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**Youth basketball coaches' perceptions and implementation
of fundamental movement skills training: Towards a realist
evaluation**

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Youth basketball coaches' perceptions and implementation of fundamental movement skills training: Towards a realist evaluation

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For Peer Review

YOUTH BASKETBALL COACHES AND FMS

Abstract

1
2 **Purpose:** To investigate youth basketball coaches' perceptions and implementation of fundamental
3 movement skills training (FMS). **Method:** Snowball and criterion-based sampling approaches were
4 used to survey youth basketball coaches (n= 79) beliefs and experiences relating to their perceptions
5 and implementation of non-basketball specific skills and FMS into practice. Realist Evaluation
6 inspired the analysis of descriptive statistics (means and frequencies) and reflexive qualitative
7 thematic analysis to inform the results. **Results:** It was found that the participants had a
8 comprehension of FMS and acknowledge their value in the long-term development of youth players.
9 However, there appeared to be varying levels of uptake amongst the surveyed coaches.
10 **Discussion/Conclusion:** The findings suggest there is a need for governing bodies to develop
11 innovative strategies to persuade youth basketball coaches to adopt non-sports specific movement
12 skills to improve their practice.

13 **Keywords**

14 survey, sports, motor learning, evaluation, mixed methods

YOUTH BASKETBALL COACHES AND FMS

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15 Development models of youth sports are often criticized due to a lack of emphasis on
16 generalized fundamental movement skills (FMS) (Bridge & Toms, 2013; DiStefano et al., 2017;
17 Liefeith et al., 2018). Furthermore, FMS are considered foundational for the development of sports-
18 specific skills, which experts have argued, that if left undeveloped may limit future performance
19 (Arede et al., 2019; Barela, 2013; Jukic et al., 2019). FMS has conventionally been classified as
20 locomotor, ball manipulation, and stability skills (Barnett et al., 2016). Hulteen et al. (2018) have
21 extended conventional definitions to include more diverse movement skills such as leaping and
22 hopping, cycling, treading water, and swimming, all of which can be honed through practice and
23 instruction. From early childhood, rudimentary goal-oriented movements, form the basis for more
24 advanced movement patterns (e.g., locomotive) to be developed (Hulteen et al., 2018). Thus, the
25 development of rudimentary throwing and catching skills can later be refined for ball games and
26 sport, such as American football, baseball, and basketball (Wormhoudt et al., 2018).

27 Research has tended to focus upon associations between FMS and physical activity levels,
28 rather than transfer to sports-specific skills (cf. Barela, 2013; Cliff et al., 2009, 2012; Holfelder &
29 Schott, 2014). Systematic reviews by Holfelder and Schott (2014) and Logan et al. (2015) have
30 highlighted the relationship between childhood FMS competence and physical activity during
31 adolescence. Further, a substantial body of research (e.g., Leppänen et al., 2015; Pasulka et al., 2017;
32 Read et al., 2016) has advocated for the use of FMS-based training to mitigate the risk of injury and
33 burnout resulting from early sports specialization¹. Bell et al. (2018) revealed through their meta-
34 analysis that youth level athletes who were categorized as highly specialized (participating in a single
35 sport) were at a significantly greater risk of injury compared to those categorized as moderate and
36 low specialization (participating in multiple sports). To combat the risks associated with early
37 specialization, initiatives have been developed to emphasize the development of FMS in children,
38 encouraging coaches to incorporate them into programs of physical activity (Ford et al., 2011; Lloyd,
39 Oliver, Faigenbaum, et al., 2015; Myer et al., 2011).

40 In 2016 the NBA released its youth basketball guidelines that were compiled by a
41 multidisciplinary panel of experts (DiFiori et al., 2018). In addition to participation recommendations
42 and the promotion of sports sampling, the guidelines recommended the incorporation of
43 neuromuscular training (NMT) programs (*Youth Basketball Guidelines*), which typically include
44 FMS based activities (Granacher et al., 2018; Hopper et al., 2017). Through a range of non-sports
45 specific exercises, NMT programs typically target balance, the stretch-shortening cycle, and lower

YOUTH BASKETBALL COACHES AND FMS

46 limb strength and power, which contribute to improved neuromuscular control (Faude et al., 2017;
47 Granacher et al., 2018). Furthermore, although not exclusively, NMT programs commonly include
48 *athletic movement skills* that underpin strength and conditioning exercises, such as squatting and hip
49 flexion patterns, which have been associated with indicators of greater athletic performance (Lloyd,
50 Oliver, Radnor, et al., 2015; Radnor et al., 2020; Woods et al., 2017). Moreover, NMT programs have
51 been found to reduce risk factors for injury across youth athletic populations (Ayala et al., 2017;
52 Bizzini & Dvorak, 2015; DiStefano et al., 2010).

53 Despite the NBA's initiative being focused on injury prevention, and discourses relating to
54 the promotion of youth athlete health and wellbeing, the adherence by youth coaches has been found
55 to vary (Norcross et al., 2016; Owoeye et al., 2020; Räisänen et al., 2021). A recent study by Owoeye
56 et al. (2020), found that coaches altered NMT programs based on perceived relevance to performance
57 as well as player interest. Owoeye and colleagues' findings suggest a lack of comprehension for the
58 importance of FMS in the development of youth basketball players. Given that it appears prudent for
59 youth basketball coaches to incorporate non-basketball specific FMS content within their coaching
60 practice, the current calls by **the NBA (and other National Sporting Organizations)** to incorporate
61 FMS may be failing to resonate. Therefore, the purpose of the present study was to investigate youth
62 basketball coaches' perceptions of FMS and the extent to which FMS are included within their
63 coaching practice. We conclude this paper by discussing how a greater understanding of coaches'
64 perceptions of FMS would improve the development of youth basketball players.

65 **Methods**

66 We used a mixture of snowball and criterion-based, sampling approaches to recruit potential
67 participants (Smith et al., 2016; Sparkes, 2014). We utilized online survey methods because we were
68 interested in surveying individuals from any nation who identified as basketball coaches (i.e., the
69 criterion). The survey was advertised on social media platforms (e.g., Twitter and LinkedIn) and
70 within online coaching communities (e.g., Basketball England's Hive platform, Basketball England's
71 Talent Pathway WhatsApp group, and a WhatsApp group for sports coaching professionals located
72 worldwide). The survey consisted of twelve questions devised by the first author (Table 1.). These
73 questions included the country where the coaches were based, the sex and age group of players
74 coached, and the number of practice sessions delivered. In addition, questions designed to assess the
75 coaches' beliefs relating to non-basketball specific FMS were included, with open ended questions
76 utilized to determine differences and commonalities between coaches' perceptions of FMS as they
77 pertain to youth basketball development. Informed consent was included within the online survey and
78 was obtained by all respondents.

YOUTH BASKETBALL COACHES AND FMS

79 [Insert Table 1 near here]

80 A total of 92 youth basketball coaches responded to the surveys, with respondents providing
81 responses to all survey items. However, 11 of the respondents were coaching basketball squads that
82 were deemed not to be youth level (under 19 and above), and two respondents were found to have
83 unintentionally submitted the survey twice. Therefore, each of these cases were removed and
84 excluded from data analysis. From the remaining 79 coaches, a total of 58 were based in the United
85 Kingdom (UK), representing the majority. Other countries included: Spain (8); the United States of
86 America (USA) (5); Canada (2); and single respondents from Belgium, Finland, Indonesia, Jamaica,
87 South Africa, and Qatar.

88 The age groups worked with by the coaches spanned age groups from under 10 years of age
89 up to under 18. Within this, eleven of the respondents coached multiple age groups, a practice that
90 appeared across the different countries where the coaches were based (Canada, Jamaica, Spain, Qatar,
91 UK, USA). In terms of the gender of the players coached, 19 of the respondents coached exclusively
92 females, 46 coached exclusively males, and 14 coached across both sexes.

93 **Analysis**

94 We analyzed our data using a mixed methods approach loosely inspired by realist evaluation
95 methods developed by Pawson & Tilley (1997) where we sought to focus on the mechanisms, context,
96 and outcomes that mediated the implementation of FMS and non-specific movement skills by coaches
97 in relation to their practice. Firstly, to assess outcomes (i.e., the uptake of FMS and non-movement
98 skills) we conducted and reported the means and frequencies associated with the forced response
99 questions to the survey. To explore how mechanisms (i.e., what drove people to implement FMS and
100 non-movement skills) were mediated by context (i.e., the practicalities of coaching and the coaches
101 environment) we analyzed open ended responses (questions five and nine) guided by reflexive
102 thematic analysis techniques (V. Braun & Clarke, 2006; Richards & Hemphill, 2018; Spaaij et al.,
103 2018; Trainor & Bundon, 2020). Data was categorized into subthemes related to the commonalities
104 that existed within the responses to each of the questions (Richards & Hemphill, 2018; Spaaij et al.,
105 2018; Trainor & Bundon, 2020).

106 To code the data, we followed a similar precedent set forward by Spaaij et al., (2018). Two of
107 the investigators independently read a proportion (10%) of the transcripts and, using survey responses
108 Microsoft Excel (Excel version 2103), coded passages of text firstly using an open (or initial meaning
109 code) and secondly an axial (or categorization of open codes) coding scheme (Spaaij et al., 2016).
110 For instance, the claim “*Balance of priorities to cover including the mental, technical and tactical*
111 *needs of the athletes. These are developed through S&C sessions*” was initially coded as “context -

YOUTH BASKETBALL COACHES AND FMS

112 balance of priorities”. After similar statements related to the theme “balance of priorities” was open
113 coded, some text would then be categorized a second time to further classify the statement. In this
114 example, the statement would also be coded under the axial theme of “context - time management”.
115 The interpretation of the identified passages and codes were debated at length by the three authors.
116 The first author then coded the rest of the responses line by line, and a third investigator reviewed the
117 coding.

118 Considerations of Reliability and Validity

119 Consistent with our mixed methods approach inspired by Pawson and Tilley’s (1997) method
120 and theory of realist evaluation, validity and quality were guided by ontological assumptions of
121 critical realism (Jagosh, 2020; Pawson & Tilley, 1994) that balanced considerations related to truth
122 being both knowable but also subject to interpretation and context. Specifically, we used the
123 following criteria to reflexively guide our decisions: We assessed the topic’s worthiness (What are
124 coaches’ perceptions of FMS? And how are these perceptions being used to inform practice and
125 pedagogical knowledge) and the importance and significance of the work to the broader scholarly
126 field (will this research address a gap in the literature and build upon applied and theoretical
127 understandings of FMS and sport pedagogy?) (B. Smith et al., 2015; Tracy, 2010). We challenged
128 ourselves to produce a rigorous account of the data (is the data nuanced, and does it provide
129 meaningful insights?). We strove for constancy and transparency in how we arrived at our conclusions
130 (is the research clearly described and did the purpose, methods, and findings align?). Drawing on a
131 previous approach described by Smith and colleagues (2016), we contend that the answer to these
132 questions is yes; however, to engage in a reflexive practice, following this precedent, the second and
133 third authors acted as 'critical friends,' providing a theoretical sounding board to explore alternative
134 interpretations as we classified the data into themes (B. Smith et al., 2016). Through these processes
135 we have endeavored to provide the opportunity for others to judge our research quality and value.

136 Results**137 Descriptive Statistics**

138 When participants were asked questions related to outcomes “do you include non-basketball
139 specific exercises / activities in the warm-up ahead of main practice content?”, 58 of the 79
140 coaches responded “yes”, while 17 responded “sometimes” and four coaches “no”. In response to
141 the question, “would you feel confident to deliver non-basketball specific warm up exercises that
142 target general athleticism?” 75 coaches responded “yes”, and four coaches responded “no”. There
143 were 76 coaches who responded “yes” to the question, “do you believe there would be value in
144 including general athletic exercises into your coaching session?” and three coaches responded with

YOUTH BASKETBALL COACHES AND FMS

145 the answer “maybe”. In terms of the number of exposures to non-specific exercises (squat; lunge;
146 hip hinge; landing technique; pushing; bridging (or ‘plank’ variations), 20 coaches’ response was
147 once per week, 30 coaches’ response was twice per week, 17 coaches responded with three times
148 per week, and 12 coaches responded with four or more times per week. In response to question 10,
149 where coaches were to indicate which *athletic movement patterns* they included from the choices
150 provided, the number of responses for the inclusion of the squat were 70 (89%); 74 (94%) for the
151 lunge; 56 (71%) for landing technique; 43 (54%) for pushing patterns; 41 (52%) for the hip-hinge;
152 39 (49%) for bridging or plank activities; and 34 (43%) for pulling patterns.

153 When asked “how proficient would you rate the players to be at performing these athletic
154 movement patterns with respect to control and stability”, 14 coaches’ response was “very”; 57
155 coaches responded with “fairly”; and 8 responded with “not”. Relating to basketball coaching
156 frequency with respective squads, there were 20 ambiguous responses which were removed from the
157 analysis for this question. In addition, due to working with players as part of a national squad, two of
158 the reported only delivering supervised coaching sessions with their respective squads once per month
159 and were also removed from the analysis for this question. The median number of sessions delivered
160 per week was reported as two, while the minimum number was one and the maximum was nine. For
161 session duration, from 55 respondents, the median was 90-minutes, with a maximum reported
162 duration of 170-minutes and a minimum of 45-minutes.

163 Qualitative findings

164 Analysis of the open-ended qualitative responses indicate that contextual concerns related to
165 professional knowledge and coaching cultures (see for example: Hammond et al., 2020) impacted
166 their ability to improve FMS,

167

168 “I coach basketball not S&C, S&C should be given its own specific sessions” (Coach
169 Gallagher).

170

171 “There are lots of non basketball specific skills that would add value to individual players to
172 enhance and improve performance and athleticism” (Coach Arthurs).

173

174 “I answered yes to all questions, but I would also state that I don't have a concrete
175 understanding of said movements. I believe in the concept. I more so follow experts I trust
176 like Alan Stein and Brian McCormick to guide me” (Coach White).

177

YOUTH BASKETBALL COACHES AND FMS

178 In the present study, the statement from Coach Gallagher suggests that they regard such content as
179 equivalent to strength and conditioning training (S&C), which not only presents a narrow view FMS
180 and its value, but also suggests a denial of responsibility for wider development of youth players.
181 Furthermore, the results for the proportions of *athletic skills* exercises included within the coaches'
182 practices are suggestive of a disregard for the development of broad FMS.

183 The lunge and squat patterns were the most widely reported exercises and were deemed to
184 have greater basketball relevance. Nevertheless, other responses contributed to the emergence of the
185 subtheme *independent entity*, and included the following two responses:

186

187 *“Balance of priorities to cover including the mental, technical and tactical needs of the*
188 *athletes. These are developed through S&C sessions”* (Coach McCarroll).

189

190 *“I do not lead warmups, my role as a coach is more of technical/analytical in nature”*
191 (Coach Bell).

192

193 The meaning established from the responses of coaches McCarroll and Bell is one which highlights
194 a potential lack of appreciation for the intertwining nature of movement and coordinative dynamics
195 (W. Smith, 2016). While Coach McCarroll and Coach Bell's perspectives are not deliberately
196 harmful, arguably they are deflecting their responsibility for enriching the athletic development of
197 their players and safeguarding their health and welfare (i.e., from an injury prevention perspective).

198 In contrast, the subtheme *non-specific and basketball specific movement skill interdependency*
199 highlighted how some coaches considered FMS to not be disparate from basketball specific
200 fundamental movement skills (W. Smith, 2016). This meant that some of our participants dismissed
201 the need to emphasize FMS and apply the same pedagogical approach across all movement skills.
202 This is somewhat reinforced by one coach who stated that: *“...to elaborate most of these activities*
203 *will be done with some sort of basketball incorporated”* (Coach Ashcroft). While such interactivity
204 of FMS and sports skills is suggestive of an appreciation of the complimentary nature of all motor
205 skills, coaches may also be ignoring the need incorporate FMS in isolation as well as in context
206 (Barnett et al., 2016). Overall, coaches who aligned with the subtheme *non-specific and basketball*
207 *specific movement skill interdependency* are likely to include FMS only haphazardly as part of sports-
208 specific drills and exercises and thus defeating the purpose of incorporating FMS in the first place.

209 When reasons for not including non-basketball specific FMS in practices and the coaches'
210 descriptions of FMS themes were compared, we found a lack of consensus and which, in turn, may

YOUTH BASKETBALL COACHES AND FMS

211 unintentionally lead to an undervaluing of their importance. For example, the *child focused* subtheme
212 intimates that FMS are exclusively children's activities, as one coach described:

213

214 *"Basic movements that children carry out. Throwing, catching, running etc."* (Coach Kelly)

215

216 Similarly, another coach responded with:

217

218 *"The motor skills of a children [sic] and mechanics"* (Coach Jones)

219

220 These descriptions from Coach Kelly and Coach Jones, while not incorrect, could be interpreted as
221 somewhat limiting. Such limiting notions are reenforced by Coaches' Weller and Meighan:

222

223 *"Shooting, handling, passing, defense and rebound"* (Coach Weller).

224

225 *"The base of the basketball game, there are several technical fundamentals aspects to be
226 teach [sic]"* (Coach Meighan).

227

228 The responses from Coaches' Weller and Meighan highlight a limited appreciation of FMS and its
229 necessary role in implementing a holistic approach to youth athlete development (Mostafavifar et al.,
230 2013). Importantly, these views were not representative of all coaches in survey. The subthemes,
231 *skills for general function*, *foundation movements*, and *athletic performance related*, were more
232 indicative of the notion that non-specific FMS can provide important foundations for sports-specific
233 skills to be built upon:

234

235 *"FMS are the basic or primary movements that all other sport movements or movements can
236 be built upon"* (Coach Starkey).

237

238 *"A performers [sic] ability to carry out functional and fundamental movements in a variety
239 of contexts and the [sic] in a basketball context apply to enable skills development"* (Coach
240 Archer).

241

242 In sum, our qualitative findings consistent with realist evaluation perspectives suggests coaches
243 implementation of FMS mechanisms within their practices are constrained by contextual factors

YOUTH BASKETBALL COACHES AND FMS

244 related to professional cultures and knowledge (Hammond et al., 2020; O’Gorman et al., 2021). While
245 coaches may appreciate the value of FMS in developing favorable outcomes (e.g., basketball-specific
246 skills) there is a need to think about how coaches can be better supported in context to implement and
247 achieve outcomes and benefits (e.g., injury mitigation, and improved movement vocabulary)
248 associated with the implementation of FMS. In addition to the *athletic performance related* subtheme,
249 it appears that these coaches are cognizant, to some degree, of the importance of FMS in the
250 development of basketball players. However, the lack of consistency in the coaches’ responses within
251 this overarching theme, further highlights the need to improve coaching knowledge.

252

Discussion

253 Our findings that context mediates enactment of behavior mechanisms seems to be consistent
254 with recent studies (Räisänen et al. 2021; Owoeye et al., 2020) and the findings related to realist
255 evaluation (Mitchell, 1997; Pawson & Tilley, 1994), and policy enactment studies in physical
256 education and sport pedagogy (Hammond et al., 2020; Landi et al., 2021; O’Gorman et al., 2021).
257 Owoeye et al. (2020) found coaches were inclined to remove strength and balance related tasks in
258 favor of exercises deemed to be more relevant to basketball performance. Similar findings were
259 reflected in the study by Räisänen et al. (2021) into the use of NMT-based warm-ups by youth
260 basketball coaches, which found 48% of coaches spent 10-minutes of less on the warm-up component
261 in their practices. Therefore, it is important not to understate the impact of socialization (Richards et
262 al., 2013; Richards & Templin, 2012; Wright et al., 2021) and contextual professional cultures (e.g.,
263 Hammond et al., 2020; O’Gorman et al., 2021) in prompting coaches to hold sports-specificity in
264 higher regard than broader aspects of player development as they attempt to implement initiatives
265 such as FMS and non-sport skills into their practice.

266 However, problems associated with coaches’ perceptions have been previously highlighted
267 in the study by Jukic et al. (2019) into youth soccer players. In their study, Jukic and colleagues found
268 that FMS to be more important in distinguishing player levels compared to the coaches’ subjective
269 evaluations of player performances, highlighting the existence of disparities between coaches’
270 perceptions and objective markers of performance capabilities. Indeed, coaches decision making
271 regarding talent identification has recently been found to be based mainly upon tacit knowledge and
272 instinct in place of valid criterion (Roberts et al., 2019). Moreover, it demonstrates that, again
273 contextual dimensions related to coaching knowledge and dispositions are tilted towards sports-
274 specific skill development potentially at the cost of long-term development and player welfare. The
275 literature (DiStefano et al., 2017; Pasulka et al., 2017; Zoellner et al., 2021) has found for instance,
276 that single sport specialization is an outcome associated with limited motor skill development, risk of

YOUTH BASKETBALL COACHES AND FMS

277 injury, and burnout syndrome (Mostafavifar et al., 2013). In youth basketball players, Leppänen et al
278 (2015) found a high prevalence of overuse injury to the knee among both males and females.
279 Therefore, any notion of non-sports specific movement skill training as a separate training form may
280 be deemed as problematic for the long-term health and development of youth basketball players
281 (DiCesare et al., 2019; DiFiori et al., 2017; DiStefano et al., 2017).

282 Collectively our findings appear to highlight a disregard for a holistic approach to the
283 development of youth players in favor of talent identification (Liefieith et al., 2018; Rongen et al.,
284 2018; Soares et al., 2020), suggesting that the education of youth basketball coaches may be a
285 contributing factor. Indeed, education regarding basketball-specific injury prevention was suggested
286 to be an area to address in the study by Räisänen et al. (2021), in response to their findings that
287 coaches 67% of the coaches surveyed expected players to experience injury during the next season.
288 Moreover, in a study by Saunders et al. (2010), youth netball coaches identified educational resources
289 as an importance factor in NMT program implementation. Despite identifying restricted time and
290 program length as barriers, the majority of the coaches believed it was effective in improving
291 athleticism and reducing injury risk (Saunders et al., 2010). Similarities can therefore be drawn
292 between coaches in both the Räisänen et al. (2021) and Saunders et al. (2010) studies and the coaches
293 in the present study, highlighting the potential requirement for improved coach education. However,
294 as a discipline, sports science, has been previously implicated in the creation of barriers through the
295 overuse of jargon, and for the lack of dissemination of relevant information to coaches (Martindale
296 & Nash, 2013). In this regard, it may be that a more clearly defined rationale for the inclusion of FMS
297 is necessary for youth basketball coaches to place a greater emphasis on their development within
298 practices in order to make such coach education interventions as contextually relevant as possible (cf.
299 Cassidy et al., 2006; Cope et al., 2021; Cushion et al., 2003; Tinning, 2011).

300 We recommend that **national sports organizations and other bodies** responsible for coach
301 education improve their rationale for the inclusion of FMS, ensuring its purpose is clear, and
302 elaborated upon more greatly regarding its place in the long-term development of youth basketball
303 players. In place of a dichotomized perspective of FMS and basketball, coaches need to shift to
304 emphasize complimentary pairing that better accounts for the complexity of skilled action (Santos et
305 al., 2017; Santos et al., 2016; Smith, 2016) as well as related reduction in risk factors for injury in
306 youth athletes (DiFiori et al., 2017; Owoeye et al., 2020). Developers might want to explore the
307 adoption of *degeneracy* and the functional role of movement variability (Seifert et al., 2014) within
308 coach education programs. Degeneracy represents the ability of an individual to vary how a skill is
309 executed by adapting their coordinative patterns to meet the goal of the task (Seifert et al., 2014).

YOUTH BASKETBALL COACHES AND FMS

310 Moreover, expert performers are understood to rely less on a fixed movement strategy, and instead
311 are able to apply different coordinative movement solutions to meet the requirements of a task
312 (Mason, 2015). Therefore, given that functional variability is understood to occur in skilled
313 movement (Komar et al., 2015), and the highly variable conditions that characterize game-based
314 sports such as basketball, degeneracy of the nervous system is an feature important skilled
315 performance (Mason, 2015).

316 From a motor skill development perspective, the *Athletic Skills Model* (Wormhoudt et al.,
317 2018), advocates for the development of FMS to enhance the acquisition of sports specific skills,
318 although we suggest that future studies might want to explore the concept of degeneracy as a way of
319 better represent the interdependency of FMS and sports skills. Intertwining ideas from degeneracy
320 encourages a move away from the dichotomizing of FMS and sports-specific skill development, and
321 instead encourages the need to emphasize their development with a level of isolated focus so that the
322 skills receive adequate attention to appropriately develop. Moreover, the notion of a limited FMS as
323 a *proficiency barrier* to the acquisition of basketball specific skills may steer coaches to incorporate
324 more focused attention to the pedagogical approaches applied.

325 A limitation of this study is that we are asking coaches to describe their practice in relation to
326 the implementation of FMS and non-sport skills. Thus, we want to emphasize that we are only
327 exploring the experiences of coaching from perspectives of the coaches themselves and that we
328 cannot therefore assume that the participants have any depth of awareness of their own practice
329 (Leeder et al., 2019; Partington & Cushion, 2013). We argue future research is required to explore
330 the implementation of FMS interventions in specific jurisdictions to better understand multiple
331 dimensions of resistance when it comes to the implementation of policy in coaching practice. While
332 the configuration of sport delivery (organization, policy, and funding) is unique to each country, what
333 was striking from our study was that coaches were facing similar dilemmas in different locations in
334 a diverse international sample, and we believe this study could provide a springboard for a more
335 focused realist evaluation of the implementation of FMS skills in the future.

336 While our study is not statistically generalizable, we argue that other scholars and
337 policymakers may be able to glean insights and following (B. Smith, 2018), we argue that when our
338 work is read in conjunction with others, generalizability might be grasped on the basis of recognition
339 of similarities and differences to which other social science pedagogues familiar with the motor
340 learning work cited (e.g., O'Sullivan et al., 2020; Renshaw & Chow, 2019; Young et al., 2020). We
341 also argue there are transferable insights and generalizability where others can infer or translate our
342 findings to other contexts: such as Physical Education (cf. (Haegele, 2019; Richards et al., 2013;

YOUTH BASKETBALL COACHES AND FMS

343 Richards & Templin, 2012; Wright et al., 2021) or in other areas of coaching policy interventions (cf.
344 Hammond et al., 2020; O’Gorman et al., 2021)

345 In sum, the importance of FMS has been well documented within **youth development** related
346 literature (Barnett et al., 2016; Hulteen et al., 2018; Lloyd, Oliver, Faigenbaum, et al., 2015). The
347 results of the present study show that youth basketball coaches have a diverse comprehension of what
348 FMS represent and, despite highlighting an appreciation of their importance as well as indicating
349 confidence in including *athletic movement skills* within their warm-up protocols, there appears to be
350 barriers to their inclusion. However, while discourse around the health and well-being of the
351 developing players should provide sufficient rationale to consistently incorporate FMS within
352 practices, it appears that a more relatable, basketball-specific, layer should be added. The concept of
353 degeneracy may provide the important link between FMS development and basketball-specific
354 performance.

355

Notes

- 356 1. **Early sports-specialization, which represents participation in a single sport, has been associated**
357 **with increased risk of injuries in youth level athletes (≤ 18 years of age) (Bell et al., 2018). In this**
358 **regard, increased injury risk is understood to relate to the intensity of year-round sports-specific**
359 **practice and competition (Sugimoto et al., 2019), and the repetitive overuse of anatomical**
360 **structures (Kraan et al., 2019; Leppänen et al., 2017)**

361

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365

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YOUTH BASKETBALL COACHES AND FMS

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YOUTH BASKETBALL COACHES AND FMS

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Tables and Figures

673 **Table 1 - Coaching survey questions (mapped to Realist Evaluation concepts of Mechanisms,**
 674 **Contexts and Outcomes)**

Question	Additional information	Answer format
1. Please state the country where you are located	-	Open-ended
2. Please state the age group of the players that you predominantly currently coach	Example: under 13s	Open-ended
3. Please state the sex of the players	-	Check boxes: male; female
4. Please provide an approximation of coaching sessions per week and total time delivering supervised coaching sessions to the players	Number of sessions per week followed by number of coaching hours per week	Open-ended
5. Briefly describe your understanding of what fundamental movement skills are (mechanism)	-	Open-ended
6. Do you include non-basketball specific exercises / activities in the warm-up ahead of main practice content? (mechanism)	Activities that do not involve basketball specific actions	Multiple choice: yes; no; or sometimes
7. Would you feel confident to deliver non-basketball specific warm-up exercises that target general athleticism? (context)	-	Check boxes, yes or no
8. Do you believe there would be value in including general athletic exercises into your coaching session? (outcome)	-	Multiple choice: yes; no; maybe
9. If you answered no to the previous question, please provide a brief explanation why you provided this answer (context)	-	Open-ended
10. Please indicate if you include any of the following athletic movement patterns within any part of your basketball coaching session (outcome)	Please tick boxes for athletic movement patterns included in your basketball session	Checkboxes: squat; lunge; hip-hinge; landing technique; pushing; pulling; bridging

YOUTH BASKETBALL COACHES AND FMS

11.	If you answered yes to any of the exercises listed in the previous question, please indicate an approximate frequency per week that the players are requested to perform them (outcome)	This can include as part of a game day warm up as well as within practice sessions	Multiple choice: once per week; twice per week; three times per week; four or more times per week
12	How proficient would you rate the players to be at performing these athletic movement patterns with respect to control and stability? (context)	-	Multiple choice: very; fairly; not

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For Peer Review