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

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13 Lorcan Donal Cronin^a

14 Edge Hill University

15 Justine Allen^b

16 University of Stirling

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19 Author Note

20 ^aDepartment of Sport & Physical Activity, Edge Hill University, Ormskirk, United Kingdom.

21 ^bJustine Allen, School of Sport, University of Stirling, Stirling, United Kingdom.

22 Correspondence concerning this article should be address to Lorcan Cronin, Department of
23 Sport & Physical Activity, Edge Hill University, Ormskirk, L39 4QP, United Kingdom.

24 Email: Lorcan.Cronin@edgehill.ac.uk

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.

158 **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).

168 **Method and Results**

169 **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, Loughhead, 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

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.

282 **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 ($M_{age} = 14.71$, $SD =$
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).

456 **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 ($M_{age} = 15.01$, $SD =$
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.

615 **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 Mañano, 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.

760 **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.

773 **Method**

774 **Participants**

775 The sample included 37 British youth sports participants ($M_{age} = 18.96$, $SD = 1.25$,
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 ($SD = 3.62$).

784 **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.

793 **Data Analysis**

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)		Study 2 (N = 338)				Study 3 (N = 223)				Study 4 (N = 37)						
	Stage 1 ^a	Stage 2 ^b	Items	M	SD	α	Items	M	SD	α	Items	M	SD	α	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.

^aPrior to the expert review process. ^bAfter 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 (<i>N</i> = 338) EFA Factor Loadings ^a	Study 3 (<i>N</i> = 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.

^aFactor loadings for items within their life skill subscale.

Table 3
Indices of Model Fit for the Life Skills Scale for Sport

Model	χ^2	<i>df</i>	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.

* $p < .05$. ** $p < .01$. *** $p < .001$.

^aThese two aspects of emotional skills were tested after obtaining less than adequate fit indices for the overall emotional skills subscale.

^b43-item models after the removal of the others' emotions items.

^c90 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)	<ol style="list-style-type: none"> 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)	<ol style="list-style-type: none"> 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)	<ol style="list-style-type: none"> 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)	<ol style="list-style-type: none"> 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)	<ol style="list-style-type: none"> 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)	<ol style="list-style-type: none"> 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)	<ol style="list-style-type: none"> 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)	<ol style="list-style-type: none"> 1. Problem definition and formulation 2. Generation of alternative solutions 3. Decision making 4. Solution implementation and verification (D’Zurilla & Goldfried, 1971)

^aAs 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 #	<u>Factor</u>							
	1	2	3	4	5	6	7	8
TW2								<u>.30</u>
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	<u>.33</u>			.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; $\delta = 0$) 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

Item	Eight-Factor Model		Second-Order Model		First-Order Model		Bifactor Model		
	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***

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.

* $p < .05$. ** $p < .01$. *** $p < .001$.