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# Youth Motor Competence Promotion Model: A Quantitative Investigation into Modifiable Factors

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8   Richard Tyler[1*], Kelly A. Mackintosh[2], Lawrence Foweather[3], Lowri C.

9   Edwards[4], Gareth Stratton[2]

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12   [1.] Sport and Physical Activity Department, Edge Hill University; St Helens Road, Ormskirk, Lancs,

13   L39 4QP, UK.

14   [2.] Applied Sports Technology Exercise and Medicine (A-STEM) Research Centre, College of

15   Engineering, Swansea University; Bay Campus, Fabian Way, Swansea, SA1 8EN, UK.

16   [3.] Physical Activity Exchange, Research Institute for Sport and Exercise Science, Liverpool John

17   Moores University; 62 Great Crosshall Street, Liverpool, L3 2AT, UK.

18   [4.] Cardiff School of Sport and Health Sciences, Cardiff Metropolitan University; Cyncoed Campus,

19   Cyncoed Road, Cardiff, CF23 6XD, UK.

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22   [*]Corresponding author: Richard Tyler; (+44)07983629791; Tylerr@edgehill.ac.uk

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25 **Abstract:**

26 Objectives: This study aimed to quantify the relationships between enabling, predisposing and

27 reinforcing ecological factors on motor competence and investigate potential sex, weight status, and

28 school level differences.

29 Methods: Data were collected from 429 children (52% boys; aged 11.1±0.6 years; 87% white British).

30 Cardiorespiratory fitness (20m Multistage Shuttle Run), muscular strength (Handgrip Strength) and

31 online questionnaire (Child Health and Activity Tool; CHAT) data on moderate-to-vigorous physical

32 activity, sport participation and available surrounding physical activity facilities were included as

33 enabling variables. Three predisposing variables were determined from self-report data on

34 benefits/barriers to exercise, adequacy, and predilection. Parental/guardian physical activity levels and

35 persons whom participate in physical activity and sport with the participant (CHAT) were selected as

36 reinforcing variables. Motor competence was determined from cumulative scores for Dragon

37 Challenge tasks (Balance Bench, Core Agility, Wobble Spot, Overarm Throw, Basketball Dribble,

38 Catch, Jumping Patterns, T-Agility, Sprint). Confirmatory Factor Analysis assessed the fit of

39 measured variables into latent factors. Structural equation modelling evaluated relationships between

40 these latent factors.

41 Results: Motor competence was directly affected by the enabling factor ($\beta$=0.50, $p$<0.001) but

42 indirectly affected by reinforcing and predisposing factors, mediated by the enabling factor ($\beta$=0.13,

43 $p$=0.014; $\beta$=0.25, $p$=0.002). Multi-group comparisons showed that each of these effects did not differ

44 by sex, weight status or school level ($p$>0.05).

45 Conclusions: This study demonstrated that enabling factors are crucial for the development of motor

46 competence. This is the first study to quantify an ecological model with motor competence as the

47 endogenous variable and is key to future interventions.

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49 Key words: Motor competence, Children, Ecological Model, Enabling, Predisposing, Reinforcing.

50 **Practical Implications:**

51 • This study presents an ecological model to provide an understanding of the multiple influences on

52 motor competence and identify multiple potential pathways that could improve motor competence

53 in children.

54 • Each direct and indirect effect in the model did not differ by school level, weight status or sex,

55 supporting the notion that the model may be applicable across many groups of primary and

56 secondary level school children.

57 • This study provides insight for interventions and programmes to promote motor competence that

58 can be used by schools, families, communities, practitioners and academics.

59 • Given the study revealed a direct effect of the enabling factor on motor competence, actively

60 promoting physical activity, sport participation and health-related fitness, as well as increasing the

61 accessibility of surrounding physical activity facilities, could improve overall motor competence

62 in children.

63 • Motor competence promotion strategies should also focus on enhancing social support

64 mechanisms such as parental/guardian physical activity levels, the number of persons whom take

65 part in physical activity and sport with children, and children's perceived benefits to, adequacy in,

66 and predilection to physical activity, while decreasing children's perceived barriers to physical

67 activity.

**Introduction:**

Motor competence, as a global term relating to the development and performance of human movement, represents an individual's ability to perform skilfully on a wide range of motor tasks[1–3], and plays an important role in the growth and development of children[1,2]. Movement skills are imperative to develop, and indeed enhance, motor competence[1–4]. Moreover, movement skills consist of three interrelated constructs: fundamental movement skills (FMS; balance, core stability, coordination, speed variation, flexibility, control, proprioception, and power), combined movement (poise, fluency, precision, dexterity, and equilibrium), and complex movement (bilateral coordination, inter-limb coordination, hand-eye coordination, turning, twisting and rhythmic movements, and control of acceleration/deceleration)[1,4]. Whilst FMS develops rapidly from the age of 3 years, children have the potential for FMS mastery by 7-8 years[1]. Movement patterns, described as general (e.g., sending, receiving, running, jumping), refined (e.g., throwing, catching, sprinting, hopping) and specific (i.e. sport-specific movement patterns), are amalgamations of movements that stem from the selection and application of movement skills[1,4]. More refined and specific movement patterns are achieved when FMS (e.g., balance), combined movement skills (e.g., poise) and complex movement skills (e.g., rhythmic movements) are utilised simultaneously (e.g., jumping patterns)[1,4]. Therefore, the development of combined and complex movement skills is speculated to be imperative to increasing levels of motor competence in children over 8 years old[1,4].

There is a vast array of evidence identifying motor competence as a critical precursor for increasing positive health trajectories, particularly physical activity, across the lifespan[5,6]. Specifically, systematic reviews and longitudinal studies have reported strong evidence for positive associations between motor competence and physical activity levels[3,5], health-related fitness[3,7] and perceived competence[3], as well as an inverse association with weight status[3,8], in paediatric populations. Furthermore, studies have shown that enhanced motor competence during childhood tracks across the lifespan by leading to higher levels of physical activity and health-related fitness during adolescence[3,5], and by supporting functional independence, general health and quality of life in later life, as well as reducing the risk of all-cause mortality[6,9]. Thus, enhanced motor competence in

95  children and young people is foundational for physical activity promotion and associated health

96  benefits, with transferable value throughout the life course.

97      Ecological models provide a framework of potential influencing factors on health-related

98  behaviours and are useful in emphasising social and psychological influences and environmental

99  contexts[5]. The Youth Physical Activity Promotion Model (YPAP-M)[10], offers an ecological

100 conceptual model framing factors that may enable (e.g., movement skills/motor competence, health-

101 related fitness, environmental attributes, and access), predispose (e.g., perceived competence and self-

102 efficacy) or reinforce (e.g., parental physical activity and family, peer and coach influence) physical

103 activity in children. Although research has investigated the mediating variable framework of the

104 YPAP-M[11], the examination of the influencing factors on motor competence, guided by the model,

105 remains to be explored. Further, few studies have investigated both psychological influences and

106 environmental factors on motor competence[5]. Therefore, the development of an ecological model with

107 motor competence as the endogenous variable would afford new insight and an in-depth

108 understanding of the multiple influences on motor competence. Although the association between

109 motor competence and other factors such as physical activity, health-related fitness, and perceived

110 competence, are expected to be reciprocal[2,3], such a model would enable the investigation of factors

111 that could be specifically modified to increase motor competence. Such a targeted approach could

112 therefore inform intervention development with the objective to promote motor competence in

113 children, as well as explain effects or lack of effects in current intervention strategies.

114     The aim of the current cross-sectional study was to quantify the direct and indirect

115 relationships between enabling, predisposing and reinforcing ecological factors on motor competence

116 and to investigate potential sex, weight status, and school level differences.

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118 **<u>Methods:</u>**

119     Following written informed head teacher and parent consent and participant assent, 429

120 children (52% boys; aged $11.1\pm0.6$ years; 87% white British) from 11 socio-demographically

121 representative primary and secondary schools (Welsh Index of Multiple Deprivation (WIMD) scores:

122 $815.9\pm615.8$, ranging from 25 (high deprivation) to 1898 (low deprivation); proportion of children in

123    most deprived WIMD quintile rank (<382) = 38.7% and least deprived WIMD quintile rank (>1527)

124    = 21.4%) in South Wales, UK, participated in the study between 2015-2018 as part of the serial Swan-

125    Linx programme[12,13]. Ethical approval was obtained from the Institutional Research Ethics Committee

126    [PG/2014/007; PG/2014/037; PG/2016/003].

127    Using standard anthropometric techniques[14], stature and body mass were measured to the

128    nearest 0.001m and 0.1kg, with a portable stadiometer [Seca 213, Seca Ltd, Birmingham, UK] and

129    electronic weighing scales [Seca 876, Seca Ltd, Birmingham, UK], respectively. Body Mass Index

130    (BMI) was calculated and age- and sex-specific BMI cut-points were used to classify overweight and

131    obese participants[15]. Participants completed two functional tests from the EUROFIT Test Battery[16],

132    the 20m Multistage Shuttle Run Test (20m MSRT), as measure of cardiorespiratory fitness, and the

133    Handgrip Strength Test, as a measure of upper-body muscular strength.

134    Children completed a 29-item health and lifestyle online questionnaire (Child Health and

135    Activity Tool; CHAT), akin to the online-based Sportslinx Lifestyle Survey, that has provided valid

136    and reliable results[12]. Children reported the number of days they had engaged in moderate-to-vigorous

137    physical activity (MVPA), described as "any activity or sport where your heart beats faster, you

138    breathed faster and you felt warmer", for $\geq 60$ min·day$^{-1}$ in the last week[17]. Children also detailed the

139    number of organised sports clubs they participated in outside of school[18]. Surrounding physical

140    activity facilities were reported by children as the number of areas close to their home that they could

141    play or take part in physical activity in, such as a garden, grassy area/playing field, playground, park,

142    street, leisure/sport centre or school[18]. Children further reported the number of times a week their

143    parent/s or guardian/s engaged in physical activity (0 days=0, 1-2 days=1, 3-4 days=2, 5+ days=3)[18].

144    Children reported both parents/guardians or a single parent/guardian that they live with. Where

145    participants reported two parents/guardians, the scores were added together. Thus, larger total scores

146    (out of a maximum total of 6) show more physically active parents, who provide active role

147    modelling. Additionally, participants reported the persons they most prominently participated in

148    physical activity and sport with during and outside of school time (i.e., on their own (=0) or with

149    parents/guardians, siblings, friends, coaches/teachers/other (=1))[18]. The questions used within this

150    study are also utilised as part of valid and reliable national surveillance surveys[17,18].

151    Benefits (desired outcomes from taking part) and barriers (perceived blocks or hindrances to

152    taking part) to exercise were measured using a nine-item benefits and ten-item barriers subscale from

153    the Children's Perceived Benefits/Barriers to Exercise Questionnaire[19], with responses ranging from 1

154    (disagree a lot) to 5 (agree a lot). Validity and reliability of the questionnaire has been shown to be

155    good (internal consistency Cronbach's alpha = 0.95 and 0.89, for the benefits and the barriers

156    subscales, respectively; construct and factorial validity were also established)[19,20]. A benefits/barriers

157    differential score was calculated by subtracting the mean barriers' score from mean benefits' score,

158    with higher scores indicating greater perceived benefits compared to perceived barriers to exercise.

159    Perceived adequacy, the perception of capability to achieve some acceptable standard of

160    success, and perceived predilection, the likelihood that one would select a physical activity when

161    given the choice, were measured using a seven-item adequacy and nine-item predilection subscale

162    from the Children's Self-perceptions of Adequacy in and Predilection for Physical Activity

163    Questionnaire[21]. Hay[21], demonstrated adequate validity and strong reliability of the questionnaire

164    (internal reliability ranged from 0.65 - 0.85; test-re-test reliability ranged from 0.78 - 0.91; factorial,

165    construct and predictive validity were also established)[21]. Each item consisted of two mutually

166    exclusive descriptions and children decided which of the two descriptions were most like them and

167    whether the selected description was "sort of" or "really" true for them. The most inactive or

168    inadequate response was scored 1 and the most active/adequate response 4. A cumulative score for

169    both adequacy and predilection were calculated.

170    Details of the Dragon Challenge have been reported elsewhere[4]. Briefly, the Dragon

171    Challenge consists of nine tasks (Balance Bench, Core Agility, Wobble Spot, Overarm Throw,

172    Basketball Dribble, Catch, Jumping Patterns, T-Agility, and Sprint) which require the application of a

173    different combination of fundamental, combined and complex movement skills, to form refined and

174    specific movement patterns[4]. The Dragon Challenge was administered and assessed using the

175    established methodology[4]. Scoring was completed in situ by expert gold assessors (>50 hours of DC

176    training and in situ experience), in accordance with the instructions specified within the Dragon

177    Challenge manual[4]. Children were scored on their technique and outcome for each task. Good inter-

178    and intra-rater reliability across all tasks and scoring components (all ICCs >0.85), as well as validity,

179    has been previously shown[4]. A cumulative score (0-4) for each task was calculated by summing the

180    technique scores and twice the outcome score, with four showing high motor competence at that task[4].

181         Descriptive statistics are presented as mean ± SD. All statistical tests were completed using

182    SPSS and SPSS AMOS, v25 [IBM SPSS Statistics Inc., Chicago, IL, USA], with statistical

183    significance set at $p<0.05$. Missing data (6.9%) were imputed using an expectation-maximisation

184    algorithm, an iterative method. Specifically, the missing values are first predicted based on assumed

185    values for the parameters and then these predictions are used to update the parameter estimates[22]. This

186    method is iterated, until the sequence of parameters converges to maximum-likelihood estimates[22].

187    Independent samples t-tests were used to determine sex differences in measured variables. A

188    Confirmatory Factor Analysis (CFA) was performed to assess the fit of the measured variables into

189    four hypothesised latent variables. Specifically, the 20m MSRT and the handgrip strength test, as well

190    as responses to questions from the CHAT on MVPA, sport participation and available surrounding

191    physical activity facilities were included as indicators of the enabling factor; the benefits/barriers

192    differential score, the adequacy score, and the predilection score were included as indicators of the

193    predisposing factor; responses to questions on parental/guardian physical activity levels and persons

194    whom participate in physical activity and sport with the participant were included as indicators of the

195    reinforcing factor; and cumulative scores for each Dragon Challenge task were included as indicators

196    of the motor competence factor[4]. Comparative fit index (CFI), Goodness of fit index (GFI),

197    Incremental fit index (IFI) and Root mean square error of approximation (RMSEA) were used to

198    assess model fit, with CFI, GFI, and IFI of >0.90 and RMSEA of <0.05 indicating a good fit[23,24]. SEM

199    was then used to evaluate the relationships between enabling, reinforcing, and predisposing latent

200    variables on the motor competence latent variable. The fit was tested at a global level using CFI, GFI,

201    IFI, and RMSEA. Direct effects were measured using direct path coefficients between latent

202    variables. In the case of a mediating latent factor, the indirect effect was measured by taking the

203    product of the two direct effects between the three latent factors. Multi-group comparisons were made

204    using Chi-squared difference tests to determine whether path relationships differed based on the value

205    of a moderator: sex (boys vs. girls), weight status (healthy vs. overweight/obese), and school level

206 (primary vs. secondary). Paths that were non-significant at an overall level, as well as for all values of

207 the moderators, were removed from the final SEM.

208

209 **<u>Results:</u>**

210  Mean and standard deviations of the measured variables are presented in Table 1.

211

212     **[INSERT TABLE 1 ABOUT HERE]**

213

214  The fit for the hypothesised CFA (Figure 1) was good (CFI, 0.927; GFI, 0.944; IFI, 0.929;

215 RMSEA, 0.035; 90% CI 0.026–0.044), after the addition of three correlations between error terms

216 within the same factor.

217

218 **[INSERT (A) FIGURE 1: Confirmatory Factor Analysis of the measured variables into four**

219     **hypothesised latent factors ABOUT HERE]**

220

221  The hypothesised SEM is shown in Supplementary Material 1 *(see hypothesised SEM, (B)*

222 *Supplementary Material 1, which displays the paths in the hypothesised model).*  The paths from

223 (i)the reinforcing factor to the motor competence factor and (ii)the predisposing factor to the motor

224 competence factor were not significant ($p$>0.05). Moreover, these relationships did not differ

225 significantly based on the value of any of the moderators, and so both paths were removed in the final

226 model. *Post-hoc* power analysis identified sufficiency to detect significant effects (statistical power

227 >0.8).

228  The final SEM (Figure 2) demonstrated a good fit on a global level (CFI, 0.925; GFI, 0.944;

229 IFI, 0.926; RMSEA, 0.036; 90% CI 0.027–0.044). The model revealed that the reinforcing factor was

230 directly related to the predisposing ($\beta$=0.45, $p$<0.001) and enabling factors ($\beta$=0.25, $p$=0.021). An

231 indirect relationship was found between the reinforcing and motor competence factors, mediated by

232 the enabling factor ($\beta$=0.13, $p$=0.014). The predisposing factor was found to have a direct effect on

233 the enabling factor ($\beta$=0.49, $p$<0.001), and an indirect effect on motor competence mediated by the

234    enabling factor ($\beta$=0.25, $p$=0.002). The enabling factor had a direct effect on the motor competence

235    factor ($\beta$=0.50, $p$<0.001). Multi-group comparisons showed that each of these direct effects did not

236    differ by sex, weight status or school level ($p$>0.05).

237

238    **[INSERT (C) FIGURE 2: Final SEM evaluating the relationships between enabling,**

239    **reinforcing, predisposing, and motor competence latent variables. ABOUT HERE]**

240

241    **Discussion:**

242    This is the first study to report the direct and indirect relationships between enabling,

243    predisposing, and reinforcing factors on motor competence. This study presents an ecological model

244    with motor competence as the endogenous variable to provide understanding of the multiple

245    influences on such an outcome[5]. Results from the CFA showed that the fit of the measured variables

246    into the four hypothesised latent factors based on the YPAP-M[10] was good, confirming that the

247    selected measures were associated with the appropriate latent factor.

248    The finding that the enabling factor had a direct effect on the motor competence factor

249    purports that an increase in the enabling factor resulted in an increase in motor competence, and thus

250    an improvement in competence in movement skills and advanced movement patterns. In accord with

251    systematic reviews, there was a positive association between motor competence and MVPA[3,5], sport

252    participation[3,5,25] and aspects of health-related fitness[3,7]. Further, research suggests that a positive

253    feedback loop exists, in which children with greater levels of physical activity and sport participation

254    develop better motor competence and fitness, consequently further increasing engagement[2,3]. Whilst

255    environmental and access factors have been previously reported to support physical activity[10,26], little

256    evidence has shown the impact on motor competence[5]. It is therefore noteworthy that available

257    surrounding physical activity facilities loaded onto the enabling factor, which was positively

258    associated with motor competence. Overall, the finding that the enabling factor had a direct effect on

259    motor competence supports previous literature, as well as provides further evidence of an association

260    between physical activity[3,5], sport participation[3,5,25], fitness[3,7], and surrounding facilities and motor

261    competence.

262        In line with previous research that has displayed positive associations between parental

263    influence and family support (reinforcing variables), and physical activity levels and fitness (enabling

264    variables), in children and adolescents[10,26], the direct relationship between the reinforcing and

265    enabling factor further supports the importance of parental/guardian modelling and friends/family

266    encouragement. Conversely, few studies have demonstrated that reinforcing variables can

267    simultaneously influence predisposing variables[11]. The proposed model is of importance since it

268    shows that an increase in the reinforcing factor resulted in an increase in perceived benefits to,

269    adequacy in, and predilection to physical activity (predisposing factor). Given that previous literature

270    has shown a parental influence on movement skills competence[5], it was hypothesised that the

271    reinforcing factor would also have a direct relationship on the motor competence factor, though this

272    direct relationship was not apparent. Rather, results showed an indirect relationship between the

273    reinforcing factor and motor competence factor, mediated by the enabling factor. Consequently,

274    increasing the reinforcing factor (i.e., social support/monitoring) may result in improvements in

275    enabling measured variables as well as motor competence. Overall, the findings regarding the

276    reinforcing factor provide evidence for the impact of psychosocial variables on biological,

277    environmental, behavioural, and psychological variables, as well as indirectly on motor competence

278    levels.

279        Congruent with previous research, whereby higher levels of self-efficacy, perceived

280    competence, and overall motor competence were related to higher levels of physical activity[26,27], the

281    SEM showed that the predisposing factor (i.e., perceived benefits to, adequacy in, and predilection to

282    physical activity) had a direct effect on the enabling factor (i.e., physical activity, sport participation,

283    health-related fitness, and available surrounding physical activity facilities). While it was

284    hypothesised that the predisposing factor may have a direct relationship on the motor competence

285    factor, an indirect effect, mediated by the enabling factor, was found. Indeed, previous research has

286    shown that perceived competence has a mediating effect on the association between motor

287    competence and physical activity in children and adolescents[28,29]. This study therefore provides

288    further support to the contention that an increase in the predisposing factor will result in an increase in

289    physical activity, sport participation, and health-related fitness, and subsequently an increase in levels

290    of motor competence.

291        Overall, previous research supports the synergistic relationships of biological, environmental,

292    psychosocial and behavioural factors on the evolution and continued development of motor

293    competence across the lifespan[3,5,6]. The current study supports the strength of these relationships,

294    particularly in terms of promoting motor competence in an ecological model that can be used to

295    inform interventions. One such intervention strategy would be to promote physical activity, sport

296    participation, health-related fitness, and available surrounding physical activity facilities, given the

297    direct effect of the enabling factor on motor competence in the current results. Potential strategies to

298    enhance these variables could be that schools offer additional after-school programmes (given the

299    pressures that exist on curricular time) to provide opportunities for physical activity and sport

300    participation, particularly vigorous and muscle/bone strengthening activities that enhance health-

301    related fitness. Parents should also be aware of the importance of providing additional opportunities

302    for their children to participate in. Furthermore, schools could enable access to school grounds outside

303    of the daily timetable and term times, to provide additional physical activity facilities for children to

304    easily access. Moreover, whilst both the reinforcing and predisposing factor only had a direct effect

305    on the enabling factor, the indirect effect of these factors on motor competence, indicates that an

306    increase in either reinforcing or predisposing factor was indirectly associated with an increase in

307    motor competence. Thus, interventions to promote motor competence could also focus on enhancing

308    social support mechanisms such as parental/guardian physical activity levels, the number of persons

309    whom take part in physical activity and sport with children, and children's perceived benefits to,

310    adequacy in, and predilection to physical activity, while decreasing children's perceived barriers to

311    physical activity. Contrary to previous findings that show increasing age, healthy weight status and

312    being male are correlates for certain aspects of motor competence[5], multi-group comparisons did not

313    display these differences. Consequently, the SEM revealed an ecological model that can be used to

314    inform interventions for the improvement of motor competence in children via multiple pathways

315    regardless of age, weight status, and sex.

316    The use of SEM in the current study provides a novel approach to identifying modifiable

317    factors that can increase motor competence in children, allowing the investigation of the concurrent

318    influences of multiple variables. Indeed, SEM explicitly models measurement error, thereby providing

319    more accurate relationships among latent factors, a frequently cited limitation of many studies[30].

320    Furthermore, the assessment of fundamental, combined and complex movement skills and varying

321    complexities of movement patterns provides a more inclusive measure to inform motor competence[4].

322    Whilst there are numerous strengths, the current study is not without limitations. Specifically,

323    the measures chosen to best predict each latent variable in the model were selected from measures

324    involved in the Swan-Linx programme, and therefore other quantitative measures (e.g., accelerometer

325    data) may have increased the strength of the model. Future research could also expand the measures

326    used to assess enabling and reinforcing factors (e.g., reinforcing factors could include encouragement

327    for motor competence from peers and parents or other aspects of social support), as well as investigate

328    whether there is a difference between single parent versus dual parent role-modelling. Further, an

329    expectation-maximisation algorithm was used to impute missing data, although this imputation

330    method has previously been validated[22]. Whilst no differences were found between primary and

331    secondary school level children, it is possible that age differences may be apparent with a larger age-

332    range, or that biological age may account for greater variation. Finally, the sample within the current

333    study was largely homogenous, with 87% of the sample being white British children. Whilst this is

334    closely aligned to the ethnicity proportions of the population in Wales, the results cannot be

335    generalised beyond this particular racial/ethnic group. Future studies should aim to adopt the current

336    analyses to test the significance of the model across a larger age range and differing ethnic groups, as

337    well as across different countries. The replication of the current study with the inclusion of a wider

338    range of participants would enhance the significance of the model and make it more generalisable.

339

340    **Conclusion:**

341    In conclusion, the present study found that the enabling factor had a direct effect, whilst the

342    reinforcing and predisposing factors had an indirect effect, on motor competence. Each direct and

343    indirect effect did not differ by school level, weight status or sex, supporting the contention that the

344    model is applicable across many groups of primary and secondary level school children. These

345    findings are the first to be set in this framework and reveal that there are multiple potential pathways

346    that could inform future interventions that aim to promote motor competence.

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360    **Conflict of Interest**:

361         The authors declare there are no known conflicts of interest in the present study. The results

362    of the study are presented clearly, honestly, and without fabrication, falsification, or inappropriate

363    data manipulation.

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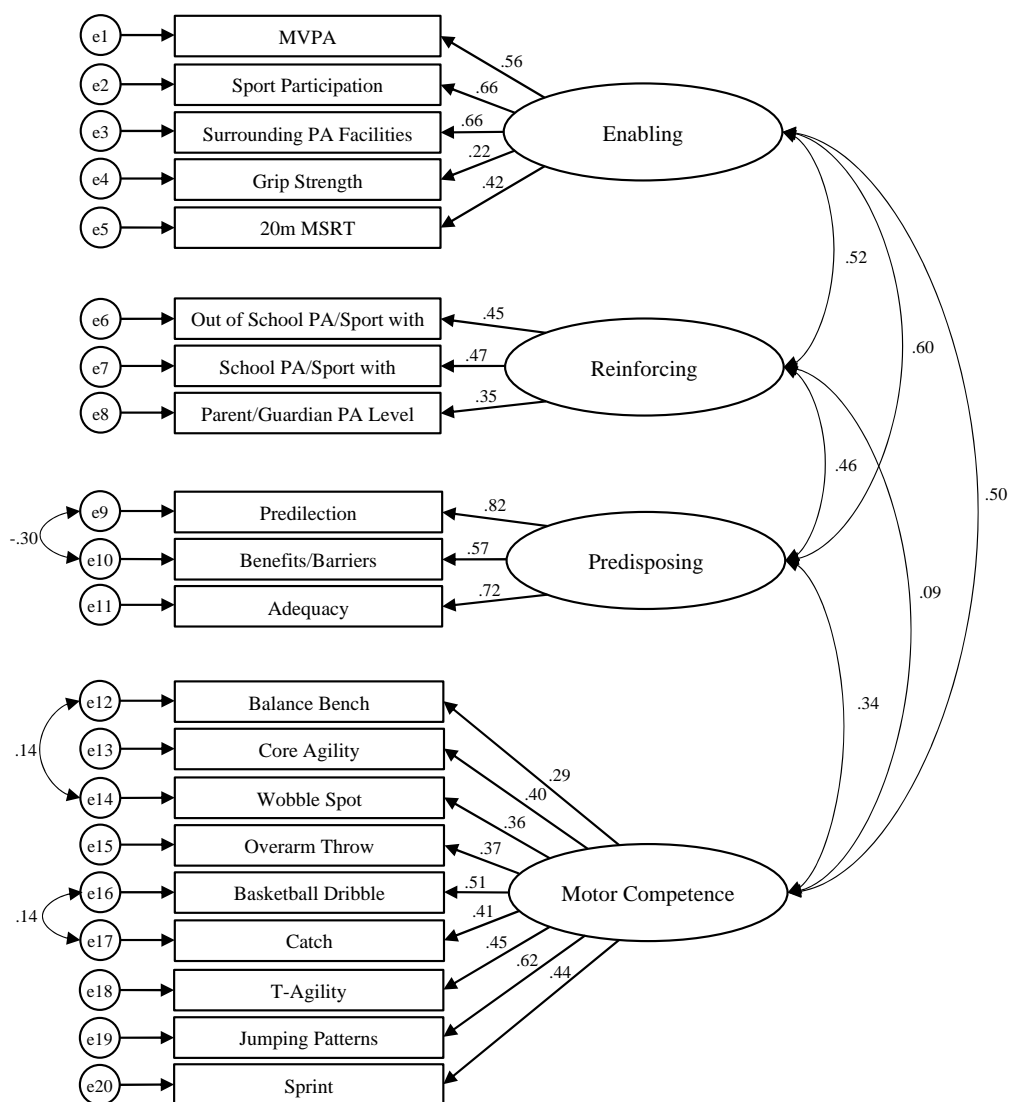449    **Table 1. Descriptive statistics, mean ± SD, of measured variables**

| Variables | Boys | Girls | All |
|---|---|---|---|
| Primary School | 73.5% | 67.9% | 70.9% |
| Secondary School | 26.5% | 32.1% | 29.1% |
| Unhealthy Weight | 35.9% | 40.0% | 37.9% |
| Healthy Weight | 64.1% | 60.0% | 62.1% |
| MVPA (0-7 days) | 2.4 ± 1.2 | 2.2 ± 1.1 | 2.3 ± 1.2 |
| Sport Participation (number of sports) | 2.7 ± 2.7* | 2.3 ± 2.1 | 2.5 ± 2.4 |
| Surrounding PA Facilities (0-8 facilities) | 3.0 ± 2.0 | 3.2 ± 2.0 | 3.1 ± 2.0 |
| Grip Strength (kg) | 17.7 ± 3.9 | 17.1 ± 3.8 | 17.4 ± 3.8 |
| 20m MSRT (shuttles) | 31.9 ± 18.1** | 22.5 ± 11.9 | 27.4 ± 16.1 |
| Out of School PA/Sport with (0-1) | 0.9 ± 0.3 | 0.8 ± 0.4 | 0.9 ± 0.3 |
| Out of School PA/Sport with others | 86.7% | 84.4% | 85.6% |
| School PA/Sport with (0-1) | 0.9 ± 0.2 | 0.9 ± 0.2 | 0.9 ± 0.2 |
| School PA/Sport with others | 95.2% | 95.4% | 95.3% |
| Parents PA Levels (0-6) | 2.4 ± 1.5 | 2.7 ± 1.4 | 2.5 ± 1.5 |
| Predilection (9-36) | 28.3 ± 4.5 | 28.2 ± 5.3 | 28.2 ± 4.9 |
| Benefits/Barriers to PA (-41-35) | 1.4 ± 0.9 | 1.3 ± 0.8 | 1.4 ± 0.8 |
| Adequacy (7-28) | 21.1 ± 3.6 | 20.8 ± 3.7 | 20.9 ± 3.6 |
| Balance Bench (0-4) | 1.4 ± 1.1 | 1.6 ± 1.2* | 1.5 ± 1.1 |
| Core Agility (0-4) | 1.3 ± 0.9 | 1.5 ± 1.0 | 1.4 ± 1.0 |
| Wobble Spot (0-4) | 1.3 ± 1.5 | 1.4 ± 1.5 | 1.4 ± 1.5 |
| Overarm Throw (0-4) | 2.1 ± 0.9** | 1.3 ± 1.0 | 1.7 ± 1.0 |
| Basketball Dribble (0-4) | 2.3 ± 1.0** | 1.7 ± 1.2 | 2.0 ± 1.1 |
| Catch (0-4) | 1.5 ± 1.3** | 0.9 ± 1.1 | 1.2 ± 1.3 |
| T-Agility (0-4) | 1.3 ± 1.1 | 1.2 ± 1.0 | 1.2 ± 1.1 |
| Jumping Patterns (0-4) | 2.0 ± 1.0 | 2.0 ± 1.0 | 2.0 ± 1.0 |
| Sprint (0-4) | 2.5 ± 0.8* | 2.3 ± 0.9 | 2.4 ± 0.8 |

Note. MVPA = Moderate-to-vigorous physical activity; PA = Physical activity; 20m MSRT = 20m
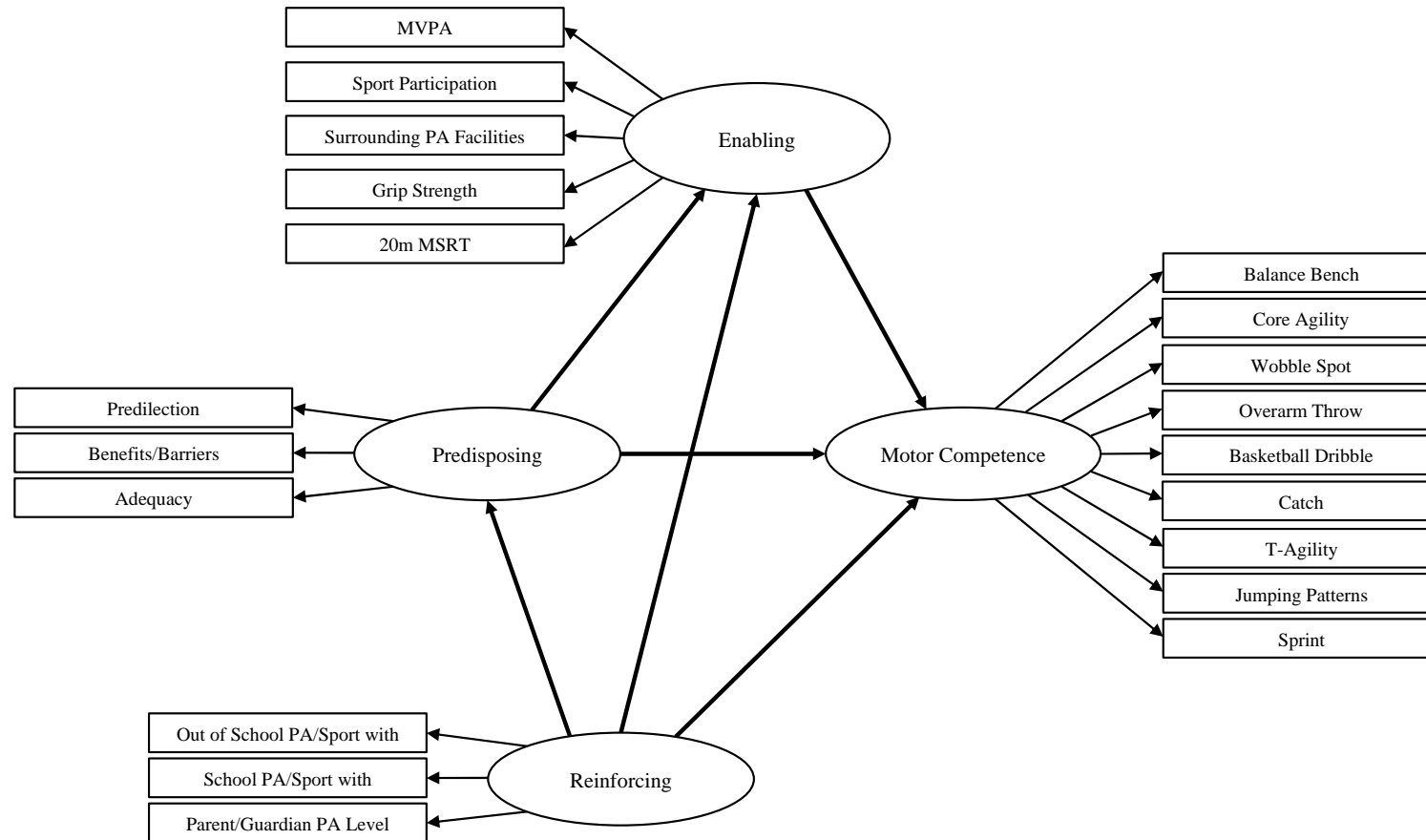Multistage Shuttle Run Test; Independent samples t-test: * = <0.05, ** = <0.001

450

451      **A. Figure 1:** Confirmatory Factor Analysis of the measured variables into four hypothesised

452      latent factors

453      **B. Supplementary Material 1.** Hypothesised model, which presents the paths in the

454      hypothesised structural equation model.    Pdf

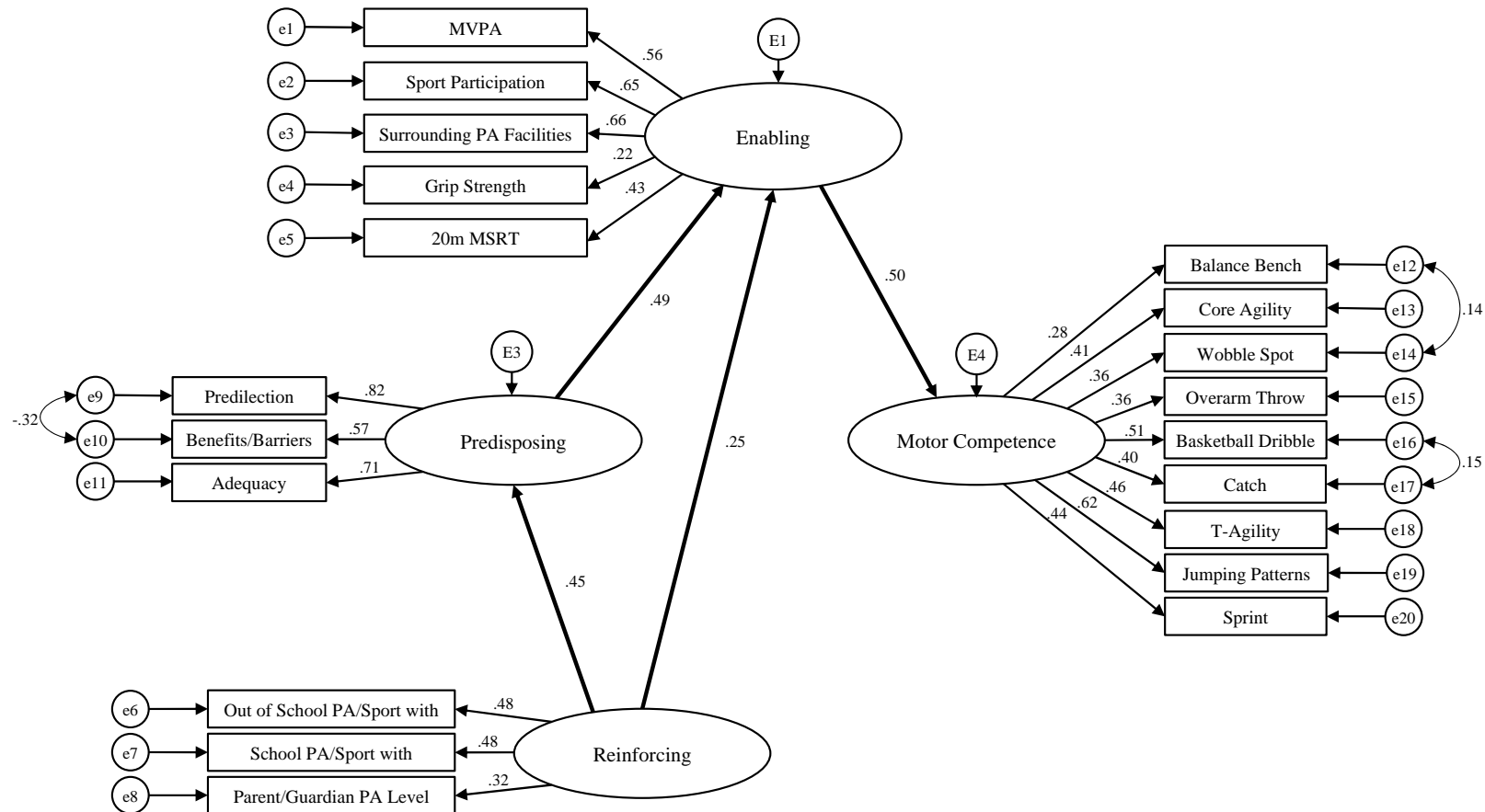455      **C. Figure 2:** Final SEM evaluating the relationships between enabling, reinforcing,

456      predisposing, and motor competence latent variables.

457

**(A) Figure 1: Confirmatory Factor Analysis of the measured variables into four hypothesised latent factors**

458

**(B) Supplementary Material 1. Hypothesised SEM, which displays the paths in the hypothesised structural equation model**

459

**(C) Figure 2: Final SEM evaluating the relationships between enabling, reinforcing, predisposing, and motor competence latent variables.**

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