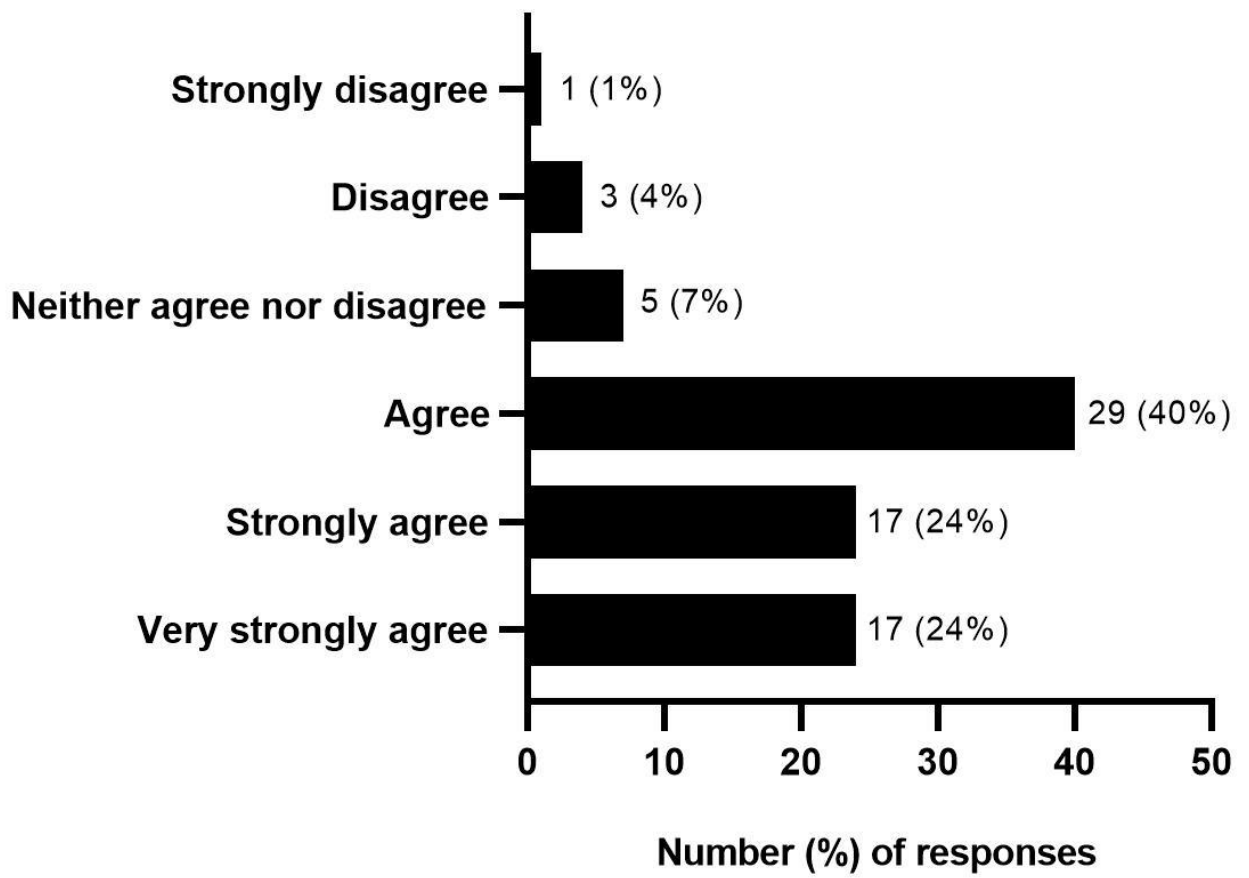
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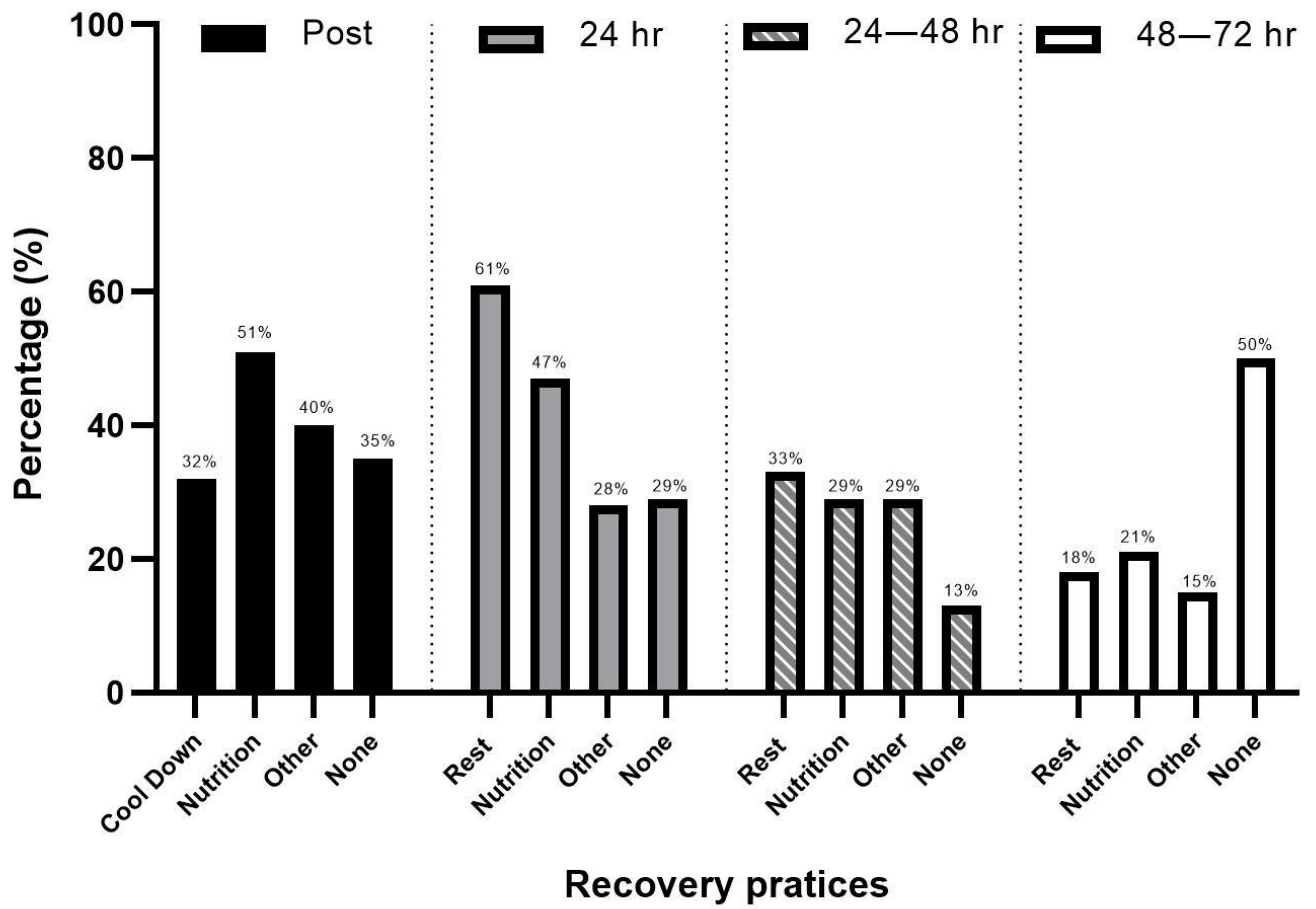
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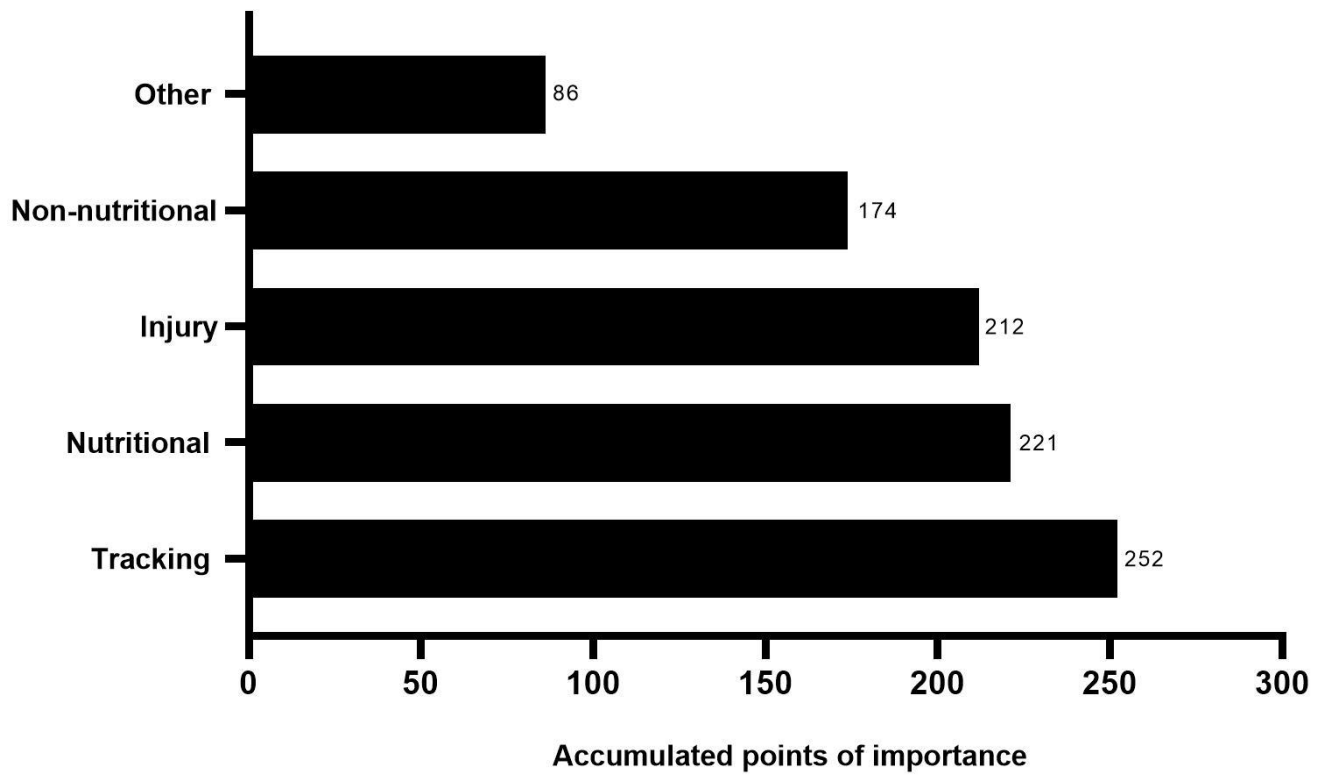
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