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10   Development and Initial Validation of the Life Skills Scale for Sport

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25   Abstract

26   Objectives: The aim of this research was to develop a measure of life skills development

27   through sport.

28   Method: Four studies were conducted to develop the Life Skills Scale for Sport (LSSS).

29   Study 1 developed items for the scale and included 39 reviewers' assessment of content

30   validity. Study 2 included 338 youth sport participants and used exploratory factor analysis

31   (EFA) and descriptive statistics to reduce the number of items in the scale and explore the

32   factor structure of each subscale and the whole scale. Study 3 included 223 youth sport

33   participants and assessed the factor structure and reliability of the scale using confirmatory

34   factor analysis (CFA), exploratory structural equation modeling (ESEM) and bifactor

35   modeling. Study 4 investigated the test-retest reliability of the scale over a two-week period

36   with 37 youth sport participants.

37   Results: Study 1 resulted in the development of the initial 144-item LSSS and provided

38   content validity evidence for all items. Study 2 refined the scale to 47 items and provided

39   preliminary evidence for the unidimensional factor structure of each subscale. Study 3

40   supported the factorial validity of the scale, with ESEM solutions providing the best fit and

41   resulting in more differentiated factors. Study 4 provided evidence for the test-retest

42   reliability of the scale.

43   Conclusions: Collectively, these studies provided initial evidence for the validity and

44   reliability of the LSSS; a measure which can be used by researchers and practitioners to

45   assess participants' perceived life skills development through sport.

46   *Keywords:* positive youth development; psychosocial development; psychosocial

47   assets; youth sport; exploratory structural equation modeling; bifactor modeling

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49   To succeed in our competitive and ever-changing global economy young people must

50 develop an abundance of life skills (Gould & Carson, 2010). Such life skills are defined as

51 the skills required to deal with the demands and challenges of everyday life (Hodge &

52 Danish, 1999). In line with the definitions of several researchers (e.g., Cashmore, 2002;

53 Danish, Forneris, & Wallace, 2005), we view skills as behavioral, cognitive, interpersonal, or

54 intrapersonal competencies that can be learned, developed, and refined. Examples of life

55 skills include teamwork, goal setting, interpersonal communication, and leadership. These

56 'life' skills can be applied to various aspects of a person's life (e.g., schoolwork, a part time

57 job, friendships, sport). Additionally, the World Health Organization (1999) has suggested

58 that such life skills are important for preparing adolescents for the future and ensuring their

59 healthy development. But where do young people develop their life skills? Research

60 suggests that young people develop their life skills through extracurricular activities such as

61 music, drama, and sport (Larson, 2000). According to Marsh (1992), sport has the greatest

62 number of positive effects of any extracurricular activity. In particular, it has been proposed

63 that the interactive, emotional, and social aspects of sport make it a promising setting for

64 young peoples' development (Danish, Forneris, Hodge, & Heke, 2004; Hellison, Martinek, &

65 Walsh, 2008; Fraser-Thomas, Côté, & Deakin, 2005). As such, the development of life skills

66 forms a key aspect of positive youth development through sport (Jones, Dunn, Holt, Sullivan,

67 & Bloom, 2011). Positive youth development (PYD) is a general term which refers to

68 strength-based and asset-building approaches to developmental research in which young

69 people are viewed as 'resources to be developed' rather than 'problems to be solved' (Holt,

70 Sehn, Spence, Newton, & Ball, 2012). Qualities and competencies such as participants'

71 health and well-being (King et al., 2005; Park, 2004) and their life skills development (Jones

72 et al., 2011) are proposed to indicate or enhance PYD.

73   Several frameworks, models and theories have recently been applied to the area of

74 PYD through sport. Examples include Benson and Saito's (2001) conceptual framework for

75 youth development theory and research (Cronin & Allen, 2015), Bronfenbrenner's (1999)

76 bioecological model of human development (Strachan, Côté, & Deakin, 2009), Bass's (1999)

77 transformational leadership theory (Vella, Oades, & Crowe, 2013), and Ryan and Deci's

78 (2000) self-determination theory (Inoue, Wegner, Jordan, & Funk, 2015). Common among

79 these frameworks, models, and theories is that they include young peoples' development as

80 an outcome variable. Furthermore, they all highlight that researchers should investigate how

81 key aspects of the youth sport environment (e.g., the coaching climate, peer relationships) can

82 impact young peoples' development. In particular, self-determination theory (Ryan & Deci,

83 2000) seems a promising theory for investigating the mechanisms by which young people

84 develop their life skills through sport. Self-determination theory suggests that autonomy

85 support, satisfaction of the three basic needs (autonomy, competence, and relatedness), and

86 self-determined motivation all relate to a person's development and well-being (Ryan &

87 Deci, 2000). Aspects of this causal sequence have been investigated extensively in relation to

88 well-being (e.g., Standage & Gillison, 2007; Smith, Ntoumanis, & Duda, 2007) but much less

89 attention has been given to the mechanisms of personal development. According to Hodge,

90 Danish, and Martin's (2012) conceptual framework for life skills interventions, the basic

91 needs of autonomy, competence, and relatedness are the underlying psychological

92 mechanisms that contribute to personal development within all life skills programs.

93 Nevertheless, it is important to acknowledge that life skills need to be intentionally taught

94 (Theokas, Danish, Hodge, Heke, & Forneris, 2008) in order for the development of life skills

95 to actually occur. To further our understanding of young people's development and explore

96 the mechanisms that lead to PYD, a critical step is to establish valid and reliable tools to

97 assess indicators of PYD (i.e., life skills).

98   As the most popular leisure activity for young people (Hansen & Larson, 2007), sport

99   has been proposed as an ideal setting for the development of life skills. Research suggests

100   that through sport young people develop: teamwork (Holt, 2007), goal setting (Holt, Tink,

101   Mandigo, & Fox, 2008), time management (Fraser-Thomas & Côté, 2009), emotional skills

102   (Brunelle, Danish, & Forneris, 2007), communication (Gould, Collins, Lauer, & Chung,

103   2007), social skills (Gould, Flett, & Lauer, 2012), leadership (Camiré, Trudel, & Forneris,

104   2009), and problem solving and decision making (Strachan, Côté, & Deakin, 2011). The

105   majority of these studies relied on qualitative research methods (e.g., interviews) to

106   investigate sports participants' life skills development. In fact, only two of the eight life

107   skills listed above (goal setting and social skills) can presently be assessed using a suitable

108   sport-specific measure – the Youth Experiences Survey for Sport (YES-S; MacDonald, Côté,

109   Eys, & Deakin, 2012). Without the availability of alternative measures to comprehensively

110   assess the range of life skills young people are purported to develop through sport,

111   researchers are unable to test and refine the theories, frameworks, and models which describe,

112   explain, and predict youth development. Furthermore, programme development and

113   evaluation that is theoretically grounded remains limited.

114   Despite calls for new measures to be developed (Gould & Carson, 2008), only one

115   sport-specific measure is currently available to assess life skills development through sport

116   (i.e., the YES-S; MacDonald et al., 2012). This survey is an adaptation of the Youth

117   Experience Survey 2.0 (Hansen & Larson, 2005) and measures personal and social skills,

118   cognitive skills, goal setting, initiative, and negative experiences. Several recent studies have

119   used the YES-S when investigating life skills development through sport (e.g., Bruner, Eys,

120   Wilson, & Côté, 2014; Cronin & Allen, 2015; Vella, Oades, & Crowe, 2013). Nonetheless,

121   these studies have only provided evidence for the internal consistency reliability of each

122   subscale, with evidence of other forms of reliability and validity yet to be established.

123   Despite the YES-S being a promising measure, there are several other life skills that young

124   people are purported to develop through sport.

125   Using content analysis, Johnston, Harwood, and Minniti (2013) identified the key

126   assets or what others would term life skills (e.g., Danish, Petitpas, & Hale, 1992; Gould &

127   Carson, 2008) that young people develop through sport. These life skills were: teamwork,

128   goal setting, time management, emotional skills, interpersonal communication, social skills,

129   leadership, and problem solving and decision making. Johnston et al. (2013) analyzed 34

130   papers on PYD through sport and showed that these eight life skills were cited a total of 95

131   times across these publications. These particular life skills are important as they are related

132   to a range of positive outcomes including: workplace productivity and success (Locke &

133   Latham, 1984; Rubin & Morreale, 1996), academic achievement (Britton & Tesser, 1991;

134   Humphrey et al., 2011), sport and exercise performance (Burton, Naylor, & Holliday, 2001),

135   overall health (Claessens, van Eerde, Rutte, & Roe, 2007), and psychological well-being

136   (Brackett & Mayer, 2003; Judge, Bono, Erez, & Locke, 2005). However, there is presently

137   no suitable measure to comprehensively assess the development of these key life skills within

138   sport. Therefore, our aim in developing and validating the LSSS was to provide a much

139   needed measure to comprehensively assess the eight key life skills that young people are

140   purported to develop through sport.

141   Developing such a measure would allow researchers and practitioners to further

142   investigate whether young people are developing these life skills through sport and pave the

143   way for theory-based research concerned with the antecedents and consequences of life skills

144   development. As youth development is best studied longitudinally (García-Bengoechea &

145   Johnson, 2001), the scale would allow researchers and practitioners to track young peoples'

146   development of these life skills over time and determine the mechanisms of development.

147   Finally, this scale would help researchers to investigate the efficacy of existing programs

148   designed to teach young people life skills through sport (e.g., Sport United to Promote

149   Education and Recreation, SUPER; Danish, 2002) and further promote the development of

150   theory-led life skills interventions.

151   Overall, the purpose of the present research was to develop a scale which could assess

152   the extent to which young people perceived they were developing the eight life skills through

153   sport. In line with previous research on PYD and life skills development through sport, this

154   survey was developed for youth sport participants in the 11–21 years age range (Holt, 2008).

155   In total, a series of four studies were conducted to develop and provide initial validity (i.e.,

156   content, factorial, convergent, and discriminant validity) and reliability (i.e., internal

157   consistency and test-retest reliability) evidence for the LSSS.

Study 1 – Initial Development of the Scale

159   The aim of this study was to create a scale to measure participants' perceived

160   development of the eight life skills within sport. This involved defining the life skills,

161   selecting components which best represented each life skill, and developing items to assess

162   the life skills. After developing the initial item pool, academics with expertise in one

163   individual life skill reviewed items related to that particular life skill. Based on experts'

164   ratings, items were selected for the initial version of the scale. A thorough approach to

165   developing the scale was important because several researchers have highlighted content

166   validity as an area which has been neglected when developing measures for sport psychology

167   (Gunnell et al., 2014; Zhu, 2012).

Method and Results

Selecting Definitions and Components

170   The first step when developing a scale is to define the construct/s being measured and

171   decide on the components which comprise the construct/s (Clark & Watson, 1995). A clear

172   definition and components should ensure that items created fit with the definition adopted

173   and represent all components of the construct. This is an important process as "any measure

174   must adequately capture the specific domain of interest yet contain no extraneous content"

175   (Hinkin, 1995, p. 969). An extensive review of literature relating to each life skill was

176   conducted to identify how life skills and components of the life skills have been defined in

177   theory and research. A university search engine which searches across all the major search

178   engines (e.g., psycARTICLES, psychINFO, SPORTDiscus) was used to locate relevant

179   journal articles. A range of search terms were used to find articles which defined the life

180   skills and outlined their components. For example, we searched for articles using the

181   following types of search terms in combination (e.g., teamwork and defined, teamwork and

182   components, teamwork and scale, teamwork and questionnaire, teamwork and survey, etc.).

183   In total, we found 103 articles which contained relevant definitions and components of the

184   eight life skills. From these articles, a list of 22 definitions (2–3 per life skill) and 20 sets of

185   components (2–4 per life skill) was drawn up and reviewed to establish our definition and

186   components for the life skills. The definitions and components we selected for each life skill

187   are outlined in Table A (see supplementary materials).

188   **Developing Items**

189   To help develop items, 38 measures and 34 sources of literature (e.g., journal articles

190   and book chapters) were consulted. When writing items, we sought to create items that

191   represented every component of the eight life skills. In line with the advice of MacKenzie,

192   Podsakoff, and Podsakoff (2011), global items representing the overall life skill were also

193   created (e.g., an item assessing overall teamwork skills). Similar to other scale development

194   studies (e.g., Eys, Loughead, Bray, & Carron, 2009), we sought to develop an item pool

195   which would be considerably larger than the final scale. In total, we developed 452 items

196   which represented the eight life skills. Due to the large number of items, we reviewed all

197   items and removed items which were too vague, too lengthy, too complicated, or lacked

198   relevance for the target population (DeVellis, 2011). After removing items, 270 items were

199   left representing the eight life skills and all the life skills components.

200   **Providing Content Validity Evidence**

201   To assess content validity evidence, a panel of experts were consulted. Due to the

202   number of items, expert reviewers who had published at least one journal article on one

203   particular life skill were invited to participate. In total, 202 potential reviewers were

204   contacted and 39 reviewers participated in the item review process which was conducted

205   using an online survey. The number of reviewers for each life skill was as follows: teamwork

206   ($n = 4$), goal setting ($n = 7$), time management ($n = 5$), emotional skills ($n = 5$), interpersonal

207   communication ($n = 4$), social skills ($n = 7$), leadership ($n = 5$), and problem solving and

208   decision making ($n = 2$). Reviewers had the following professional roles: full professor ($n = $

209   19), associate/assistant professor ($n = 9$), professor emeritus ($n = 2$), lecturer ($n = 2$), reader (n

210    $= 1$), associate dean ($n = 1$), dean ($n = 1$), head of department ($n = 1$), teaching assistant ($n = $

211   1), assessment coordinator ($n = 1$), and sport psychologist ($n = 1$). The countries where

212   reviewers worked were: America ($n = 20$), Canada ($n = 7$), United Kingdom ($n = 5$),

213   Australia ($n = 3$), the Netherlands ($n = 2$), Norway ($n = 1$), and Israel ($n = 1$).

214   Within the online survey, reviewers were told the purpose of the item review process

215   (e.g., to develop a scale to assess the development of teamwork skills through sport) and

216   provided with both the definition and components of the life skill. Reviewers were asked to:

217   (a) rate each item from 'poor' (1) to 'excellent' (5) on its ability to measure the life skill, (b)

218   select what component of the life skill the item related to, and (c) comment on the suitability

219   of the item (e.g., item wording and clarity, suitable for the sport domain, relates more to

220   another construct, etc.). Finally, each reviewer was asked: "Have you any other comments or

221   suggestions for improving the scale"? This methodology for providing content validity

222   evidence has been advocated by researchers (e.g., Beck & Gables, 2001; Haynes, Richards, &

223   Kubany, 1995) and used in previous sport and exercise psychology studies (e.g., Dunn,

224   Bouffard, & Rogers, 1999; Lonsdale, Hodge, & Rose, 2008).

225   After the expert review process, items were selected for the initial version of the scale

226   based on the following criteria: (1) the item must have scored well (above 3.0) on its ability

227   to measure the life skill, (2) the majority of reviewers (above 50%) must have agreed that the

228   item referred to a particular component of the life skill, and (3) reviewers' comments were

229   taken into account (e.g., negative comments about an item were considered when selecting

230   items). A 50% agreement among reviewers for retaining items has been used in previous

231   sport and exercise psychology studies (e.g., Pope & Hall, 2014). During this process, the

232   number of items was reduced from 270 to 144 items. The breakdown of the number of items

233   for each life skill is contained within Table 1. Mean scores for selected subscale items on the

234   'poor' (1) to 'excellent' (5) reviewer rating scale were: teamwork (4.2), goal setting (3.7),

235   time management (3.4), emotional skills (4.5), interpersonal communication (4.3), social

236   skills (3.9), leadership (4.1), and problem solving and decision making (5.0). Of the 144

237   items, only four items scored below the 3.0 criteria but these items were retained to ensure

238   adequate content coverage. Within their subscale, the frequency with which items were

239   assigned to the correct component was as follows: teamwork (85%), goal setting (75%), time

240   management (74%), emotional skills (83%), interpersonal communication (90%), social skills

241   (73%), leadership (89%), and problem solving and decision making (100%). Only 10 items

242   were assigned to the correct component less than 50% of the time, but as this was still an

243   initial stage of scale development these items were retained to ensure content coverage.

244   Reviewer comments such as "does not reflect any component", "will not give you much

245   variance in responses", "too general" were also taken into account when selecting items.

246   Specific reviewer feedback also helped to improve the wording of 23 items (e.g., "set goals

247   so that I can stay focused" was changed to "set goals so that I can stay focused on

248   improving") and led to the inclusion of one additional item. Finally, as readability is an

249   important consideration when conducting research with younger participants, all 144 items

250   were assessed for readability using the Flesch-Kincaid readability assessment (Harrison,

251   1980). Results showed that these items required a grade 4.9 reading level, which means that

252   the average 10–11 year old would be able to read the items.

253   After selecting items to include within the scale, three elements of the scale had to be

254   decided upon: (1) the directions given to respondents, (2) the item stem, and (3) the response

255   format. The present authors - with the help of five doctoral students - decided on these three

256   elements of the scale. The directions to be given to respondents were: "Young people have

257   all kinds of experiences and can learn a lot from playing sport. These questions ask about the

258   skills you may have learned through playing your chosen sport. Please answer the questions

259   by circling the number to the right of each question. There are no right or wrong answers, so

260   please answer as honestly as possible. Please rate how much your sport has taught you to

261   perform the skills listed below." The item stem decided upon was: "This sport has taught me

262   to…" After reviewing some of the methodological literature on response scales (e.g., Hinkin,

263   1995), we decided on the following response scale: not at all (1), a little (2), some (3), a lot

264   (4), and very much (5). A five-point response scale was chosen as it offered enough choice

265   without overwhelming respondents with too many response options – an important

266   consideration given the age range of participants (11–21 years). In his review of response

267   scales, Cox (1980) suggested that five response options is adequate for most measures. Other

268   measures within youth sport have also used this 1 (not at all) to 5 (very much) response

269   format (e.g., the Sources of Enjoyment in Youth Sport Questionnaire; Wiersma, 2001).

Discussion

271   The purpose of Study 1 was to develop a scale which adequately assessed the

272   life skills participants' perceived they developed within youth sport. Informed by the

273   work of Johnston et al. (2013), this study developed an initial 144-item scale which

274   assessed the eight key life skills that young people are purported to develop through

275   sport. The expert review process outlined in this study provided content validity

276   evidence for the items selected for the initial version of the scale. This was important

277   as both Gunnell et al. (2014) and Zhu (2012) suggested that content validity is

278   frequently neglected during scale development in sport and exercise psychology.

279   Given the large number of items in the initial version of the scale, the next study used

280   EFA and descriptive statistics to further refine the scale and assess the factor structure

281   of each subscale and the whole scale.

Study 2 – Scale Refinement and EFA

283   The purpose of this study was to reduce the number of items in the LSSS to 47 items

284   and provide initial evidence for the unidimensional factor structure of the subscales.

285   Reducing the amount of items to a more manageable number was considered necessary so

286   that the scale could be practically implemented by researchers and practitioners. A minimum

287   of 47 items was needed so that every component of each life skill would be represented in the

288   LSSS. Specifically, each life skill would have 4–8 items depending on how many

289   components comprised the life skill. Four items was the minimum for any subscale as

290   researchers have suggested at least four items are needed to describe a construct and ensure

291   adequate internal consistency reliability (Watson & Clark, 1997). Providing preliminary

292   evidence for the unidimensional structure of the subscales was important as several

293   methodologists propose that ensuring the unidimensionality of subscales is a key aspect of

294   developing a scale (Anderson & Gerbing, 1988; Clark & Watson, 1995; Kline, 2000; Reise,

295   Waller, & Comrey, 2000). In sum, the focus of this study was to refine the scale further in

296   order to develop the strongest possible measure in terms of both validity and reliability.

297   EFA was chosen at this stage so initial evidence for the factor structure of the

298   subscales and the whole scale could be assessed and the number of items in the scale could be

299   reduced prior to conducting CFA, ESEM and bifactor modeling with another sample. EFA

300   was conducted firstly at the subscale level and later for the whole scale due to the large

301   number of items involved ($N = 144$) and to ensure the refinement of each subscale before

302   proceeding to CFA, ESEM and bifactor analysis. Several methodologists and researchers

303   agree that EFA is preferable to CFA in the early stages of survey development (e.g., Brown,

304   2006; Kelloway, 1995). In particular, EFA is considered a useful method of data reduction

305   when developing or refining a scale (Anderson & Gerbing, 1988; Conway & Huffcut, 2003;

306   Floyd & Widaman, 1995), whereas model modification should be done sparingly within CFA

307   (MacCallum, 1995). Past studies in sport psychology have used EFA to refine a scale in a

308   similar manner (e.g., Eys et al., 2009).

309   **Method**

310   **Participants**

311   The sample comprised of 338 British youth sports participants (Mage = 14.71, $SD =$

312   2.42, age range = 11–21) who participated in a range of sports. Reviews of EFA studies

313   across various psychology journals has shown such a sample size to be in line with other

314   published research (Fabrigar, Wegener, MacCallum, & Strahan, 1999; Henson & Roberts,

315   2006). The main sports represented were football ($n = 87$), swimming ($n = 40$), dance ($n =$

316   34), field hockey ($n = 27$), basketball ($n = 21$), athletics ($n = 18$), golf ($n = 15$), and rugby (n

317   = 12). The sample included 84 respondents who participated in 30 other sports (e.g., tennis,

318   netball, badminton, horse riding, boxing, etc.). The sample had slightly more males ($n =$

319   189) than females ($n = 149$). Participants played their sport for an average of 5.34 hours per

320   week ($SD = 4.79$) and had an average of 6.24 years ($SD = 3.93$) playing experience.

321   **Measures**

322   **Life skills development.** The 144-item LSSS was used to measure the extent to

323   which youth sport participants perceived they were developing the eight life skills through

324   their chosen sport. This scale asks participants to "rate how much your sport has taught you

325   to perform the skills listed below". Participants responded on a five-point scale ranging

326   from 1 (*not at all*) to 5 (*very much*). Example items are contained in Table 2.

327   **Procedures**

328   Following approval from the university's ethics committee, participants were

329   recruited by contacting physical education teachers from local schools. Initial contact was

330   made via email, telephone, or face-to-face meetings and permission to survey the school

331   was granted. Prior to completing the scale, informed consent was obtained from either the

332   youth sport participant or the participant's parent or guardian if under 16 years. Participants

333   completed the scale after the researcher gave an introductory statement which explained the

334   purpose of the study, that there were no right or wrong answers, and that all information

335   provided would be confidential. The scale took approximately 20–25 minutes to complete.

336   **Data Analyses**

337   The main purpose of the data analyses was to reduce the LSSS from 144 to 47 items

338   and assess the factor structure of the subscales. Reducing the number of items involved two

339   steps: (1) conducting an EFA on each subscale, and (2) examining the descriptive statistics

340   for individual items. EFA was conducted using SPSS 19.0 (IBM Corp., 2010). Principal

341   components analysis was used as we wanted an empirical summary of the dataset

342   (Tabachnick & Fidell, 2007). An unrotated factor solution was specified as we sought to

343   explore each subscale and decide how many factors were evident. Based on expert

344   recommendations (e.g., Fabrigar et al., 1999), Kaiser's criterion (Kaiser, 1960), the scree

345   test (Cattell, 1966) and parallel analysis (Horn, 1965) were used when deciding the number

346   of factors in each subscale. Additionally, the amount of variance explained, interpretability,

347   scientific utility, and replicability of a given factor were considered when deciding to retain

348   a factor (Brown, 2006; Tabachnick & Fidell, 2007). Assessing the factor structure at this

349   early stage of scale development would allow us to ensure the unidimensional structure of

350   the life skills subscales and create additional components of the life skills if necessary.

351   After deciding the number of factors in each subscale, the next step was to select

352   items for the next version of the scale. The following information was collated and used to

353   decide on items to retain: (1) factor loadings, (2) cross-loadings, (3) mean scores, (4)

354   standard deviations, and (5) skewness and kurtosis values. First, we selected items with the

355   highest possible factor loading during EFA. Comrey and Lee (1992) propose that loadings

356   greater than .71 are considered excellent, .63 very good, .55 good, .45 fair, and .32 poor.

357   This criteria was used to help select items. Second, we chose items which did not cross-load

358   substantially with other potential factors. Where possible, this meant selecting 'pure' items

359   which are correlated highly with only one factor (Tabachnick & Fidell, 2007). Third, we

360   selected items with a mean score closer to the mid-point (3) on the 1–5 scale. This was in

361   line with the proposition that items convey little information if respondents simply agree

362   with them by circling the endpoint of the response scale (Clark & Watson, 1995). Fourth,

363   we chose items with a higher standard deviation in order to ensure variability in responses.

364   This meant that items would have the ability to detect both high responders (i.e., those who

365   perceive they learned 'a lot' about a life skill) and low responders (i.e., those who perceive

366   they learned 'a little' about a life skill). Fifth, we looked to select items with values closer

367   to zero for both skewness and kurtosis. This would help ensure that items display a normal

368   distribution, which is a fundamental assumption of most statistical tests (Tabachnick &

369   Fidell, 2007). In line with our overall approach, several researchers recommend using factor

370   loadings, cross loadings, mean scores, standard deviations, skewness and kurtosis values to

371   evaluate items when developing a scale (e.g., Clark & Watson, 1995; DeVellis, 2011;

372   Hinkin, 1995; MacKenzie et al., 2011; Stanton, Sinar, Balzer, & Smith, 2002).

373   **Results**

374   **Preliminary Analyses**

375   Prior to the main analyses, the data were screened for normality. Skewness values

376   ranged from -1.30 to -.02 and kurtosis values ranged from -1.32 to 1.47, indicating

377   reasonable normality (Tabachnick & Fidell, 2007). Of the 144 items in the LSSS,

378   participants failed to respond to an average of 3.76 items ($SD = 2.32$; range = 0–11).

379   Missing data analysis revealed no pattern to these missing values, rather the data was

380   missing at random. As the percentage of missing data was low (2.6%), a mean substitution

381   was performed. Mean substitution is a valid approach for dealing with missing data in a

382   moderately sized data set (Tabachnick & Fidell, 2007).

383   Preliminary tests were carried out to assess the suitability of the data for EFA.

384   Bartlett's (1937) test statistic was significant for each of the eight life skills: teamwork,

385    $\chi^2(253) = 3{,}765.07$, $p < .001$; goal setting, $\chi^2(91) = 2{,}917.35$, $p < .001$; time management,

386    $\chi^2(66) = 2{,}654.54$, $p < .001$; emotional skills, $\chi^2(325) = 5{,}430.98$, $p < .001$; interpersonal

387   communication, $\chi^2(78) = 2{,}805.25$, $p < .001$; social skills, $\chi^2(153) = 3{,}492.07$, $p < .001$;

388   leadership, $\chi^2(253) = 5{,}477.90$, $p < .001$; and problem solving and decision making, $\chi^2(105)$

389    $= 3{,}861.38$, $p < .001$. The KMO measure of sampling adequacy for each of the subscales

390   ranged from .93–.96, indicating superb sampling adequacy (Hutcheson & Sofroniou, 1999).

391   The majority of off-diagonal elements on the anti-image covariance matrix were less than .1.

392   Combined, these tests indicated that the correlation matrix was suitable for EFA (Dziuban &

393   Shirkey, 1974).

394   **EFA Results**

395   **Teamwork.** The teamwork subscale had four factors with eigenvalues above 1.0

396   (see Table B in supplementary materials). In contrast, both the scree plot and parallel

397   analysis suggested retaining two factors. To aid in the interpretation of these two factors, a

398   further oblique (direct oblimin; $\delta = 0$) rotation was performed as the factors were thought to

399   be correlated rather than orthogonal (Conway & Huffcut, 2003). Factor one contained 11

400   items (e.g., "work well within a team/group" and "help build team/group spirit") with factor

401   loadings above .55 which is considered 'good' (Comrey & Lee, 1992). Factor two only

402   contained three items with factor loadings above .55. These items were difficult to interpret

403   as a separate teamwork factor that would have scientific utility; thus, we interpreted

404   teamwork as involving one factor and excluded these three items from the first version of

405   the scale.

406   **Other seven life skills.** For the other life skills, despite some eigenvalues suggesting

407   additional factors, the scree plots and parallel analyses suggested retaining one factor only

408   (see Table B in supplementary materials). Therefore, we interpreted goal setting, time

409   management, emotional skills, interpersonal communication, social skills, leadership, and

410   problem solving and decision making as each having one factor.

411   **Item Selection Results**

412   To aid in the selection of items, results tables containing factor loadings, cross-

413   loadings, mean scores, standard deviations, skewness and kurtosis values were created for

414   each of the life skills. Table C (see supplementary materials) provides an example of one of

415   the eight tables used for comparing items. Using these results tables allowed the researchers

416   to compare individual items for each life skill and decide on the items to retain for the first

417   version of the scale. In total, 47 items were selected for the scale (see Table 1 for the

418   number of items per life skill).

419   To investigate potential cross-loadings of these items on non-intended life skills, a

420   further EFA with oblique (direct oblimin; $\delta = 0$) rotation was conducted on the 47 items as

421   the factors were thought to be correlated (Conway & Huffcut, 2003). The resulting pattern

422   matrix can be seen in Table D. From the pattern matrix, we can see that 46 of the 47 items

423   loaded onto their intended life skill. Only one teamwork item ("accept suggestions for

424   improvement from others") did not load on its intended factor and instead loaded on an

425   unintended life skill (i.e., problem solving and decision making). However, we decided to

426   retain this item to ensure that the 'accepting suggestions or criticism' component of

427   teamwork was represented in the final scale and the content validity of the teamwork

428   subscale was not compromised. The pattern matrix also shows that one emotional skills

429   item ("help someone control their emotions when something bad happens") and two

430   problem solving items ("think carefully about a problem" and "create as many possible

431   solutions to a problem as possible") cross-loaded significantly on non-intended life skills.

432   Given that these items primary factor loadings were of a higher value than their secondary

433   factor loadings, we decided to retain both items.

434   Within their subscales, the factor loadings for retained items ranged from .44–.85

435   (see Table 2). The majority of items had 'excellent' factor loadings (above .71, $n = 41$) with

436   a small number of items displaying 'very good' factor loadings (above .63, $n = 5$). Only one

437   item displayed a factor loading less than .63. This item was from the teamwork subscale

438   ("accept suggestions for improvement from others") and displayed a factor loading of .44.

439   As none of the other items representing the 'accepting suggestions and criticism' component

440   of teamwork had higher factor loadings, we retained this item to ensure content coverage.

441   Within the component matrix for their subscales, only 11 of the 47 items selected displayed

442   any tendency to cross-load with other potential factors. Ten of these items had cross

443   loadings of .30–.39 on a potential second factor. These values were considerably lower than

444   the first factor loading and as such were not problematic. Only one item from the teamwork

445   subscale ("accepting suggestions for improvement from others") had a cross-loading which

446   was higher than its first factor loading. Mean scores for the selected items ranged from 3.33

447 to 4.13 indicating that participants learned between 'some' and 'a lot' about the life skills.

448 The standard deviation of the retained items ranged from .86–1.24. Both the mean scores

449 and standard deviations indicated that the items would ensure a certain level of variability

450 amongst responses, which would allow the survey to discriminate between high and low

451 responders. Lastly, skewness values ranged from -1.18 to -.25 and kurtosis values ranged

452 from -.86 to 1.55, indicating reasonable normality (Tabachnick & Fidell, 2007). With the

453 retained items, we calculated Cronbach's alpha coefficients for each of the eight subscales

454 (see Table 1). All were above the .70 value deemed adequate for the psychological domain

455 (Nunnally & Bernstein, 1994).

Discussion

457   It has been proposed that researchers should pay greater attention to front-end

458 processes such as scale refinement when developing a new scale (MacKenzie et al., 2011).

459 In keeping with this recommendation, the main purpose of Study 2 was to reduce the LSSS

460 to a more practical number of items that had both statistical and conceptual integrity. Based

461 on criteria recommended by several researchers (e.g., Clark & Watson, 1995; DeVellis,

462 2011; Hinkin, 1995; MacKenzie et al., 2011), a rigorous process of item selection guided our

463 choice of the 47 items included in the first version of the scale. EFA helped identify items

464 which displayed high factor loadings on a first factor and did not cross-load with other

465 potential factors. Analysing the descriptive statistics meant that we chose items which not

466 everyone agreed with, ensured a reasonable level of variability, and would produce a normal

467 distribution in future studies. Combined, using both EFA and descriptive statistics ensured

468 the best items were selected for the next version of the scale.

469   This second study also provided preliminary support for the factor structure and

470 internal consistency reliability of the eight subscales and the whole scale. However, as

471 validity is an ongoing process (DeVellis, 2011), it was important to confirm the factor

472   structure of each subscale and the full scale with another sample. Evidence for convergent

473   and discriminant validity would also need to be assessed during the subsequent study.

474   **Study 3 – CFA, ESEM & Bifactor Analysis**

475   The aim of the third study was to assess the eight-factor structure of the 47-item

476   LSSS. Building on the previous study, we tested the factor structure of each subscale and

477   the whole-model using a model testing approach. For this task, another independent sample

478   of youth sport participants completed the scale. This allowed for the assessment of factorial,

479   convergent, and discriminant validity evidence for the LSSS. To replicate the findings of

480   the previous study, the internal consistency reliability of each subscale was also tested.

481   **Method**

482   **Participants**

483   The sample included 223 British youth sports participants (Mage = 15.01, SD =

484   2.81, age range = 10–21 years). A sample size greater than 200 is considered adequate for

485   CFA (e.g., Barrett, 2007; Brown, 2006; Myers, Ahn, & Jin, 2011) and approximates the

486   five-year median sample size for correlational studies across the major sport and exercise

487   psychology journals (Schweizer & Furley, 2016). It must be noted that parameters for

488   adequate sample size have yet to be determined in relation to ESEM or bifactor analysis

489   (Ntoumanis, Mouratidis, Ng, & Viladrich, 2015). The main sports represented in the

490   sample were football (n = 82), dance (n = 25), swimming (n = 22), field hockey (n = 16),

491   rugby (n = 15), and basketball (n = 10). In total, 63 respondents participated in 23 other

492   sports (e.g., track and field, golf, horse riding, etc.). The sample comprised more males (n

493   = 131) than females (n = 92), with participants having an average of 6.87 years (SD = 4.08)

494   playing experience. Participants played their sport for an average of 5.35 hours per week

495   (SD = 4.08).

496   **Measures and Procedures**

497   **Life skills development.** The 47-item LSSS refined in Study 2 was used to

498   measure the extent to which youth sport participants perceived they were developing life

499   skills through their chosen sport (see Table 2 for example items). Prior to collecting any

500   data, approval was granted by the university's ethics committee. Following the same

501   procedures for recruitment, informed consent, and questionnaire administration as Study 2,

502   participants completed the scale in approximately 10 minutes.

503   **Data Analyses**

504   To begin with, CFA employing maximum likelihood estimation was conducted using

505   Mplus (Version 7.4; Muthén & Muthén, 1998–2015). When conducting CFA, the first step

506   was to examine each subscale for fit. After ensuring that the subscales displayed an adequate

507   fit, a series of models were tested. The following fit indices were used to assess model fit:

508   chi-square (χ^2), chi-square statistic divided by degrees of freedom (*df*), RMSEA (Stieger &

509   Lind, 1980), CFI (Bentler, 1990), and TLI (Tucker & Lewis, 1973). Biddle, Markland,

510   Gilbourne, Chatzisarantis, and Sparkes (2001) suggest that the principal means of assessing a

511   good fit is a non-significant chi-square ($p > .05$). However, with a large sample size ($N >$

512   200), models rarely fit via the chi-square test statistic (Barrett, 2007). Consequently,

513   Jöreskog and Sörbom (2003) have recommended that large chi-square values relative to *df*

514   indicate a poor fit, and small values indicate a good fit. Researchers suggest that the chi-

515   square value relative to *df* ratio should be 3:1 or lower (e.g., Tabachnick & Fidell, 2007). Hu

516   and Bentler's (1999) criteria was used for assessing the RMSEA, CFI and TLI values. An

517   RMSEA of equal or less than .06 indicates a close fit, less than .08 a reasonable fit, and

518   greater than .10 a poor fit. For the CFIs and TLIs, >.90 indicates adequate fit and >.95

519   indicates excellent fit.

520   To assess convergent validity evidence, we checked to see whether items loaded

521   significantly onto their hypothesized factor by displaying a *p*-value less than .01 (Anderson &

522   Gerbing, 1988). To evaluate discriminant validity evidence for the eight subscales,

523   competing models where the unconstrained model was compared to a series of models where

524   the correlation between pairs of factors was constrained to 1.00 were performed. For

525   discriminant validity to be evident, the unconstrained models chi-square value has to be

526   significantly less than the constrained model (cf. Anderson & Gerbing, 1988). Competing

527   models were compared using the χ^2 difference test. This involved subtracting the χ^2 value of

528   the constrained model from the χ^2 value of the unconstrained model, and subtracting the *df* of

529   the constrained model from the *df* of the unconstrained model. The resulting χ^2 difference

530   value and its associated *df* are then compared against the *Critical Values of Chi-Square* table

531   (see Tabachnick & Fidell, 2007, p. 949). If the χ^2 difference value and its associated *df* are

532   significant, the unconstrained model would fit the data best. It must be noted that some

533   researchers agree with Anderson and Gerbing's (1988) method of assessing convergent and

534   discriminant validity evidence within an overall scale (e.g., John & Benet-Martínez, 2000;

535   Brown, 2006) whereas others disagree (e.g., Gunnell et al., 2014). Given the breadth and size

536   of the scale (eight life skills and 47 items), we felt it was necessary to assess convergent and

537   discriminant validity evidence within the overall scale. A similar approach has been taken by

538   other researchers during scale development (e.g., Lonsdale, Hodge, & Rose, 2008).

539   When developing a scale, it is important to test other plausible models which can be

540   compared to the fit of the original model (Jackson, Gillaspy, & Purc-Stephenson, 2009). To

541   achieve this aim, we tested several models using the procedures outlined by Appleton,

542   Ntoumanis, Quested, Viladrich, and Duda (2016), and Myers, Martin, Ntoumanis, Celimli,

543   and Bartholomew (2014). We began by testing an eight-factor CFA model which allowed all

544   eight life skills factors to correlate but restricted items to load only on their intended life skill

545   factor. We then compared the original eight-factor CFA model to a second-order model (i.e.,

546   eight factors composing a higher-order factor) and a first-order model (i.e., one factor

547   representing all 47 items).

548   Recent research suggests several limitations to the CFA approach. Firstly, CFA relies

549   on the highly restrictive Independent Cluster Model (ICM), which means that items are only

550   permitted to load on their intended factor and possible cross-loadings with other factors are

551   restricted to zero (Tomás, Marsh, González-Romá, Valls, & Nagengast, 2014). This is

552   problematic as items within multidimensional measures are rarely 'pure' indicators of only

553   one factor (Morin, Arens, & Marsh, 2016). Another limitation of CFA is the inflated

554   correlations between factors that result from the highly restrictive ICM-CFA model (see

555   Asparouhov & Muthén, 2009; Tomás et al., 2014). A final limitation is that it is quite

556   common to obtain a poor fit via CFA with no clear sources of misfit being evident

557   (Asparouhov & Muthén, 2009).

558   To overcome these limitations, Asparouhov and Muthén (2009) proposed ESEM,

559   which combines the principles of EFA (i.e., allowing for the cross loading of items) within a

560   CFA/SEM framework (i.e., fit indices to assess model fit). Within ESEM, items load on their

561   intended factor, loadings on non-intended factors are freely estimated at non-zero values, and

562   the factors can be correlated (Ntoumanis et al., 2015). The ESEM approach is thought to

563   overcome the highlighted limitations of CFA and provide a better representation of data from

564   multidimensional scales (Morins et al., 2016). Asparouhov and Muthén (2009) maintain that

565   ESEM is a useful approach following an initial EFA. Furthermore, the advantages of using

566   ESEM in the development of multidimensional scales has been highlighted by recent studies

567   in sport and exercise psychology (e.g., Appleton et al., 2016; Myers, 2013). In an extension

568   to ESEM, research by Morin, Marsh, and colleagues (see Morin, Marsh, & Nagengast, 2013;

569   Marsh, Morin, Parker, & Kaur, 2014; Marsh, Nagengast, & Morin, 2013) has proposed an

570   ESEM-within-CFA model, which permits the testing of higher-order models based on ESEM

571   models (H-ESEM). This H-ESEM model is advantageous when testing multidimensional

572   scales as the inclusion of a higher-order construct ensures the aforementioned cross-loadings

573   between factors are not inflated (Morin et al., 2016).

574   Along with ESEM and H-ESEM, psychometric experts (e.g., Morin et al., 2016;

575   Myers et al., 2014; Ntoumanis et al., 2015) have advocated testing the structure of

576   multidimensional scales using a bifactor CFA model (B-CFA) and a bifactor ESEM model

577   (B-ESEM). With bifactor models, all items in the scale are viewed as indicators of a general

578   factor and a specific factor (Ntoumanis et al., 2015). Bifactor models should be tested when

579   the researcher is investigating multifaceted concepts (Reise, 2012) or when investigating the

580   presence of a single global factor (Howard, Gagné, Morin, & Forest, 2016). Using the

581   present research as an example, the B-CFA model would allow items to load onto two

582   factors: (1) a general life skills factor, and (2) a specific life skill factor the item relates to.

583   With the B-CFA model, correlations between all factors are constrained to zero and all items

584   are only permitted to load on their intended factor, with loadings on unintended factors

585   constrained to zero. Using the B-ESEM framework, researchers can also conduct a bifactor

586   rotation within an EFA/ESEM framework. Using the current research as an example, the B-

587   ESEM approach would allow items to load onto a general life skills factor along with all of

588   the specific life skills factors. With the B-ESEM model, correlations between all factors are

589   constrained to zero, but all items are allowed to cross-load onto unintended factors.

590   Summarising the information presented above, we tested several competing models

591   which included: an eight-factor CFA model, a second-order CFA model, a first-order CFA

592   model, a B-CFA model, an ESEM model, a H-ESEM model, and a B-ESEM model. All

593   models were tested in Mplus (Version 7.4; Muthén & Muthén, 1998–2015) based on the

594   robust maximum likelihood (MLR) estimator. When modeling the B-CFA structure, the

595   global and specific factors were specified as orthogonal to ensure that the interpretability of

596   the solution was in line with bifactor assumptions. For ESEM, a target rotation was utilized

597   with all cross-loadings "targeted" to be close to zero and all main loadings freely estimated.

598   A target rotation is purported to lead to better results with larger and more complicated

599   models (Asparouhov & Muthén, 2009) as is the case with the LSSS. From the ESEM model,

600   a H-ESEM model was estimated using ESEM-Within-CFA (Morin et al., 2013), with all

601   eight life skills being specified as related to a higher order life skills factor. For the B-ESEM

602   model, an orthogonal bifactor target rotation was employed when estimating the model

603   (Reise, 2012). The eight group factors were defined from the same pattern of target and non-

604   target factor loadings that was used in the ESEM model and all items were allowed to load

605   onto a global life skills factor.

606   To compare alternative models, we adopted the procedures of Morin et al. (2016).

607   When comparing models, similar fit is evident when changes in the CFI are < .01 and

608   increases in RMSEA are < .015 (Chen, 2007; Cheung & Rensvold, 2002). Changes in the

609   TLI of < .01 indicate a similar fit with models involving a complex structure (Marsh et al.,

610   2009; Morin et al., 2013). We also examined the Akaike Information Criteria (AIC; Akaike,

611   1987), the Bayesian Information Criterion (BIC; Schwartz, 1978), and the sample size

612   adjusted BIC (ABIC; Sclove, 1987) when comparing models. Lower values for AIC, BIC,

613   and ABIC are indicative of better model fit (Appleton et al., 2016). Finally, after testing all

614   models, we tested each of the eight subscales for internal consistency reliability.

Results

616   **Preliminary Analysis**

617   Prior to conducting the main analyses, the data were screened for normality.

618   Skewness values ranged from -1.35 to -.30 and kurtosis values ranged from -.82 to 1.87,

619   indicating reasonable normality (Tabachnick & Fidell, 2007). Of the 47 items, participants

620   failed to respond to an average of 2.65 items ($SD = 2.16$; range = 0–10). Missing data

621 analysis revealed no pattern to these missing values, rather the data was missing at random.

622 Consequently, a mean substitution was performed in SPSS to replace missing data.

623 **Subscale Results**

624   CFA results for each of the eight subscales are contained in Table 3. Seven of the

625 eight subscales demonstrated excellent fit. Only the emotional skills subscale displayed a

626 less than adequate fit. However, the factor loadings for this subscale did not reveal any items

627 that were affecting model fit (see Table 2). To further investigate model fit, we separately

628 assessed the four items that dealt with 'my emotions' and the four items that dealt with

629 'others emotions' to see whether a better fit could be achieved. The 'my emotions' subscale

630 displayed an excellent fit, $\chi^2 = 2.49(2)$, $p = .29$, $\chi^2/df = 1.25$, RMSEA = .03, CFI = 1.00, TLI

631 = 1.00, whereas the 'others emotions' subscale displayed a poor fit, $\chi^2 = 21.04$, $p < .001$, χ^2/df

632 = 10.52, RMSEA = .21, CFI = .95, TLI = .84. Therefore, we only retained the 'my emotions'

633 items for the emotional skills subscale. However, we did test the 'others emotions' subscale

634 across younger (10–14 years, $n = 114$) and older (15–21 years, $n = 109$) participants to

635 investigate whether age played a role in the inadequate fit of this subscale. The 'others

636 emotions' subscale displayed a poor fit with younger participants, $\chi^2 = 18.77(2)$, $p < .001$,

637 $\chi^2/df = 9.39$, RMSEA = .27, CFI = .89, TLI = .66; whereas, it displayed a reasonable fit with

638 older participants, $\chi^2 = 5.19(2)$, $p = .07$, $\chi^2/df = 2.60$, RMSEA = .12, CFI = .99, TLI = .95.

639 **Model Testing Results**

640   After removing the four 'others emotions' items, the full 43-item model was firstly

641 tested using CFA. The full eight-factor model displayed an adequate fit (see Table 3).

642 Providing evidence of convergent validity, results showed that all items loaded significantly

643 onto their hypothesized factor when tested within the eight-factor model (see Table E of the

644 supplementary materials). The average factor loading for the 43 items was .73, which is

645 considered excellent (Comrey & Lee, 1992). Only one teamwork item ("accepting

646   suggestions for improvement from others") had a factor loading less than .40. Analysis for

647   discriminant validity between subscales revealed that all 28 unconstrained CFA models had

648   significantly lower chi-square values than the constrained models, providing evidence for the

649   discriminant validity between subscales (Anderson & Gerbing, 1988).

650   During the analyses, other competing models were examined. The fit indices and

651   information criteria for these models are contained in Table 3 and the factors loadings for

652   these models are contained in Tables E, F, and G (see supplementary materials). When

653   tested, the first-order CFA model displayed a poor fit. This indicated that one overriding

654   factor is not appropriate to represent all 43 life skills items. The second-order model

655   displayed adequate results for fit, with the exception of the .89 TLI value. Given the

656   closeness of the TFI value to Hu and Bentler's (1999) >.90 criteria and keeping the

657   complexity/size of the model in mind (Cheung & Rensvold, 2002), we felt the second-order

658   CFA model provided a reasonable fit. Furthermore, all eight life skills factors loaded

659   significantly onto the higher-order factor (*M* factor loading = .77, range = .64–.88). When

660   tested, the B-CFA displayed an adequate model fit with the fit indices being very similar to

661   the eight-factor and second-order CFA models. Additionally, all items loaded significantly

662   onto the general life skills factor and their specific life skill factor. The only exception was

663   one teamwork item which did not load on the specific teamwork factor but was retained to

664   ensure content coverage. We also tested a series of ESEM solutions. The ESEM, H-ESEM,

665   and B-ESEM models all displayed an adequate fit with similar fit indices across each

666   solution. Overall, the ESEM models provided a better fit than the CFA solutions as

667   evidenced by improved fit indices and lower AIC, BIC, and ABIC values. Both the ESEM

668   and H-ESEM models appeared to provide the best representation of the data because they

669   displayed the best fit indices and lowest AIC, BIC, and ABIC values when compared to all

670   other models.

671   Along with examining fit indices and information criteria, Morin and colleagues

672   (2016) suggested that researchers should examine parameter estimates and theoretical

673   conformity of the models to guide the selection of the best model. This initially involves

674   comparing CFA and ESEM models before comparing all ESEM models (Morin et al., 2016).

675   It is suggested that an ESEM model should be preferred over a CFA model when the factor

676   correlations are substantially reduced (Marsh et al., 2009; Howard et al., 2016). In the

677   current study, the ESEM factor correlations (M = .37, range = .20–.56) were substantially

678   smaller than in the eight-factor CFA model (M = .59, range = .33–.78). Table H of the

679   supplementary materials contains a complete list of these factor correlations. An examination

680   of the ESEM parameter estimates (see Table F of the supplementary materials) revealed well

681   defined factors for the eight life skills. With the exception of one teamwork item (factor

682   loading = .10, p = .28), all items loaded significantly onto their intended factor, with the

683   average factor loading being .60 (range = .10–.87). Although there were several significant

684   cross-loadings, they were substantially lower than the primary factor loadings, except for the

685   one teamwork item. With the B-ESEM model, all items loaded significantly onto the general

686   factor, with the average factor loading being .57 (range = .23–.71). In contrast, 10 items

687   failed to load on their specific factor, with the average loading on specific factors being .44

688   (range = .09–.69). Of the items which failed to load on their intended factor, six items were

689   from the leadership factor, two from the social skills factor, one from interpersonal

690   communication, and one from teamwork. Cross-loadings were less evident in the B-ESEM

691   solution as compared to the ESEM solution, but the ESEM solution was still preferable as it

692   displayed more defined factors for the eight life skills (i.e., items that loaded significantly

693   onto their intended factor). With the H-ESEM model, seven of the eight lower-order factors

694   loaded significantly onto the higher-order factor with loadings ranging from .54–.77 (M =

695   .65). Only the interpersonal communication skills factor failed to load onto the higher-order

696   factor, as it had a .16 loading ($p = .40$).

697   In sum, the ESEM models provided a better fit than the CFA models, albeit three of

698   the four CFA models did provide an adequate fit. Factors were more distinctive in the ESEM

699   model as compared to the eight-factor CFA model as evidenced by the factor correlations. Of

700   the ESEM models, both the ESEM and H-ESEM provided a slightly better fit than the B-

701   ESEM model. Despite some problems with one teamwork item and cross-loadings of some

702   items, the ESEM and H-ESEM models clearly provided an adequate fit to the data.

703   Lastly, the internal consistency reliability for each subscale was tested (see Table 1).

704   All alpha coefficients were above the .70 criterion suggested by Nunnally and Bernstein

705   (1994). Mean scores for the subscales also revealed that participants perceived they were

706   learning at least 'some' and at most 'a lot' about the eight life skills. Teamwork,

707   interpersonal communication, social skills, and leadership were the life skills participants

708   perceived they learned the most about.

709   **Discussion**

710   The main purpose of this study was to assess the factor structure of the 47-item

711   LSSS. When tested individually, seven of the eight subscales displayed excellent factorial

712   validity evidence. Only the emotional skills subscale displayed an inadequate fit. After

713   removing four items dealing with 'others emotions' this subscale displayed an excellent fit.

714   There may be a specific reason why the 'others emotions' subscale did not provide an

715   adequate fit. Although emotional skills involve dealing with one's own and others' emotions

716   (Gignac, Palmer, Manocha, & Stough, 2005), it is possible that youth sport participants as

717   young as 11 years may be more familiar in dealing with their own emotions. This hypothesis

718   was supported by the fact that the fit indices for the 'others emotions' subscale were poor for

719   the younger sample and reasonable for the older sample. Using a larger sample size than the

720   present study (i.e., $n = 109$), future studies could attempt to develop an 'others emotions'

721   scale with older participants who may be more knowledgeable and practiced in dealing with

722   other peoples' emotions.

723   Within Study 3, the model testing approach recommended by Jackson et al. (2009)

724   showed that ESEM solutions were superior to CFA solutions in terms of fit indices,

725   information criteria, and the distinctiveness of factors. Such a finding supports previous

726   research within sport and exercise psychology (e.g., Appleton et al., 2016; Tomás et al.,

727   2014). When comparing the various models, the ESEM and H-ESEM models fitted the data

728   best. However, with the exception of the first-order model, it must be noted that all other

729   models provided an adequate fit. Given the reasonable fit of all models, we would

730   recommend that future studies continue to investigate the factor structure of the LSSS using

731   CFA, ESEM, and bifactor models. A noteworthy result with the bifactor models was that all

732   items (with the exception of one teamwork item) loaded onto the general life skills factor.

733   This suggests that a general life skills factor is evident within the data and it may be

734   appropriate to calculate a total life skills score comprising of scores for all eight life skills.

735   However, the eight life skill factors also loaded onto a higher-order factor when tested within

736   the second-order CFA model and H-ESEM model, with the only exception being the

737   communication skills factor in the H-ESEM solution. Future research comparing these

738   models is important, as future studies may seek to investigate the mechanisms that lead to

739   overall life skills development or to the development of specific life skills – a research goal

740   best suited to a bifactor solution.

741   Before proceeding, it is important to note that some general considerations in relation

742   to ESEM and bifactor modelling should be taken into consideration when interpreting the

743   models tested in the current study. Specifically, some key aspects of ESEM and bifactor

744   modeling remain somewhat unexplored in the literature. For instance, issues related to

745   sample size and statistical power (Myers et al., 2011), the best choice of rotation (Morin &

746   Maïano, 2011; Myers et al., 2014), and the performance of fit indices (Marsh et al., 2010)

747   remain unclear. Furthermore, some researchers would actually debate the need for ESEM

748   models (e.g., Herman & Pfister, 2013) and others would suggest that bifactor models are

749   over-interpreted within the literature (Revelle & Wilt, 2013).

750   In sum, the current study provided evidence for the factorial validity, convergent

751   validity, discriminant validity and internal consistency reliability of the LSSS. Such evidence

752   is important as establishing the validity and reliability of measures is considered the first

753   stage of the research process (Schutz, 1994). By providing validity and reliability evidence

754   for the LSSS, we can be more assured of the accuracy of our measurement of the eight life

755   skills and thus more confident in our research findings using the scale. However, as validity

756   and reliability should be continually assessed (DeVellis, 2011), future studies should look to

757   replicate such findings. A second form of reliability which has yet to be examined during the

758   scale validation process is test-retest reliability. Therefore, the next study assessed the test-

759   retest reliability of the scale with an independent sample of youth sport participants.

Study 4 – Test-Retest Reliability

761   The purpose of this study was to assess the test-retest reliability of the LSSS. Test-

762   retest reliability is a method used to assess the temporal stability of a scale; that is, how

763   constant scores remain from one occasion to another (DeVellis, 2011). Zhu (2012)

764   highlighted that most scale development and validation studies in sport psychology fail to

765   assess this form of reliability. According to Vaughn, Lee, and Kamata (2012), administering

766   a test twice to the same set of subjects over a relatively short period of time and correlating

767   the two measurements is the most straightforward method of assessing reliability. In the

768   present study, a two-week test-retest analysis was performed to establish the reliability of

769   each of the LSSS subscales. Two weeks was deemed appropriate as it was unlikely that

770   participants' perceptions of life skills development would change over this time. Thus, if the

771   LSSS is a reliable measure of life skills development through sport it should produce similar

772   scores over a two-week period.

<div align="center">**Method**</div>

Participants

775   The sample included 37 British youth sports participants (Mage = 18.96, SD = 1.25,

776   age range = 17–21) who completed the scale on two occasions. Participants were recruited

777   from first year university seminars and met the criteria for being youth sport participants (i.e.,

778   between 11–21 years and currently taking part in sport). The main sports represented were

779   football (n = 10), rugby (n = 5), athletics (n = 5), and field hockey (n = 3). In total, 14

780   respondents took part in 10 other sports (e.g., basketball, American football, karate, etc.).

781   The sample included more males (n = 24) than females (n = 13), with participants having an

782   average of 8.47 years (SD = 3.87) playing experience. Participants played their sport for an

783   average of 6.00 hours per week (SD = 3.62).

Measures and Procedures

785   **Life skills development.** The revised 43-item LSSS was used to measure the extent

786   to which youth sport participants perceived they were developing life skills through their

787   chosen sport (see Table 2 for example items). Participants completed the LSSS after

788   seminars which were two weeks apart. Before collecting any data, approval was granted by

789   the university's ethics committee and informed consent was obtained from all participants.

790   Participants completed the scale after the researcher gave the same introductory statement

791   described in Study 2. The scale took 5–10 minutes to complete on each occasion and no

792   incentive for participation was provided.

Data Analysis

794   Intraclass correlation coefficients were used to assess test-retest reliability. Intraclass

795   correlation coefficients are a measure of reliability which can range from 0, indicating no

796   reliability, to 1, indicating perfect reliability (Weir, 2005). Values above .70 provide

797   evidence of adequate reliability (Mitchell & Jolley, 2001).

Results

799   The intraclass correlation coefficients in this study were all above the .70 criterion

800   needed to provide evidence of adequate reliability: teamwork (.93), goal setting (.93), time

801   management (.92), emotional skills (.87), interpersonal communication (.89), social skills

802   (.86), leadership (.93), and problem solving and decision making (.82). For each life skill,

803   participants rated themselves above 3 (*some*) and generally closer to or above 4 (*a lot*) on the

804   1–5 scale. The four life skills which participants perceived they learned the most about were

805   teamwork, interpersonal communication, social skills, and leadership.

Discussion

807   The findings from this study provided evidence for the test-retest reliability of the

808   LSSS over a two-week period. This was important as it demonstrates that scores obtained

809   using the LSSS were stable over this timeframe, which provides researchers with greater

810   confidence that the measure is accurately capturing participants' perceptions of life skills

811   development in a consistent manner. In assessing test-retest reliability, we also addressed a

812   common weakness of scale development and validation studies in sport psychology (Zhu,

813   2012). Like validity, reliability is also an ongoing process (DeVellis, 2011) and, as such,

814   future studies should assess the test-retest reliability of the LSSS over different periods of

815   time (e.g., 1–6 weeks) and with younger participants.

Overall Discussion

817   The purpose of the present research was to develop a scale to comprehensively assess

818   participants' perceptions of life skills development through sport. The studies described led

819   to the development of the 43-item LSSS, which measures teamwork, goal setting, time

820   management, emotional skills, interpersonal communication, social skills, leadership, and

821   problem solving and decision making. These are the most frequently cited life skills which

822   young people are purported to develop through sport (Johnston et al., 2013). Four separate

823   studies provided evidence for the construct validity of the LSSS. Using 39 expert reviewers,

824   Study 1 provided evidence for the content validity of items selected for the initial version of

825   the scale. Study 2 provided evidence for the unidimensional factor structure of the LSSS

826   subscales and refined the scale to 47 items using EFA and descriptive statistics. Study 3 led

827   to the reduction of the scale to 43 items and provided evidence for the factorial, convergent

828   and discriminant validity of the subscales. The model testing approach utilized in this study

829   suggested that ESEM solutions, particularly ESEM and H-ESEM models, best represented

830   the data. Using a sample of youth sport participants, Study 4 provided evidence for the test-

831   retest reliability of the scale over a two-week period. Finally, Studies 2–4 provided evidence

832   for the internal consistency reliability of the LSSS subscales.

833   The studies in this research paper followed a rigorous process of scale development

834   and validation which was guided by 'best practice' recommendations (e.g., DeVellis, 2011).

835   Addressing the concerns of Zhu (2012) and Gunnell et al. (2014), this research provided

836   evidence for both the content validity of items and the test-retest reliability of the subscales.

837   Such a thorough approach to scale development and validation cannot be underestimated, as

838   providing both validity and reliability evidence are the cornerstones of accurate measurement

839   in psychology. As Schutz (1994) suggested, ensuring scales are both valid and reliable

840   should be the first stage of the research process. Without establishing validity and reliability

841   evidence for a measure, we cannot study the construct/s in question with any scientific

842   validity. Validity and reliability evidence from the present research suggests that researchers

843   who use the LSSS can be confident in the accuracy of the scores they obtain, the relationships

844   they find with other variables, their interpretation of such relationships, and the implications

845   for both coaches and participants.

846   Having established the validity and reliability of the LSSS, the findings from studies

847   2–4 also demonstrate that British youth sport participants perceive they are developing a

848   range of life skills through sport. Consistently, these studies indicated that participants

849   perceived they learned between 'some' and 'a lot' about the eight life skills. Such findings

850   support research with athletes, coaches, and parents which has shown that American (Gould

851   et al., 2007, 2012), Canadian (Brunelle et al., 2007; Camiré et al., 2009; Fraser-Thomas &

852   Côté, 2009; Holt, 2007; Holt et al., 2008; Strachan, Côté, & Deakin, 2011) and Australian

853   (Vella et al., 2013) participants are developing these life skills through sport. From the

854   current research, one could conclude that British youth sport participants perceived they

855   learned the most about teamwork, interpersonal communication, social skills, and leadership,

856   whereas they perceived they learned less about emotional skills, goal setting, problem solving

857   and decision making, and time management. This novel finding suggests that young people

858   perceive they learn more about certain life skills as compared to other life skills when

859   participating in sport. Future research could illuminate the matter further by investigating

860   possible differences in perceived life skills development across sports (team versus

861   individual), gender (male versus female), and age groups (younger versus older participants).

862   From a theoretical standpoint, the LSSS will allow researchers to test various theories,

863   models, and conceptual frameworks that can explain the processes involved in youth

864   development through sport. In line with recent research (e.g., Cronin & Allen, 2015; Inoue et

865   al., 2015; Strachan et al., 2009; Vella et al., 2013), self-determination theory (Ryan & Deci,

866   2000), transformational leadership theory (Bass, 1999), the bioecological model of human

867   development (Bronfenbrenner, 1999), along with Benson and Saito's (2001) conceptual

868   framework for youth development theory and research, could all be tested using the LSSS as

869   an outcome variable. With self-determination theory (Ryan & Deci, 2000), the following

870   causal sequence could be investigated: coach autonomy support – basic need satisfaction –

871   self-determined motivation – life skills development. Similar causal sequences have been

872   tested previously with well-being measures such as self-esteem, positive affect, and life

873   satisfaction as outcome variables (e.g., Standage & Gillison, 2007; Smith, Ntoumanis, &

874   Duda, 2007). However, self-determination theory's (Ryan & Deci, 2000) predictions about

875   personal development have never been thoroughly tested using a life skills development

876   perspective. The LSSS and self-determination theory combined provide the opportunity to

877   begin examining the social/environmental determinants and underlying psychological

878   mechanisms of development within youth sport. Through theory testing, researchers could

879   provide coaches, sports administrators, and parents with theory-based evidence, explanations,

880   and predictions on how they can promote young peoples' life skills development.

881   **Limitations and Future Directions**

882   Although the majority of evidence from Studies 1–4 supports the validity and

883   reliability of the LSSS, it is important to re-emphasize that validity and reliability are

884   considered ongoing processes (DeVellis, 2011). Thus, future studies should provide further

885   evidence for the validity and reliability of the scale. Addressing the limitations of the current

886   research, the LSSS should be examined in other countries/cultures and the measurement

887   invariance of the scale should be tested across competitive levels (recreational and elite

888   athletes), gender (males and females), sport type (individual and team sports), and time. We

889   would also encourage future research to assess the temporal stability of the LSSS over time

890   and with different populations (e.g., younger participants than used in Study 4). In the short

891   term (2–6 weeks), young peoples' perceptions of life skills development through sport would

892   not be expected to change; whereas, in the long term (1–5 years) one would expect that

893   young peoples' perceptions of life skills development may increase. Addressing a weakness

894   of the present research, future studies should also provide evidence for the predictive validity

895   or nomological validity of the scale. One way this could be achieved is by testing the scale in

896   relation to the casual sequence of self-determination theory outlined earlier. Replicating the

897   findings of the current research, future studies should provide evidence for the factor

898   structure and internal consistency reliability of the LSSS. Through further assessment of the

899   psychometric properties of the scale, the validity and reliability of the LSSS can be

900   continually assessed, critiqued and improved (DeVellis, 2011). In this regard, future studies

901   could develop an alternative item to assess the 'accepting suggestions or criticism'

902   component of teamwork. The item representing this component of teamwork (i.e., "accept

903   suggestions for improvement from others") was the only item which proved problematic

904   across studies 2–3. This may have been due to the fact that this item displayed a lower

905   standard deviation (average $SD = .75$) than other teamwork items (average $SD = 1.00$) across

906   all studies. According to Clark and Watson (1995), items with poor variability are likely to

907   correlate weakly with other items and perform poorly during structural analysis. A final

908   limitation of the present research is the fact that the LSSS relies on participants' perceptions

909   of whether they developed the eight life skills through their chosen sport. With any self-

910   report measure there are always concerns with memory recall, social desirability and the

911   truthfulness of responses (Brenner & DeLamater, 2014). Thus, we would encourage future

912   studies to gain others' perspectives on participant's life skills development (e.g., parents,

913   coaches, and independent observers) as well as using self-report. Gaining multiple

914   perspectives - including the participants themselves - will provide more compelling evidence

915   that participants' are developing the eight life skills through sport. In addition, future

916   research could also create knowledge tests or behavioural ratings scales to assess the

917   development of these life skills (Goudas, 2010).

918   Despite requiring further validity and reliability evidence, the scale developed in the

919   current series of studies provides a useful measure of life skills development through sport.

920   In addition to theory testing, future studies could assess whether participants perceive they

921   learn certain life skills in particular sports. For instance, it could be proposed due to the

922   nature of sports (e.g., team versus individual) that a rugby player would learn more teamwork

923   skills than a golfer, whereas a golfer may learn more problem solving and decision making

924   skills. Such information could help market sports as venues where young people can develop

925   their life skills and further persuade parents to involve their children in sport. Researchers

926   could also use the LSSS to examine the efficacy of existing programs designed to teach

927   young people life skills through sport (e.g., SUPER; Danish, 2002). Given that the SUPER

928   program's content includes teamwork, goal setting, emotional skills, communication, and

929   problem solving, the LSSS is an ideal measure to assess this program. For instance,

930   researchers could use post-test ratings and retrospective pre-test ratings to mitigate against the

931   'response-shift bias' (Howard, 1982) and accurately assess the effectiveness of this program.

932   Future studies should also track participants' perceived life skills development to investigate

933   changes that occur over time, why and how these changes occur, and to assess the long-term

934   impact of sports participation. Finally, the LSSS could be adapted to assess life skills in other

935   domains such as physical education and other extracurricular activities. This would enable

936   researchers to compare and contrast young people's development across the range of

937   activities they engage in.

938   In conclusion, the studies in this paper provided initial evidence for the validity and

939   reliability of the LSSS. Using this scale, researchers can thoroughly assess the degree to

940   which youth sport participants perceive they are developing these eight life skills across

941   sports, competitive levels, and coaching environments. Researchers can also use the LSSS to

942   test theories investigating the mechanisms that lead to life skills development and the

943   consequences of life skills development (e.g., transfer of life skills to other settings).

944   Practitioners could use the scale to examine whether their efforts to develop these life skills

945   in young people are effective or not. Ultimately, it is hoped that the LSSS proves a useful

946   tool for researchers and practitioners interested in the promotion of PYD through sport.

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Table 1

Number of Items, Mean Scores, Standard Deviations and Alpha Coefficients Across the Four Studies

Life Skill/s	Study 1 (N = 39) Stage 1[a] Items	Stage 2[b] Items	Study 2 (N = 338) Items	M	SD	α	Study 3 (N = 223) Items	M	SD	α	Items	Study 4 (N = 37) Time 1 M	SD	α	Time 2 M	SD	α
Full scale	270	144	47				43				43						
Teamwork	43	23	7	3.98	0.71	.84	7	4.08	0.61	.78	7	3.96	0.73	.85	4.05	0.77	.92
Goal setting	29	14	7	3.81	0.83	.89	7	3.67	0.95	.92	7	3.67	0.98	.93	3.65	1.11	.96
Time mgmt.	26	12	4	3.48	1.03	.89	4	3.41	1.01	.88	4	3.39	0.98	.90	3.34	1.03	.93
Emotional skills	41	26	8	3.63	0.83	.89	4	3.68	0.88	.83	4	3.73	0.72	.70	3.86	0.68	.78
Communication	35	13	4	4.06	0.84	.88	4	4.07	0.76	.83	4	4.14	0.78	.84	4.24	0.66	.85
Social skills	36	18	5	3.98	0.80	.85	5	3.99	0.82	.86	5	3.95	0.74	.83	3.97	0.77	.90
Leadership	31	23	8	3.92	0.78	.92	8	3.97	0.68	.89	8	3.96	0.72	.91	3.87	0.78	.94
Problem solving	29	15	4	3.67	0.92	.88	4	3.61	0.92	.89	4	3.52	0.93	.90	3.48	0.80	.89

Note. No means, standard deviations or alpha coefficients are provided in Study 1 as the scale was being developed during this study.
[a]Prior to the expert review process. [b]After the expert review process.

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Table 2
Factor Loadings for the Life Skills Scale for Sport Items

Factors and Items	Study 2 (N = 338) EFA Factor Loadings[a]	Study 3 (N = 223) CFA Factor Loadings[a]
Teamwork		
Accept suggestions for improvement from others	.44	.22
Help build team/group spirit	.73	.69
Work well within a team/group	.75	.75
Suggest to team/group members how they can improve their performance	.69	.54
Help another team/group member perform a task	.70	.45
Change the way I perform for the benefit of the team/group	.73	.66
Work with others for the good of the team/group	.74	.71
Goal setting		
Set goals so that I can stay focused on improving	.68	.73
Set challenging goals	.77	.80
Check progress towards my goals	.75	.78
Set short-term goals in order to achieve long-term goals	.77	.83
Remain committed to my goals	.81	.80
Set goals for practice	.82	.81
Set specific goals	.76	.80
Time management		
Manage my time well	.84	.82
Assess how much time I spend on various activities	.82	.83
Control how I use my time	.85	.86
Set goals so that I use my time effectively	.82	.73
Emotional skills		
Know how to deal with my emotions	.67	.71
Understand that I behave differently when emotional	.66	.64
Notice how I feel	.71	.73
Use my emotions to stay focused	.76	.72

Understand other peoples' emotions	.71	.73
Notice how other people feel	.75	.74
Help others use their emotions to stay focused	.81	.72
Help other people control their emotions when something bad happens	.80	.73
Interpersonal communication		
Speak clearly to others	.78	.84
Pay attention to what someone is saying	.80	.72
Pay attention to peoples' body language	.75	.75
Communicate well with others	.80	.67
Social skills		
Interact in various social settings	.77	.73
Maintain close friendships	.72	.70
Start a conversation	.77	.84
Get involved in group activities	.78	.75
Help others without them asking for help	.67	.70
Leadership		
Set high standards for the team/group	.78	.73
Know how to motivate others	.77	.79
Help others solve their performance problems	.77	.72
Be a good role model for others	.76	.72
Organise team/group members to work together	.77	.74
Recognise other peoples' achievements	.73	.59
Know how to positively influence a group of individuals	.81	.73
Consider the individual opinions of each team/group member	.76	.65
Problem solving and decision making		
Think carefully about a problem	.77	.82
Create as many possible solutions to a problem as possible	.81	.89
Compare each possible solution in order to find the best one	.82	.86
Evaluate a solution to a problem	.79	.74

Note. All factor loadings are standardized.

[a]Factor loadings for items within their life skill subscale.

Table 3

Indices of Model Fit for the Life Skills Scale for Sport

Model	χ^2	df	χ^2 / df	RMSEA	CFI	TLI	AIC	BIC	ABIC
Teamwork	19.67	14	1.41	.04 (.00, .08)[c]	.98	.98	3843	3915	3848
Goal setting	23.48	14	1.68	.06 (.00, 09)	.99	.99	3888	3960	3893
Time management	3.57	2	1.79	.06 (.00, .16)	1.00	.99	2355	2396	2358
Emotional skills	127.35***	20	6.37	.16 (.13, .18)	.88	.83	4556	4638	4562
My emotions[a]	2.49	2	1.25	.03 (.00, .14)	1.00	1.00	2376	2417	2379
Others' emotions[a]	21.04***	2	10.52	.21 (.13, .29)	.95	.84	2299	2340	2302
Communication	.25	2	.13	.00 (.00, .07)	1.00	1.02	2093	2134	2096
Social skills	4.66	5	.93	.00 (.00, .09)	1.00	1.00	2766	2817	2770
Leadership	44.22**	20	2.21	.07 (.04, .10)	.97	.96	3968	4050	3974
Problem solving	2.21	2	1.11	.02 (.00, .14)	1.00	1.00	2109	2150	2112
CFA – Eight-factor model[b]	1341.12***	832	1.61	.05 (.05, .06)	.91	.90	22523	23057	22560
CFA – Second-order model[b]	1434.83***	852	1.68	.06 (.05, .06)	.90	.89	22576	23043	22609
CFA – First-order model[b]	2916.02***	860	3.39	.10 (.10, .11)	.63	.62	24041	24481	24072
CFA – Bifactor model[b]	1335.84***	817	1.64	.05 (.05, .06)	.91	.90	22547	23133	22588
ESEM[b]	852.22***	587	1.45	.05 (.04, .05)	.95	.93	22524	23893	22619
H-ESEM[b]	853.83***	607	1.41	.04 (.04, .05)	.95	.92	22512	23813	22603
ESEM – Bifactor model[b]	865.41***	552	1.57	.05 (.04, .06)	.93	.89	22513	24002	22617

Note. N = 223. RMSEA = root mean square error of approximation; CFI = comparative fit index; TLI = Tucker-Lewis index; AIC = Akaike information criterion; BIC = Bayesian information criterion; ABIC = Sample size adjusted BIC.

*p < .05. **p < .01. ***p < .001.

[a]These two aspects of emotional skills were tested after obtaining less than adequate fit indices for the overall emotional skills subscale.

[b]43-item models after the removal of the others' emotions items.

[c]90 percent confidence intervals for RMSEA values.

Supplementary Materials

Table A
Selected Definitions and Components for the Life Skills

Life Skill	Definition	Components
Teamwork	"people working together to achieve something beyond the capabilities of individuals working alone" (Marks, Mathieu, & Zaccaro, 2001, p. 356)	1. Providing suggestions or criticisms 2. Accepting suggestions or criticisms 3. Cooperation 4. Coordination 5. Team spirit and morale 6. Adaptability (Morgan, Glickman, Woodward, Blaiwes, & Salas, 1986)
Goal setting	"the process by which people establish desirable objectives for their actions" (Moran, 2004, p. 55)	1. Make goals specific and measurable 2. Identify time constraints 3. Use moderately difficult goals 4. Write goals down and monitor progress 5. Use a mix of process, performance, and outcome goals 6. Use short-range goals to achieve long-range goals 7. Set goals for practice and competition 8. Make sure goals are internalised by the athlete (Cox, 2012)
Time management	"behaviours that aim at achieving an effective use of time while performing certain goal-directed activities" (Claessens, van Eerde, Rutte, & Roe, 2007, p. 262)	1. Time assessment 2. Planning 3. Monitoring (Claessens et al., 2007)
Emotional skills[a]	"the processes involved in the recognition, use, understanding, and management of one's own and others emotional states" (Salovey, Brackett, & Mayer, 2004, p. i)	1. Perception of emotions 2. Use of emotions 3. Understanding of emotions 4. Management of emotions (Latimer et al., 2007)

Interpersonal communication	"the process by which people exchange information, feelings, and meaning through verbal and non-verbal messages: it is face-to-face communication" (Interpersonal Communication Skills, 2011)	1. Speaking 2. Listening 3. Non-verbal communication (Dunbar, Brooks, & Kubicka-Miller, 2006; Henry, Reed, & McAllister, 1995)
Social skills	"learned behaviours that allow one to interact and function effectively in a variety of social contexts" (Sheridan & Walker, 1999, p. 687)	1. Social assertiveness 2. Performance in public situations 3. Participation in social groups 4. Friendship and intimacy 5. Giving or receiving help (Smith & Betz, 2000)
Leadership	"process whereby an individual influences a group of individuals to achieve a common goal" (Northouse, 2010, p. 3)	1. Individual consideration 2. Inspirational motivation 3. Intellectual stimulation 4. Fostering acceptance of team goals and promoting teamwork 5. High performance expectations 6. Appropriate role modeling 7. Contingent reward (Callow, Smith, Hardy, Arthur, & Hardy, 2009)
Problem Solving and Decision Making	"the activities by which a person attempts to understand problems in everyday living and to discover effective solutions" (D'Zurilla & Nezu, 2010, p. 200)	1. Problem definition and formulation 2. Generation of alternative solutions 3. Decision making 4. Solution implementation and verification (D'Zurilla & Goldfried, 1971)

[a]As emotional skills involves dealing with one's own and other's emotional states, there were eight components of emotional skills which dealt with: perception of my emotions, perception of other's emotions, use of my emotions, use of other's emotions, understanding of my emotions, understanding of other's emotions, management of my emotions, and management of other's emotions.

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Table B
EFA Results for Each Subscale of the Life Skills Scale for Sport

Subscale & Factors	Eigenvalue from real dataset	Percentage of variance explained	Average eigenvalue from parallel analysis	95th percentile eigenvalue from parallel analysis
Teamwork				
1	8.87	38.55	1.51	1.59
2	2.01	8.74	1.42	1.48
3	1.39	6.06	1.35	1.41
4	1.32	5.75	1.30	1.34
Goal Setting				
1	7.60	54.27	1.36	1.44
2	1.14	8.11	1.27	1.33
Time Management				
1	7.05	58.78	1.32	1.40
Emotional Skills				
1	12.47	47.97	1.55	1.62
2	1.50	5.78	1.46	1.52
3	1.07	4.13	1.40	1.45
Communication				
1	7.44	57.20	1.34	1.42
2	1.01	7.74	1.25	1.32
Social Skills				
1	8.95	49.73	1.42	1.50
2	1.33	7.41	1.34	1.40
Leadership				
1	12.75	55.43	1.51	1.59
2	1.02	4.44	1.42	1.48
Problem Solving				
1	9.00	60.00	1.38	1.46
2	1.03	6.83	1.29	1.35

Note. During parallel analysis 1,000 random datasets were generated. Only factors with eigenvalues above 1.0 are displayed.

Table C

Comparison Table for Social Skills Items

Component	Item #	Item	FL	CL	Mean	SD	Skewness	Kurtosis
FI	1	Make friends	.73	Yes	4.29	0.94	-1.31	1.23
PPS	2	Behave appropriately in social situations	.64	Yes	4.04	0.98	-1.07	1.01
PSG	3	Participate in social groups	.77	No	4.11	1.00	-1.10	0.85
SA	4	Introduce myself to others	.68	Yes	4.09	1.00	-1.06	0.61
H	5	Ask for help when I need it	.68	Yes	3.90	1.01	-0.74	-0.02
PPS	**6**	**Interact in various social settings**	**.77**	**No**	**3.93**	**0.94**	**-0.63**	**0.04**
SA	7	Arrange to meet with others	.71	No	3.78	1.15	-0.61	-0.61
PPS	8	Get others to laugh	.69	No	4.14	1.02	-1.09	0.54
SA	9	Join in on a conversation	.77	No	4.21	0.93	-1.13	0.85
FI	**10**	**Maintain close friendships**	**.72**	**No**	**4.10**	**1.00**	**-1.13**	**0.91**
H	11	Help others when they need it	.66	No	4.11	0.86	-0.81	0.35
SA	**12**	**Start a conversation**	**.77**	**No**	**3.94**	**1.10**	**-0.91**	**0.09**
PPS	13	Conduct myself properly when I am around others	.67	No	3.98	0.99	-0.94	0.64
PSG	**14**	**Get involved in group activities**	**.78**	**No**	**4.11**	**0.97**	**-0.98**	**0.44**
FI	15	Talk to friends about personal things	.61	Yes	3.46	1.32	-0.45	-0.86
H	**16**	**Help others without them asking for help**	**.67**	**No**	**3.85**	**1.05**	**-0.86**	**0.33**
SA	17	Stand up for myself	.59	No	4.21	0.94	-1.13	0.85
PSG	18	Socialise with others	.76	No	4.24	0.92	-1.22	1.21

Note. Items selected are in boldface. FI = Friendship and intimacy; PPS = Performance in public situations; PSG = Participation in social groups; SA = Social assertiveness; H = Helping behavior; FL = Factor Loading; CL = Cross loading.

Table D
Pattern Matrix for the Full 47-Item Scale

Item #	Factor							
	1	2	3	4	5	6	7	8
TW2								.30
TW5			.63					
TW7			.76					
TW8			.70					
TW11			.73					
TW13			.68					
TW18			.69					
GS1		.68						
GS4		.80						
GS6		.62						
GS7		.69						
GS8		.76						
GS9		.75						
GS14		.81						
SS6							-.43	
SS10							-.62	
SS12							-.75	
SS14							-.69	
SS16							-.51	
TM4						-.79		
TM5						-.88		
TM7						-.84		
TM10						-.73		
ES4				.63				
ES6				.62				
ES8				.70				
ES10				.72				
ES16				.52				
ES20				.50				
ES21				.62				
ES26	.33			.45				
LS6	.57							
LS10	.75							
LS11	.73							
LS12	.69							
LS13	.68							
LS15	.72							
LS16	.80							
LS17	.70							

PS1	<u>-.37</u>	-.54
PS2	<u>-.36</u>	-.57
PS3		-.53
PS9		-.40
CS1	-.72	
CS2	-.77	
CS3	-.67	
CS4	-.72	

Note. Exploratory factor analysis was conducted with a oblique (direct oblimin; δ = 0) rotation. Coefficients < .30 were suppressed and all cross loadings are underlined. TW = Teamwork; GS = Goal setting; TM = Time management; ES = Emotional skills; CS = Communication skills; SS = Social skills; LS = Leadership skills; PS = Problem solving & decision making.

Table E

Standardized Factor Loadings and Uniqueness of Items for all CFA Models

	Eight-Factor Model		Second-Order Model		First-Order Model		Bifactor Model		
Item	FL	Uniqueness	FL	Uniqueness	FL	Uniqueness	Specific FL	General FL	Uniqueness
TW2	.26***	.93***	.24**	.94***	.28***	.92***	.07	.27***	.92***
TW5	.70***	.51***	.69***	.53***	.44***	.81***	.54***	.42***	.53***
TW7	.73***	.46***	.73***	.47***	.42***	.83***	.63***	.41***	.44***
TW8	.57***	.68***	.57***	.68***	.47***	.78***	.34***	.46***	.68***
TW11	.46***	.79***	.47***	.78***	.34***	.88***	.30***	.34***	.79***
TW13	.64***	.59***	.65***	.58***	.39***	.85***	.54***	.38***	.57***
TW18	.69***	.52***	.70***	.51***	.44***	.81***	.58***	.41***	.49***
GS1	.74***	.46***	.73***	.46***	.56***	.69***	.54***	.50***	.47***
GS4	.80***	.36***	.80***	.36***	.60***	.64***	.59***	.55***	.36***
GS6	.78***	.40***	.78***	.40***	.54***	.71***	.63***	.47***	.38***
GS7	.83***	.32***	.82***	.32***	.59***	.65***	.64***	.52***	.32***
GS8	.79***	.37***	.80***	.37***	.55***	.70***	.64***	.49***	.36***
GS9	.81***	.34***	.81***	.34***	.62***	.62***	.58***	.57***	.34***
GS14	.80***	.36***	.80***	.36***	.65***	.58***	.54***	.60***	.36***
TM4	.81***	.35***	.82***	.33***	.57***	.67***	.62***	.53***	.33***
TM5	.84***	.29***	.84***	.29***	.65***	.58***	.56***	.62***	.30***
TM7	.84***	.29***	.84***	.30***	.57***	.67***	.68***	.53***	.26***
TM10	.76***	.43***	.74***	.45***	.63***	.61***	.46***	.58***	.45***
ES6	.78***	.40***	.77***	.42***	.64***	.59***	.41***	.63***	.44***
ES8	.71***	.49***	.72***	.49***	.55***	.70***	.55***	.54***	.41***
ES10	.76***	.43***	.76***	.42***	.59***	.65***	.52***	.60***	.38***
ES21	.70***	.51***	.71***	.50***	.66***	.57***	.22**	.66***	.52***

CS1	.81***	.34***	.81***	.34***	.66***	.57***	.53***	.66***	.29***
CS2	.70***	.51***	.71***	.50***	.59***	.65***	.41***	.58***	.49***
CS3	.77***	.41***	.77***	.41***	.66***	.57***	.34***	.67***	.43***
CS4	.70***	.52***	.69***	.53***	.61***	.63***	.28***	.61***	.54***
SS6	.75***	.44***	.75***	.44***	.63***	.60***	.38***	.64***	.46***
SS10	.71***	.50***	.70***	.51***	.55***	.70***	.44***	.54***	.51***
SS12	.81***	.34***	.81***	.34***	.60***	.64***	.62***	.58***	.27***
SS14	.74***	.45***	.74***	.46***	.54***	.71***	.54***	.52***	.44***
SS16	.71***	.49***	.72***	.48***	.62***	.61***	.35***	.62***	.49***
LS6	.73***	.47***	.72***	.48***	.66***	.56***	.38***	.63***	.45***
LS10	.77***	.41***	.77***	.41***	.66***	.57***	.51***	.64***	.34***
LS11	.72***	.48***	.73***	.47***	.69***	.52***	.25***	.69***	.46***
LS12	.72***	.48***	.72***	.48***	.64***	.59***	.35***	.63***	.48***
LS13	.73***	.47***	.74***	.46***	.66***	.57***	.38***	.63***	.46***
LS15	.60***	.64***	.60***	.64***	.54***	.71***	.24**	.53***	.66***
LS16	.74***	.45***	.74***	.46***	.68***	.54***	.28***	.67***	.47***
LS17	.67***	.56***	.66***	.56***	.61***	.62***	.22**	.61***	.58***
PS1	.83***	.31***	.83***	.32***	.73***	.46***	.38***	.72***	.34***
PS2	.86***	.26***	.87***	.25***	.72***	.48***	.56***	.71***	.19***
PS3	.85***	.28***	.85***	.28***	.72***	.48***	.47***	.71***	.27***
PS9	.77***	.41***	.77***	.41***	.73***	.47***	.23***	.73***	.41***

Note. FL = Factor Loading; TW = Teamwork; GS = Goal setting; TM = Time management; ES = Emotional skills; CS = Communication skills; SS = Social skills; LS = Leadership skills; PS = Problem solving & decision making.
*p < .05. **p < .01. ***p < .001.

Table F

Standardized Factor Loadings and Uniqueness of Items for the ESEM Model

Item	TW	GS	TM	ES	CS	SS	LS	PS	Uniqueness
TW2	**.10**	.27**	-.05	-.01	.03	.14	.13	-.17	.85***
TW5	**.50***	-.09	.04	.000	-.11	.15*	.23**	-.04	.54***
TW7	**.81***	.08	-.08	-.13*	.12*	.12*	-.15*	.07	.30***
TW8	**.48***	.07	.07	.13	-.25***	-.04	.20**	.03	.57***
TW11	**.43***	-.004	-.04	.06	.23**	-.004	-.07	.06	.71***
TW13	**.59***	-.05	.04	.10	-.14*	-.03	.20**	-.07	.56***
TW18	**.55***	.07	-.03	-.01	-.05	.19*	-.05	.06	.56***
GS1	.004	**.64***	.23***	.02	-.03	.004	.01	-.08	.43***
GS4	.15**	**.73***	.11*	-.001	.06	-.16**	.09	-.07	.33***
GS6	.14**	**.79***	.04	-.03	.02	-.10	-.10	.07	.36***
GS7	-.001	**.76***	.07	.10	-.08	-.02	.01	-.01	.31***
GS8	-.05	**.85***	-.12*	-.04	.03	.03	.003	.08	.33***
GS9	-.06	**.77***	-.05	.04	-.06	.07	.04	.09	.32***
GS14	-.07	**.71***	-.02	.05	.02	.07	.11	.04	.35***
TM4	.10*	-.06	**.87***	-.13**	.11*	-.04	-.01	.07	.26***
TM5	.06	.06	**.74***	.06	.05	.02	-.03	.03	.29***
TM7	-.11*	.02	**.82***	.09	-.06	.04	.08	-.05	.27***
TM10	-.14*	.25***	**.50***	-.01	-.07	.17**	.04	.12	.40***
ES6	.04	.14**	.10	**.66***	-.06	.09	-.08	.03	.36***
ES8	-.02	-.01	-.07	**.75***	.13*	-.03	.07	-.02	.41***
ES10	.04	-.02	.04	**.71***	.09	.07	-.08	.04	.39***
ES21	-.01	.07	-.04	**.39***	-.10	.09	.26***	.21**	.47***

CS1	-.02	-.05	.13*	.10	**.55***	.04	.26***	.09	.34***
CS2	-.13*	.13*	.03	.12	**.48***	.25***	.01	.08	.46***
CS3	.08	-.01	.03	.18**	**.44***	-.02	.13*	.23***	.41***
CS4	.07	-.001	.03	-.08	**.41***	.21**	.28***	.08	.46***
SS6	.04	-.06	-.004	.18**	.15*	**.49***	.12	.04	.44***
SS10	.19**	-.07	.18**	.10	.17**	**.51***	-.19**	.03	.45***
SS12	.15**	.02	.07	.08	.03	**.69***	-.07	-.02	.34***
SS14	.08	-.02	-.01	-.13*	-.02	**.75***	.19**	-.02	.31***
SS16	.05	.03	.04	.11	.01	**.53***	.05	.09	.48***
LS6	.14*	.06	.08	.04	.04	.02	**.52***	.05	.47***
LS10	.06	-.05	.02	.04	-.07	.15*	**.70***	.03	.34***
LS11	.05	.02	.07	.04	-.07	.04	**.47***	.29***	.43***
LS12	.06	.04	-.02	.04	-.01	.002	**.55***	.19**	.47***
LS13	.01	.02	.16**	.04	.02	-.01	**.59***	.05	.45***
LS15	.07	.12	.01	.09	.31***	-.04	**.45***	-.17*	.56***
LS16	-.01	.14*	.003	-.06	.22***	.20**	**.56***	-.04	.38***
LS17	.22***	.10	-.003	.07	.28***	-.12	**.41***	.004	.50***
PS1	.07	.14**	.003	.21***	.01	.06	-.02	**.56***	.32***
PS2	.05	.01	.03	-.02	.06	-.01	.03	**.86***	.16***
PS3	.04	.03	.08	.05	.07	-.02	.10	**.68***	.29***
PS9	-.06	.10	.17**	.05	.16**	.09	.10	**.44***	.40***

Note. TW = Teamwork; GS = Goal setting; TM = Time management; ES = Emotional skills; CS = Communication skills; SS = Social skills; LS = Leadership skills; PS = Problem solving & decision making.

*p < .05. **p < .01. ***p < .001.

Table G

Standardized Factor Loadings and Uniqueness of Items for the Bifactor ESEM Model

Item	TW	GS	TM	ES	CS	SS	LS	PS	General Factor	Uniqueness
TW2	**.09**	.21*	-.03	-.004	.06	.17	.17	-.09	.23*	.83***
TW5	**.44****	-.13	-.01	-.05	-.11	.13	.17	-.07	.44***	.53***
TW7	**.69****	-.04	-.09	-.10	.13	.17	-.09	.01	.41**	.28
TW8	**.39****	.09	.05	.10	-.18	.07	.26	.07	.42***	.55***
TW11	**.35****	-.05	-.06	.05	.22	.06	-.03	.03	.33**	.71***
TW13	**.51****	-.08	-.02	.02	-.14	-.04	.07	-.11	.42***	.53***
TW18	**.48***	-.05	-.06	-.06	-.07	.09	-.11	-.04	.46**	.52
GS1	-.03	**.52****	.21**	.01	-.05	-.05	-.05	-.07	.50***	.42***
GS4	.08	**.60****	.12	.02	.06	-.10	.09	-.03	.52***	.33***
GS6	.08	**.69****	.11*	.05	.06	.01	.07	.13	.42***	.30***
GS7	-.04	**.62****	.10	.09	-.09	-.05	.01	.003	.52***	.31***
GS8	-.09	**.63****	-.05	-.04	-.02	-.07	-.06	.01	.51***	.33***
GS9	-.09	**.58****	-.01	.02	-.10	-.03	-.03	.03	.57***	.32***
GS14	-.10	**.52****	.000	.001	-.04	-.06	-.03	-.03	.61***	.34***
TM4	.04	.04	**.66****	-.10	.07	-.03	-.05	.04	.54***	.26***
TM5	.01	.17**	**.60****	.08	.07	.09	.07	.08	.56***	.26***
TM7	-.13*	.11*	**.63****	.03	-.10	-.03	-.03	-.05	.55***	.25***
TM10	-.15*	.22**	**.38****	-.05	-.13	.03	-.09	.04	.61***	.39***
ES6	-.01	.17**	.09	**.49****	-.04	.08	-.04	.09	.59***	.35***
ES8	-.06	.01	-.08	**.52****	.11	-.06	-.004	.02	.54***	.41***
ES10	-.02	.002	.01	**.50****	.06	.01	-.12	.05	.59***	.39***
ES21	-.04	-.003	-.09	**.21***	-.18	-.10	-.02	.07	.69***	.42***

	TW	GS	TM	ES	CS	SS	LS	PS		
CS1	-.05	-.09	.03	.04	**.44***	.02	.11	.01	.66***	.34***
CS2	-.13	.02	-.02	.04	**.37***	.10	-.11	-.02	.60***	.46**
CS3	.02	-.05	-.03	.12	**.37****	-.01	.04	.14	.64***	.42***
CS4	.05	-.12	-.06	-.14	**.29**	.08	.03	-.07	.65***	.45***
SS6	.05	-.12	-.05	.08	.09	**.34**	.04	-.01	.64***	.44***
SS10	.17	-.08	.13	.07	.17	**.45***	-.07	.04	.52***	.44***
SS12	.16	-.04	.04	.04	.02	**.62****	.03	-.01	.57***	.26
SS14	.12	-.17	-.07	-.20	-.10	**.45**	.01	-.14	.60***	.32**
SS16	.05	-.06	-.01	.01	-.05	**.33****	-.06	.000	.64***	.48***
LS6	.10	.02	.001	-.03	.000	-.01	**.32***	-.01	.64***	.47***
LS10	.05	-.12*	-.08	-.10	-.15	-.01	**.33**	-.09	.70***	.34***
LS11	.01	-.02	.002	-.03	-.13	-.04	**.24**	.15	.69***	.43***
LS12	.04	.01	-.06	-.01	-.04	-.02	**.38***	.11	.62***	.45***
LS13	-.01	.05	.10	.01	.02	.05	**.53**	.06	.60***	.34
LS15	.04	.02	-.07	-.02	.22	-.10	**.15**	-.22	.57**	.55**
LS16	-.01	.001	-.08	-.15	.11	.05	**.24**	-.14	.71***	.38***
LS17	.16*	.04	-.06	.01	.23	-.07	**.25**	-.03	.59***	.50***
PS1	-.01	.10	.004	.17	-.01	.01	-.01	**.41***	.69***	.32***
PS2	-.03	-.02	.01	.01	.01	-.05	.001	**.59***	.70***	.16*
PS3	-.04	-.01	.04	.03	.002	-.10	-.02	**.44***	.71***	.29***
PS9	-.10	.07	.11	.03	.10	.04	.04	**.30***	.69***	.40***

Note. TW = Teamwork; GS = Goal setting; TM = Time management; ES = Emotional skills; CS = Communication skills; SS = Social skills; LS = Leadership skills; PS = Problem solving & decision making.

p < .05. **p* < .01. ***p* < .001.

Table H

Standardized Factor Correlations for the CFA and ESEM Models

	TW	GS	TM	ES	CS	SS	LS	PS
CFA Model								
TW	–							
GS	.33***	–						
TM	.34***	.63***	–					
ES	.45***	.61***	.57***	–				
CS	.51***	.48***	.55***	.70***	–			
SS	.71***	.38***	.53***	.62***	.72***	–		
LS	.65***	.58***	.58***	.66***	.78***	.71***	–	
PS	.47***	.59***	.63***	.77***	.74***	.61***	.74***	–
ESEM Model								
TW	–							
GS	.22**	–						
TM	.24***	.53***	–					
ES	.29***	.48***	.42***	–				
CS	.26***	.20**	.22**	.32***	–			
SS	.49***	.28***	.38***	.38***	.33***	–		
LS	.43***	.42***	.39***	.42***	.28***	.49***	–	
PS	.28***	.41***	.44***	.56***	.27***	.39***	.49***	–

Note. TW = Teamwork; GS = Goal setting; TM = Time management; ES = emotional Skills; CS = Communication skills; SS = Social skills; LS = Leadership skills; PS = Problem solving & decision making.

*p < .05. **p < .01. ***p < .001.