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All three authors contributed equally to the conceptualization and ideation of the investigation. All three authors were co-participants in analyses of Phase 1 of the investigation. All three authors contributed equally to methodology of Phase 2. **Bradley W. Young:** Systematic literature search of adult learning instruments in Phase 1; Recruitment, data collection, and analyses of Phase 2; Writing – Original draft preparation and final edits. **Scott Rathwell:** Systematic literature search of adult learning instruments in Phase 1; Recruitment, data collection and analyses of Phase 3; Writing – Original draft preparation; **Bettina Callary:** Writing – Editing and review; Funding acquisition.

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Running head: ADULT ORIENTED SPORT COACHING SURVEY

Testing a Coaching Assessment Tool Derived from Adult Education in Adult Sport

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1 Abstract

2 **Objectives:** The effective tailoring of instructional approaches to adult learners is beneficial in
3 educational domains. No tool exists to assess coaches' use of adult-tailored methods in Masters
4 (> 35+ years-old) sport. This study tested the content (face) and factorial (convergent,
5 discriminant) validity of a self-report survey, derived from instructor assessment in adult
6 education, for Masters sport coaches' assessment of adult-oriented approaches. **Design:** Phase 1
7 involved a systematic search to nominate a survey for import to sport. Phase 2 involved the
8 vetting of face validity among the researchers, and with 12 Masters coaches. Phase 3 tested the
9 fit of a hypothesized factor structure to survey data from Masters coaches. **Method:** Twelve
10 coaches (8 m, 4 f, ages = 27-75 years) representing eight sports judged the face validity of the
11 Instructional Perspectives Inventory (IPI), resulting in descriptive statistics for each item's
12 suitability. A multi-sport sample of 383 Masters coaches (271 m, 110 f, 2 undisclosed; $M_{\text{age}} =$
13 49.32, $SD = 13.60$) completed the IPI, with responses submitted to confirmatory factor analyses
14 and exploratory structural equation modeling. **Results:** Frequencies revealed awkwardness with
15 items from disparate factors of the IPI, especially reverse-coded factors. The hypothesized
16 measurement model was ill fitting to data obtained from sport coaches. **Conclusions:** Importing
17 an established adult instructor survey from education and establishing its preliminary validity in
18 adult sport was challenging. The resultant survey, even with minor modifications, proved
19 insensitive to the context of Masters sport. Future research should translate content from
20 emerging qualitative literature on the coached Masters context into a more viable quantitative
21 instrument.

22 **Keywords:** coach assessment, adult learning, andragogy, Masters sport, survey development

1 **Testing a Coaching Assessment Tool Derived from Adult Education in Adult Sport**

2 As adult sport participation, or Masters sport, has grown exponentially in recent decades,
3 a corresponding body of empirical literature has slowly developed (see Dionigi, 2016; Jenkin,
4 Eime, Westerbeek, & van Uffelen, 2018; Young, Callary & Rathwell, 2018). Recently, several
5 works dedicated to the coached context of adult sport have appeared, opening up spaces in
6 dialogue around coaching middle-aged and older adults (e.g., Callary, Rathwell & Young, 2015;
7 Callary & Young, 2016; Ferrari, Bloom, Gilbert & Caron, 2016; Hoffmann, Young, Rathwell, &
8 Callary, 2019; Rathwell, Callary & Young, 2015). The vast majority of these works are
9 qualitative, serving to describe how adult-tailored coaching approaches have numerous benefits
10 to adult sportspersons, including a heightened sense of self-confidence, motivation and authentic
11 interest in sport, basic needs satisfaction, increased social belonging, skill acquisition, improved
12 performance, and active lifestyle gains.

13 Tailoring instructional approaches to older adults has been the focus of texts related to
14 exercise prescription and fitness programming (Rose, 2019). Attuning to the needs and
15 preferences of an older cohort helps to personalize and improve programming/services,
16 facilitating best practices and adherence by clients (Ecclestone & Jones, 2004; Jones & Rose,
17 2004). A similar notion, that age-tailored approaches to sport coaching may enrich middle-aged
18 and older adults' experience and sport commitment, has been advanced (Callary & Young, 2019;
19 Young, Callary & Niedre, 2014; Young & Callary, 2018) and has gained attention in empirical
20 circles of coach education (Callary, Rathwell & Young, 2018). Despite vast literature devoted to
21 coaching youth and younger adults, studies on how to coach older athletes (35+ years) are
22 limited. Further studies investigating the assessment of coaching practices with older athletes are
23 non-existent.

24 Several recent qualitative studies have described the coaching strategies and techniques
25 that are preferred by adult sportspersons and the personal attributes they appreciate from a coach.
26 Ferrari et al (2016) found that adult swimmers (aged 49-64 yrs) liked coaches who effectively
27 communicated teaching feedback and motivational messaging to establish positive environments,
28 and who conveyed organizational competency in planning workouts while maintaining flexibility
29 to suit the adults' schedules. Swimmers (aged 45-65 yrs) valued having a coach who could share
30 what they learned from their own athletic experience and professional development, and who
31 used discretionary judgment when making decisions related to ranking and role assignment
32 (Callary et al., 2015). These swimmers appreciated coaches who were relatable and wholly
33 involved, who fostered reciprocal caring for the sport program, and who respected adults' time
34 by efficiently managing training activities. Moreover, a pan-Canadian collaborative group
35 addressing older adult physical literacy (Jones et al., 2018) stated "that quality physical activity
36 experiences depend to an extent on tailoring instructional leadership and programs to older
37 adults' preferences" (p. 11), underscoring the importance of organizations investing in trained
38 coaches in adult sport.

39 A series of qualitative studies has specifically examined how adult-learning principles
40 manifest in sport coaching and whether there are notable benefits of using approaches that are
41 tailored to adults (Callary, Rathwell & Young, 2017; Callary et al., 2018; MacLellan, Callary &
42 Young, 2018; MacLellan, Callary & Young, 2019). In keeping with prominent coaching
43 researchers' (e.g., Jones, 2006) endorsement of theories from education to frame inquiry on
44 psychosocial topics of coaching, the aforementioned qualitative studies drew from Knowles,
45 Holton and Swanson's (2012) *andragogy* in practice model. The andragogical framework is a
46 well-known adult learning model that outlines principles for how instructors can interact and

47 design activities to facilitate learner-centric interventions that align with adults' mature self-
48 concept. Similarly, Henschke's (2014a) work on instructional methods has helped conceptualize
49 best practices for teaching adults and helping adults learn. These models share common features,
50 specifically the importance of teacher empathy and trusting in adults to direct many aspects of
51 their own learning, considering how a teacher can transfer responsibility to adults,
52 accommodating and personalizing the learning process, and acknowledging that adults' prior
53 experiences are an asset. These andragogical features have proven fruitful in traditional adult
54 education domains where learning is verbal-cognitive (e.g., corporate training and classrooms).
55 Case studies in Masters swimming (Callary et al., 2017), canoe and kayak (MacLellan et al.,
56 2018; 2019), dragon boat (Young & Callary, 2018), and women's synchronized skating (Currie,
57 Young & Callary, 2019), affirmed that adult-oriented principles, or andragogical principles, were
58 commonly and intentionally employed by coaches. These studies described substantial (though
59 not perfect) alignment of andragogical principles with preferred approaches by coaches in
60 Masters sport (Callary et al., 2017; MacLellan et al., 2019). Furthermore, andragogical
61 approaches were more prevalent and more nuanced in their application among middle-aged and
62 older sportspersons compared to when they were invoked with teenaged athletes (MacLellan et
63 al., 2018). Callary et al. (2017) noted that coaches' approaches with adult sportspersons were
64 more effective when they were aligned with andragogical principles.

65 With the understanding that adult-tailored coaching approaches may result in tangible
66 benefits, and descriptions of adult-learning principles from qualitative studies, a promising next
67 step is to more broadly assess the pertinence of adult-oriented coaching approaches. Broader
68 issues of assessment implicate a need to complement what has been found qualitatively with a
69 quantitative strategy (Henschke, 1989). There is need to develop a survey instrument that allows

70 coaches to reliably report on various valid principles of adult-oriented coaching as they relate to
 71 their coaching practice. Such self-report inventories are central to personal and more formalized
 72 coach development protocol wherein coaches receive feedback from multiple sources, including
 73 data-based sources, to reflect and deliberate on their craft (Hoffmann, Duguay, Guerrero,
 74 Loughead & Monroe-Chandler, 2017).

75 The parallels between how teachers craft a learning situation for adults and how coaches
 76 craft skill acquisition scenarios during adults' sport practice are notable. Callary et al. (2017)
 77 argued this warranted borrowing conceptualizations from the adult education field to understand
 78 what might pertain to understanding adult sport coaching. Given the substantial overlap between
 79 andragogical perspectives and emerging findings on coaching adults (e.g., MacLellan et al.,
 80 2019), our proposition was that initial exploration of coach assessment of adult-oriented methods
 81 should draw upon precedents in quantitative assessment from the adult education field. We
 82 aimed to understand how assessment has been conducted in this parallel field and whether such
 83 methods have content validity and structural (factorial) validity for assessing adult-oriented sport
 84 coaching. Three specific objectives were pursued in succession: 1) to systematically review
 85 assessment instruments in adult education to derive the most valid candidate for assessment in
 86 sport; 2) to conservatively address phrasing of survey items before testing the face validity of the
 87 candidate instrument among coaches; and 3) to test the factorial validity of this instrument using
 88 confirmatory factor analyses and, if required, subsequent exploratory structural equation
 89 modeling (ESEM) to retain the conceptual themes borrowed from adult education.

90 **Phase 1: Targeted Literature Review**

91 We conducted a targeted literature search with four search engines (Pubmed, Psycinfo,
 92 Jstor, and Proquest) and within Google Scholar in September 2016 to identity articles employing

93 quantitative instruments for assessing andragogy. Search terms included “andragogy” in
94 combination with “measurement”, “survey”, “validation”, “psychometrics” or “questionnaire”.
95 Our initial search returned 23 items. We pursued a secondary search of references in these items,
96 and those noted in Knowles et al.’s (2012) and Holton, Swanson Wilson, and Bates’ (2009)
97 reviews of andragogical instruments. This secondary search returned an additional 10 items.
98 Each item was inspected to ensure it related to (a) data collection with a quantitative survey that
99 could be recovered, (b) for which authors made an effort to report at least basic measurement
100 considerations, and (c) surveys were for English-speaking respondents. Applying these criteria,
101 we retained 14 survey tools (see table in Supplementary Appendix). Next, we vetted each of the
102 retained surveys according to several criteria. Foremost, we were interested in identifying
103 surveys that had been used to explicitly assess the perceptions of instructor-coaches, and not for
104 adult students alone. Next, we judged the quality of these studies for addressing measurement
105 issues, which we rated on a scale ranging from minimal considerations (e.g., descriptive data and
106 distributions) to increasingly more substantial considerations such as internal consistency
107 reliability and those additionally related to factorial validity (e.g., exploratory factor analyses)
108 and how survey items validly converged on factors (see measurement quality column in
109 Supplementary Appendix). We were also interested in identifying survey inventories that showed
110 breadth in assessing multiple adult learning principles (i.e., several constituent factors/subscales);
111 for example, those that foreclosed assessment around one or two factors were deemed to provide
112 little discrimination in assessing instructor-coaches’ use of different facets. We also sought to
113 identify an instrument that had been used widely, i.e., an instrument that has been adopted by
114 multiple researchers and refined in successive studies, indicating its acceptance among

115 academics in diverse adult learning domains. Our notations and appraisal of all the surveys are in
116 the Supplementary Appendix.

117 Of the 14 retained tools, many of the instruments had scant psychometric reporting; the
118 highest quality inventories had been subjected to exploratory factor analyses, but not
119 confirmatory factor analyses. Only Henschke's (1994; 2014a) Instructional Perspectives
120 Inventory (IPI) showed respectable measurement quality, including a line of subsequent studies
121 in different samples of adult educators to verify internal consistency reliability, convergent
122 validity on multiple factors, evidence of concurrent validity (Stanton, 2005) and predictive
123 validity (Vatcharasirisook, 2011). The IPI showed a lineage across successive studies with minor
124 modifications, in samples ranging from educators in community colleges/universities, in medical
125 technology education, state social service agencies, health care settings, elementary school
126 principals, educators of youth workers and in banking and hospitality services, and with life
127 coaches (see Supplementary Appendix). Finally, the IPI was the only tool of the 14 that has been
128 adapted to measure andragogy from the perspective of the coach (i.e., business and life coaches
129 of adults; Lubin, 2013).

130 The IPI (Henschke, 1989) is a self-scoring, self-assessment tool that answers the
131 question: "What beliefs, feelings and behaviors do adult educators need to possess to practice in
132 the emerging field of adult education?" (p. 86). It has been used regularly to assess instructors'
133 perceptions of the frequency of their andragogy in practice in various domains, including
134 graduate-school education, collegiate teaching staff development, medical technology
135 instruction, nursing education, foreign language education, banking, health care and hospitality
136 education, and business and life coaching. The IPI has been employed in 18 subsequent studies
137 in adult learning and has been essential to many publications in the field (Henschke, 2014b). It

138 has shown strong convergent validity on as many as seven factors, but consistently showing
139 validity for at least five andragogical principles, and has been tested for internal consistency
140 reliability (Henschke, 2014b). Compared to all other andragogical surveys, it is associated with
141 modest psychometric reporting. Lubin (2013) modified the IPI to validly assess business and life
142 coaches in the management domain. She found evidence for acceptable internal consistency
143 reliability. The seven factor means and levels derived from Lubin's sample were consistent with
144 Henschke (1994) and further interviews with the coaches corroborated the construct validity of
145 items attributed to each scale. With no universally accepted andragogical tool available, and
146 based on the tools retrieved in a systematic search, we concluded that the IPI (Henschke, 1994),
147 and the coaching variant (Lubin, 2013), represented the most suitable self-report instrument for
148 investigating coaches' perceptions of andragogical teaching behaviours within adult sport.

149 **Phase 2: Face Validity**

150 The goal of Phase 2 was to address face validity of the items from the IPI. We aimed to
151 do this by internally vetting the items for their suitability to the sport practice setting. We also
152 wished to vet the IPI items externally with a sample of sport coaches who were involved and
153 invested in the field to get an initial sense of the applicability of items. This procedure was
154 guided by a conservative mindset, in which we bracketed against making substantial revisions to
155 the IPI, to fairly assess its utility to adult sport coaching, with the vast majority of its items intact.

156 **Method**

157 **Researcher vetting.** Henschke's (1994) and Lubin's (2013) IPI inventories were the
158 foundation for this phase. The left column of Table 1 shows the 45 items that were next vetted
159 independently by the three authors. Each researcher judged each item for whether: it was
160 articulated in an easily understood way; it represented an andragogical principle; it was relevant

161 for coaching adult athletes (> age 35). The authors were qualified reviewers, with each bringing
162 different expertise to the procedure. The first author had research expertise on the social
163 psychology of adults' motivation for Masters sport, is a former high-performance athletics coach
164 and physical educator, and at the time was a Masters athlete. The second author brought research
165 expertise on leadership and coaching, and had published on participatory and performance
166 narratives relating to Masters sport. The third author had research expertise in coaching and
167 coach development, was serving as an advisor to national and international organizations
168 developing coaching curriculum, and was presently a coach of Masters alpine skiers.

169 Items that were independently flagged as potentially problematic were addressed in a
170 consensus meeting with all members. Twelve items were resolved with minor modifications,
171 while making an effort to retain the meaning of the original item. Minor changes are noted in
172 bold text in the right column of Table 1. These edits ensured items were expressed as statements
173 of action/competency (i.e., items 1, 10, 12, 20, 31), to conform to the realities of coaching in a
174 motor skill acquisition domain (items 3, 32, 36) or to improve readability (9, 28, 30, 37).

175 Although efforts were made to retain all original items, decisions were taken to delete
176 eight items. Item 44 (left side of Table 1; "experiencing unconditional positive regard") was not
177 based on actions/competencies for guiding adults, and we deemed it too arduous to arrive at a
178 new articulation of an action/competency. We determined that items 1, 21, 38 and 42 (left side,
179 Table 1) were superfluous with the inherent nature of teaching motor skills in sport. We judged
180 apathy (item 27, left side) as less prevalent among Masters participants because they are not
181 usually obligated to be at practice (whereas obligation and thus apathy might be more common
182 in a corporate training setting). Instead, we reframed this item to capture the essence of
183 Henschke's (1994) items for a coach's insensitivity towards learners, portraying it instead as

184 “frustration with adult athletes who are difficult to coach” (new item 28, right side of Table 1). In
185 resolving this, we deleted an item for learner inattentiveness (item 41, left side) because it was
186 effectively assessed with the new item 28. We interpreted Lubin’s (2013) role-play item (item
187 35, left) as vague and modified it to represent sport-specific roles that are simulated (new item
188 32, right). By addressing this, we determined that Henschke’s item 10 (left side) was now
189 redundant and deleted it. Finally, Henschke’s item relating to listening teams (item 24, left) was
190 deleted because we already considered it represented in an item that assessed coach’s use of
191 discussion groups (item 31, right). This step of vetting resulted in 37 items drawn from Henschke
192 and Lubin’s respective IPI inventories with minor modifications for comprehension within sport
193 coaching populations.¹ The descriptions for each of the seven factors are provided in Table 1
194 (Henschke, 2014a).

195 **Coach vetting.** Twelve Masters coaches participated in the next step of vetting for face
196 validity. Initially, 26 email invitations were sent to Masters sport coaches across Canada. These
197 coaches were identified from a roster of former participants (who had consented to be contacted
198 again), or were identified from publicly available contact information on adult sport websites.
199 Table 2 shows demographic information, experience, coaching involvement and certification of
200 the respondents. Those who agreed to participate were sent an electronic copy of the 37 survey
201 items along with a spreadsheet and were asked to assess each item based on three criteria. On the
202 spreadsheet, they judged the extent to which each item was “relevant for the coaching of
203 Masters/adult athletes” and answered with either ‘agree’, ‘somewhat agree’, ‘disagree’, or ‘don’t
204 know because the item doesn’t make sense or is awkward’. Respondents were invited to provide

¹ There were 37 items resulting from the internal vetting. A 38th item appears in Table 1 (item 33, right column) that was added to remedy a psychometric consideration at a later point in Phase 3.

205 comments or feedback after each item. Participants returned their ratings and spreadsheet by
206 email. All procedures followed ethical standards approved by the host institution.

207 **Results and Interim Discussion**

208 Data were collated across all coaches and analyzed as frequencies. Responses are
209 displayed in Figure 1, regrouped as ‘agree’, ‘somewhat agree’, with the latter two response
210 categories displayed together as ‘disagree, don’t know, or awkward to me’.

211 The frequency data revealed concerns with many items, indicated especially by
212 frequencies in the ‘disagree, don’t know, or awkward to me’ category. Foremost, the coaches
213 noted they were uncomfortable with the content of reverse-coded items. Specifically, they found
214 items for reporting their insensitivity toward athletes as being difficult to comprehend. They
215 identified items such as “having difficulty understanding athletes’ point of view”, “getting your
216 point across”, “feeling impatient with your adult athletes’ progress”, “having difficulty with the
217 amount of time athletes need to grasp concepts”, and getting “annoyed with the many questions
218 your adult athletes ask” as problematic. These items are antithetical to the patience, and empathy
219 required for a learner-centered approach (Henschke, 1994). They are also contrary (hence their
220 reverse-coding) to the notion that a coach should afford athlete opportunities to take
221 responsibility for learning, and a coach’s appreciation that athletes should be allowed to become
222 frustrated and will ask many questions as they figure out their own direction. The notion that a
223 coach of adults should make efforts to understand how an athlete’s perspective may differ from
224 their own is a hallmark of adult-learning facilitation (Henschke, 1994).

225 Phase 2 frequencies also indicated that coaches judged statements related to the reverse-
226 coded factor of coach-centered processes to be quite problematic. Particularly, the vetting
227 process displayed poor ratings for “your [coaching] skills require no further refinements”,

228 stipulations that “your adults follow the precise learning experiences you provide them”, and
229 coaching “exactly what and how you have planned”. Yet, these items are essential in the IPI for
230 opposing the learner-centered items representing andragogy; within andragogy, it is not
231 imperative for a coach to assume that what they have precisely communicated to athletes should
232 be subsequently followed, instead allowing learners to discover information for themselves
233 (MacLellan et al., 2018). Overall, these difficulties with reverse-coded items were not entirely
234 surprising, as reverse-coded items had caused significant problems for internal consistency
235 reliability in prior efforts among adult educators and had to be discarded (Holton, Wilson, &
236 Baltes, 2009). Many comments from our Masters coaches indicated that, despite their knowledge
237 that these items were intentionally negative-valenced, they had difficulties accepting and
238 endorsing reverse-coded items in the survey.

239 Our frequency results also showed some smaller but notable issues with items from
240 disparate factors, including, placing adult athletes in groups to discuss information (athlete-
241 centered learning processes), asking adult athletes how they would approach a learning task
242 (accommodating athlete uniqueness), balancing the emphasis of coaching efforts between skill
243 acquisition and motivation (coach empathy with athletes), and trusting your athletes to know
244 their own goals, dreams and realities (coach trust of athletes). Although the frequencies revealed
245 issues with many items after Phase 2 vetting, our position at that point was they were not so
246 significant that we should meddle with the items of the posited factor structure from the IPI, that
247 we should respect its integrity, and submit it for further testing of factorial validity in Phase 3.

248 **Phase 3: Factorial Validity**

249 Phase 3 aimed to advance the survey items to tests of a measurement model to determine
250 whether the conceptualized factor structure of the IPI could be ascertained based on self-report

251 by sport coaches. The conceptual integrity of the survey inventory would be fully respected were
252 the data to fit a model with seven factors (Lubin, 2013): coach empathy with athletes; coach trust
253 of athletes; planning and delivery of instruction; accommodating athlete uniqueness; athlete-
254 centered learning processes; coach-centered learning processes; coach insensitivity toward
255 athletes. The latter two factors are antithetical to andragogic principles and were reverse-coded.

256 **Method**

257 **Participants.** Following institutional ethics clearance, coaches were contacted via
258 recruitment emails that were forwarded by directors of Masters sport organizations and through
259 social media platforms controlled by Masters sport organizations in Canada and the USA.
260 Recruitment messages contained a link to our SurveyMonkey online survey. In total, 512
261 Masters coaches accessed our survey and 383 completed the study. Of the 383 coaches ($M_{\text{age}} =$
262 49.32, $SD = 13.60$), 271 were male, 110 were female, and 2 did not disclose their gender. The
263 majority were from Canada ($n = 292$), while others were from the USA (59), UK (19), Australia
264 (10), China (1), New Zealand (1), and 1 coach did not indicate a country. Our sample had
265 coached their primary sport for a mean of 19.01 years ($SD = 12.74$), and reported having coached
266 Masters/adult athletes for an average of 15.94 years ($SD = 11.34$). The majority of the coaches
267 worked with golfers ($n = 223$) or swimmers (86), while others coached canoe/kayak (14),
268 athletics (14), curling (7), triathlon (6), distance running (5), and 16 other recognized sports (29).

269 On average, the participants coached 9.41 months per yr ($SD = 2.84$) and coached adults
270 for 12.09 hrs per wk ($SD = 10.85$) during those months. Our survey asked coaches to respond to
271 questions about the ages of their athletes. For each of “under 20 yrs-old”, “20-30 yrs-old”, “31-
272 40 yrs-old”, “41-54 yrs-old”, and “55+ yrs-old” categories, they reported whether they had
273 “none”, “a few”, or “many” athletes (anchored at 1, 2 and 3, respectively). On average, coaches
274 worked with “a few” to “many” athletes who were between 41-54 yrs-old ($M = 2.46$, $SD = 0.54$)

275 and who were 55 yrs-old and older ($M = 2.41$, $SD = 0.58$). They coached “a few” 31-40 yrs-old
276 athletes ($M = 2.27$, $SD = 0.48$), 21-30 yrs-old athletes ($M = 2.09$, $SD = 0.48$), and under 20 yrs-
277 old athletes ($M = 2.09$, $SD = 0.72$). Therefore, although our coaches generally worked with more
278 middle-aged and older athletes, they also worked with diverse age ranges.

279 **Instrument.** Coaches completed our IPI inventory comprising 38 items intended to load
280 on 7 factors (Table 1, right). These included the 37 items resulting from Phase 2, plus an added
281 item to ensure we had three items at minimum on all factors (Hair, Black, Babin, & Anderson,
282 2010). Specifically, we revisited our internal vetting document from Phase 2 and reclaimed the
283 essence of items 2 and 24 (left side of Table 1) by adding an item for what sport coaches may do:
284 “place athletes in groups so they can coach each other” (new item 33, right side of Table 1).
285 Coaches rated all items on a 7-point Likert scale anchored at 1 (never) and 7 (always). The stem
286 “How often do you...” preceded each item.

287 **A priori data analyses.** Using the Mplus software program (Muthén, L. K., & Muthén,
288 B. O., 2012), we used Confirmatory Factor Analyses (CFA). Since a hypothesized structure for
289 the IPI existed, CFAs were conducted to test *a priori* structures against the data, i.e., to evaluate
290 model fit. CFAs test the hypothesis that a specific number of factors are explained by a specific
291 number of indicators. In CFA, each item is only allowed to load onto one factor, and all non-
292 intended item loadings are constrained to zero. In the case of poor fit, we planned to use the
293 MPlus program to conduct Exploratory Structural Equation Modeling (ESEM) with a target
294 rotation (Muthén, L. K., & Muthén, B. O., 2012).

295 Our rationale was, should the *a priori* IPI model show poor fit, we would proceed to
296 employ ESEM to test the same factor structure, in a more lenient fashion than in CFA, but not as
297 freely as the traditional approach of using an exploratory factor analysis. By allowing for cross-

298 loadings between items to be freely estimated, ESEM allows for a better approximation of social
299 science data than CFA, by accommodating data that may genuinely be inter-correlated (Marsh,
300 Morin, Parker, & Kaur, 2014) when CFA would likely discard measurement models on account
301 of these same circumstances. The advantage of ESEM over exploratory factor analyses at this
302 stage is that it provides a more conservative approach and increases the possibility of retaining a
303 model fit that aligns with the *a priori* structure. Traditionally, after CFA fails, many researchers
304 default to an exploratory factor analyses, which are not beholden to any hypothesized structure
305 from a guiding conceptualization and are predominantly data driven. By using a target rotation in
306 ESEM, one is able to adopt a “primarily confirmatory approach” to ESEM because non-intended
307 factor loadings are set to load close to 0 (i.e., ~ 0) on their hypothesized factor (Marsh et al.,
308 2014, p. 88). Like CFA, ESEM provides parameter estimates, goodness-of-fit statistics, and
309 standard errors (Marsh et al., 2009). Thus, with ESEM being less restrictive than CFA, but
310 attentive to the guiding *a priori* structure compared to EFA, we were prepared to employ such
311 analyses should the initial CFA fail.

312 In all analyses, we planned to use a robust maximum likelihood estimator (MLR), which
313 produces both standard errors and tests of model fit. We used multiple indices to assess model
314 fit: Comparative Fit Index (CFI), Tucker-Lewis index, Standardized Root Mean Square Residual
315 (SRMR), Root Mean Square Error of Approximation (RMSEA), and the normed chi-square
316 (χ^2/df). Hair et al. (2010) suggest good model fit is reached if: $CFI \geq 0.90$, $TLI \geq 0.90$, $SRMR \leq$
317 0.08 , $RMSEA \leq 0.05$, and $\chi^2/df \leq 5$.

318 **Results**

319 **Preliminary analyses.** Only 0.24% data were missing. As the influence of missing data
320 was negligible, missing data were treated with multiple imputations using an expectation-
321 maximization method (Tabachnick & Fidell, 2013).

322 **CFA.** We conducted a CFA to test the fit of the 38 item, seven factor IPI (Table 1, right).
323 Statistics indicated very poor model fit: CFI = .577, SRMR = .105, RMSEA = .084 (90% CI =
324 .080 – .087), and $\chi^2/df = 3.691$. There was multicollinearity between the ‘accommodating athlete
325 uniqueness’ factor and both the ‘coach trust of athletes’ ($r = 1.02$), and ‘planning and delivery of
326 instruction’ ($r = 0.94$) factors. There was multicollinearity between ‘coach empathy with
327 athletes’ and ‘coach trust of athletes’ ($r = 0.98$). All construct reliability (CR) scores were below
328 .7 except for ‘coach insensitivity toward athletes’, indicating most factors had weak internal
329 consistency reliability (Hair et al., 2010). Average Variance Extracted (AVE) scores for each
330 factor were below .5, meaning that the majority of variance in each item was not explained by
331 their respective factors. Taken together, the factor loadings and the AVE statistics suggested
332 poor convergent validity within the resultant model (Hair et al., 2010). Finally, all factors had
333 smaller AVE scores than Maximum Shared Variance (MSV) scores except for the ‘coach
334 insensitivity toward athletes’ factor. MSV scores are calculated by determining the largest
335 correlation each factor has with another and squaring the correlation coefficient. With this in
336 mind, it could be concluded that the majority of factors explained less variance within their own
337 items than the variance in items they shared with any other factor. These results indicated poor
338 discriminant validity amongst factors (Hair et al., 2010). These results altogether suggested the
339 hypothesized factor structure was not appropriate.

340 **ESEM.** We used ESEM, with a target rotation, to test the fit of the 38 item, seven factor
341 IPI (Table 1, right). The following criteria were used for our ESEM analyses: each item must

342 have a primary factor loading $\geq .32$ ($\geq 10\%$ overlapping variance); each item must not have cross
343 loadings greater than .32 on unintended factors (Tabachnick & Fidell, 2013). We posited that
344 responses to the 38 items would be explained by seven correlated factors. Statistics showed good
345 fit: CFI = .904, SRMR = .029, RMSEA = .047 (90% CI = .042–.052), and $\chi^2/df = 1.856$. The
346 factor loading matrix is in Table 3. Notably, inspection of the factor loadings showed
347 inconsistencies between the hypothesized structure and the data. More specifically, items 1, 3, 6,
348 9, 10, 19, 20, 21, 24, 25, 33, 36, and 38 failed to load on their respective factors, and items 1, 3,
349 6, 9, 10, 13, 16, 19, 20, 21, 24, 33, 38 had problematic cross-loadings on unintended factors.
350 When considering the low loading items and cross loadings, 17 of the 38 items (or 45% of all
351 items) were problematic. Finally, the ‘accommodating athlete uniqueness’ factor was not
352 represented by any of its intended items. Taken together, our ESEM results support our
353 conclusion from our CFA that the hypothesized factor structure was not appropriate for our adult
354 sport coach data.

355 **A posteriori exploratory analyses.** Although the hypothesized factor structure of the IPI
356 was not supported, it was still possible that the IPI items could fit our data if they were
357 represented by a different factor structure. Although we had not initially intended to pursue this
358 possibility, given our knowledge at this stage that the *a priori* model was ill-suited, we elected
359 to conduct further exploratory analyses. Using the SPSS and Mplus software programs, we used
360 a data driven approach to find an alternative factor structure with better fit. We ran a parallel
361 analysis with an eigenvalue Monte Carlo simulation to determine the number of factors to
362 extract. Results suggested that the data were best supported by a three-factor structure. With the
363 Mplus software program, the three-factor structure was tested through ESEM analyses with a
364 geomin rotation, which was an exploratory approach (unlike the confirmatory ESEM approach

365 we used in our *a priori* analyses). Unlike in the previous ESEM analyses, where items were
366 “targeted” to a specific factor, all items in this analysis were free to load on all three factors.
367 Items were then removed for having low factor loading $\geq .32$ and for having cross loadings $> .32$
368 on multiple factors. Through this process, it was not possible to uncover a model that had both
369 good model fit, and no problematic items. After multiple attempts, the best model achieved was a
370 two-factor, 11 item structure that had no problematic items and adequate fit: CFI = .903, SRMR
371 = .045, RMSEA = .093 (90% CI = .078 – .087), and $\chi^2/df = 3.691$. However, it is important to
372 note that many factors and 27 items were lost in this process. The process “felt” data-driven, and
373 the final factor structure was interpreted to have little theoretical or practical relevance. For
374 instance, one factor was represented by three items: have difficulty understanding your athletes'
375 points-of-view (item 25); get annoyed with the many questions your athletes ask (item 30); feel
376 your skills require no further refinements for coaching your athletes (37). This factor did not tie
377 to an andragogic principle, and was believed to provide limited practical use for coaches. Thus,
378 these continued exploratory analyses provided support that the IPI items could not be salvaged
379 with respect to a rich, multi-faceted factor structure in our adult sport coach data.

380 Discussion

381 This three-phase investigation sought to develop a survey that allows coaches to reliably
382 report on valid principles of adult-oriented coaching as they relate to their coaching practice. Our
383 first aim was to nominate a survey tool from the neighbouring field of adult education for testing
384 in the adult sport domain. After conducting a systematic literature search, we identified the IPI
385 (Henschke, 1994, 2014a) as a candidate instrument. The IPI had been used by instructors in
386 numerous domains to assess their andragogical practices, by adult learners to assess andragogic

387 teaching, showed modest psychometric support relative to other instruments in the field, and had
388 been applied to the role of coaching (i.e., life/corporate coaches; Lubin, 2013).

389 We submitted the IPI, with minor edits for phrasing, to vetting for face validity with adult
390 sport coaches. The frequency data revealed concerns with many items, and especially negatively-
391 valenced items related to ‘coach insensitivity toward athletes’ and ‘coach-centered learning
392 processes’. Yet, from the very start of IPI scale development, Henschke (1994) has contended
393 that such negatively-valenced constructs are imperative and complementary for assessment and
394 applied purposes, and he more recently contended that teacher insensitivity toward learners
395 makes a central contribution to andragogical teachers and learners in the classroom (Henschke,
396 2014b). Thus, despite some concerns, and in keeping with our mindset to retain as many of the
397 items converging on the IPI structure as possible, we advanced all of our item to Phase 3 for
398 model testing using coaches’ self-report survey responses.

399 In Phase 3, the collective results from the CFA and ESEM clearly showed that the
400 hypothesized factor structure for our IPI items was not appropriate for assessing adult learning in
401 Masters sport. There were complications related to convergent and discriminant validity of items,
402 and multicollinearity between factors, evidenced by widespread cross-loading items. The final *a*
403 *posteriori* analytic results showed widespread difficulties that likely only could be remedied by
404 taking foremost data-driven decisions that would become increasingly distanced from the
405 hypothesized IPI structure, which was never our intention in this investigation.

406 Our conclusion is that the IPI taken from a parallel domain of adult learning is ill fitting
407 and inappropriate for coach report in adult sport. Thus, our results epitomize evidence justifying
408 Hagger and Chatzisarantis’ (2009) strong caution against assuming that established self-report
409 scales from another domain (e.g., education) can be equally valid in the sporting context. Our

410 three-phase investigation followed their recommendations to verify face validity (in our case,
411 from expert researchers in adult sport, and also from experienced coaches of adult sportspersons)
412 and convergent validity (via CFA and ESEM). In particular, the internal vetting and external
413 coach vetting for face validity highlighted problems related to awkwardness of phrasing that
414 could not be remedied by our conservative approaches to wordsmithing. It is very likely that
415 these issues related to phrasing also underpinned the difficulties that were borne out by our poor
416 evidence relating to convergent (factorial) validity; clearly, items that conceptually were
417 supposed to capture the essence of certain latent constructs did not load together well. Overall,
418 our efforts to reliably import an established tool from a parallel domain were not successful; the
419 language of the items may have been insufficiently sensitive to the domain of adult sport and the
420 coaching of adult sportspersons, meaning we fell short on a contextually-specific survey.

421 Hagger and Chatzisarantis (2009) instructed sport psychology researchers to remain
422 cognizant of macro- and micro-level distinctions in research on validity. We remain convinced
423 that macro-level use of andragogical conceptualizations to understand coaching approaches in
424 Masters sport is valid, though the current investigation showed micro-level measures that are
425 founded upon instruments from the adult education domain are invalid. We appreciate those who
426 may take different positions, for example, who might state we moved beyond conservative
427 wordsmithing of the IPI to make it more suitable to sport (thus changing the structure of the
428 latent factors), or who might suggest that the ill-fitting results were particular to the sample
429 recruited in this study. However, we had committed to retain the *a priori* structure in line with
430 the operational definitions of each factor. Moreover, given our relatively diverse samples of
431 coaches (e.g., from various sports, coaching a wide range of adults), we submit that the
432 inappropriateness of the IPI was related to broader issues of validity than our sample. In

433 particular, the observed items and *a priori* factor structure were not formulated based on
434 essential nuances, lexicon, and intonation of experiences in the Masters coaching context.

435 While the items derived from the IPI were not fitting in the current study (i.e., at the
436 micro-level), there exists notable macro-level evidence that an andragogical model borrowed
437 from education can be aptly used for exploring coaching in Masters sport (Callary et al., 2017;
438 Callary & Young, 2019; MacLellan et al., 2019). With this in mind, the next step should be the
439 development of a coach report instrument whose content appreciates the nuances, lexicon, and
440 intonation of experiences in the Masters coaching context. One approach would be to begin by
441 scrutinizing an emerging set of rich, descriptive, qualitative studies detailing the practices and
442 personal attributes of Masters sport coaches (Callary et al., 2015, 2017; Currie et al., 2019;
443 Ferrari et al., 2017; MacLellan et al., 2018; 2019; Morris-Eyton, 2008; Rathwell et al., 2015).
444 These qualitative works appreciatively document various approaches, strategies, actions and
445 practices that sport coaches apply to satisfy learning and training needs/preferences of adults.
446 The content in these works can be framed within a sport andragogy, or adult athlete learning
447 perspective (Callary et al., 2017). Using a reliable process of vetting, investigators could
448 endeavour to effectively translate designated items from such qualitative works into andragogical
449 survey items that could be advanced for testing. Such a strategy conforms to Morse's (2010)
450 recommendations for how to integrate and execute mixed-methods research on a dedicated topic
451 over time. Morse discussed how qualitatively informed research could subsequently inform and
452 help generate a survey instrument as long as researchers maintained a consistent theoretical drive
453 (e.g., andragogy/adult sport learning) and took steps to pursue incremental validity, effectively
454 incorporating meaning and quantity into the same line of inquiry. In line with Morse, we
455 therefore recommend borrowing from prior "big-Q" qualitative findings of researchers sensitive

456 to the Masters sport coaching domain and translating these works into initial “small-q”
457 quantitative trials related to coach self-assessment. We anticipate, over time, that subsequent
458 quantitative trials (centered on accruing evidence for validity and replication) may result in a
459 robust, contextually sensitive, survey tool that ultimately achieves “big-Q” quantitative status.

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Table 1

Catalogue of Items from Henschke's and Lubin's Inventories for the IPI used in Current Study

| Item # | Henschke (1994): designated by H Lubin (2013): designated by L | Item # | Items used in the present study |
|---|---|-----------------------------|---|
| Coach empathy with learners | | Coach empathy with athletes | |
| Empathetic coaches play close attention to development of a warm, close, working relationship with learners and respond to their learner's learning needs. | | | |
| 4 | Feel fully prepared to coach (L) | 1 | Purposefully demonstrate to your adult athletes that you are fully prepared to coach |
| 12 | Notice and acknowledge to learners positive changes in them (H) | 2 | Notice and acknowledge to adult athletes positive changes in them |
| 19 | Balance your efforts between learner content acquisition and motivation (H) | 3 | Balance your efforts between adult athlete skill acquisition and motivation |
| 26 | Express appreciation to learners who actively participate (H) | 4 | Express appreciation to an adult athlete who actively participates |
| 33 | Promote positive self-esteem in learners (H) | 5 | Promote positive self-esteem in your adult athletes |
| Coach trust of learners | | Coach trust of athletes | |
| Trust and respect between coaches and learners can be created in different ways, for example, avoiding threat and negative influences, creating a relaxed and low risk atmosphere, and allowing learners to take responsibility for their own learning. | | | |
| 7 | Purposefully communicate to learners that each is uniquely important (H) | 6 | Purposefully communicate to an adult athlete that s/he is uniquely important |
| 8 | Express confidence that learners will develop the skills they need (H) | 7 | Express confidence that your adult athletes will develop the skills they need |
| 16 | Trust learners to know what their own goals, dreams, and | 8 | Trust your adult athletes to know their own goals, dreams, |

| | | | |
|---|--|---|---|
| | realities are like (H) | | and realities |
| 28 | Prize the learner's ability to learn what is needed (H) | 9 | Value your adult athletes' ability to learn what is needed |
| 29 | Feel learners need to be aware of and communicate their thoughts and feelings (H) | 10 | Encourage your adult athletes to be aware of and communicate their thoughts and feelings |
| 30 | Enable learners to evaluate their own progress in learning (H) | 11 | Enable your adult athletes to evaluate their own progress in learning |
| 31 | Hear what learners indicate their learning needs are (H) | 12 | Pay attention to your adult athletes' indications of their learning needs |
| 39 | Engage learners in clarifying their own aspirations (H) | 13 | Engage your adult athletes in clarifying their own aspirations |
| 43 | Develop supportive relationships with your learners (H) | 14 | Develop supportive relationships with your adult athletes |
| 44 | Experience unconditional positive regard for your learners (H) | | |
| 45 | Respect the dignity and integrity of the learners | 15 | Respect the dignity and integrity of your adult athletes |
| Planning and delivery of instruction | | Planning and delivery of instruction | |
| Coaches plan learning facilitation in a way that learners are involved in the planning process, with evaluation and feedback included in the planning. | | | |
| 1 | Use a variety of coaching techniques (L) | | |
| 9 | Search for or create new coaching techniques (L) | 16 | Search for or create new coaching techniques for adult athletes |
| 22 | Establish coaching objectives (L) | 17 | Establish coaching objectives |
| 23 | Use a variety of coaching media in your sessions (telephone, internet, pictures, videos, etc.) (L) | 18 | Use a variety of coaching media in your sessions (telephone, internet, pictures, videos, etc.) |
| 42 | Integrate coaching techniques with subject matter content (L) | | |
| Accommodating learner uniqueness | | Accommodating athlete uniqueness | |
| Coaches facilitate learning by taking into account the learner's self-concept, motivation, accumulated life experience, and the application learners have in mind for the subject. Each learner has his/her preference in learning and learns best in different methods. Coaches apply distinct learning facilitation techniques with their learners. | | | |
| 6 | Expect and accept learner frustration as s/he grapples with | 19 | Expect and accept an adult athlete's frustration as s/he |

| | | | |
|---|---|-------------------------------------|---|
| | problems (H) | | grapples with problems |
| 14 | Believe that learners vary in the way they acquire, process, and apply subject matter knowledge (H) | 20 | Take steps to account for variability in the way adult athletes acquire and apply skills |
| 15 | Really listen to what learners have to say (H) | 21 | Really listen to what your adult athletes have to say |
| 17 | Encourage learners to solicit assistance from other learners (H) | 22 | Encourage adult athletes to solicit assistance from other athletes |
| 37 | Individualize the pace of learning for each learner (H) | 23 | Individualize the pace of learning for each adult athlete |
| 38 | Help learners explore their own abilities (H) | | |
| 40 | Ask the learners how they would approach a learning task (H) | 24 | Ask your adult athletes how they would approach a learning task |
| <hr/> | | <hr/> | |
| Coach insensitivity toward learners | | Coach insensitivity toward athletes | |
| <p>When coaches lack sensitivity and feeling to recognize learners' uniqueness and effort, trust and mutual respect between coaches and learners is not bonded. Insensitivity is failing to show care and respect to learners and not listening to what learners say.</p> | | | |
| 5 | Have difficulty understanding learners' points-of-view (H) | 25 | Have difficulty understanding your adult athletes' points-of-view |
| 13 | Have difficulty getting your point across to learners (H) | 26 | Have difficulty getting your point across to your adult athletes |
| 18 | Feel impatient with learner progress (H) | 27 | Feel impatient with your adult athletes' progress |
| 27 | Experience frustration with learner apathy (H) | 28 | Experience frustration with adult athletes who are difficult to coach |
| 32 | Have difficulty with the amount of time learners need to grasp various concepts (H) | 29 | Have difficulty with the amount of time your adult athletes need to grasp various concepts |
| 36 | Get bored with the many questions learners ask (H) | 30 | Get annoyed with the many questions your adult athletes ask |
| 41 | Feel irritation at learner inattentiveness in the learning session (H) | | |
| <hr/> | | <hr/> | |
| Experience-based coaching techniques/Learner-centered learning processes | | Athlete-centered learning processes | |
| <p>With different accumulated learning experiences, learners take a major part in their own learning and become active parts of the work process. The role of coaches is to facilitate group dynamics and social interaction so learners can easily apply the</p> | | | |

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| learned subject to applications they have in mind. | | | |
| 2 | Use buzz groups (learners placed in groups to discuss information from coaching sessions) (H) | 31 | Place your adult athletes in groups to discuss information from coaching sessions |
| 10 | Teach through simulations of real-life settings (H) | | |
| 21 | Conduct group coaching sessions (L) | | |
| 24 | Use listening teams (learners grouped together to listen for a specific purpose) during sessions (H) | | |
| 35 | Conduct role plays (L) | 32 | Incorporate opportunities at practice for your adult athletes to play different roles simulating competition |
| | | * 33 | Place athletes in groups to coach each other |

| | | | |
|--|--|----|---|
| Coach-centered learning processes | Coach-centered learning processes | | |
| When coaches control the environment, learning is a subject-centered process in which knowledge flow is a one-way transmission from coaches to learners, and learners are passive. | | | |
| 3 | Believe that your primary goal is to provide the learner as much information as possible (H) | 34 | Feel that your primary goal is to provide your adult athletes with as much information as possible |
| 11 | Coach exactly what and how you have planned (L) | 35 | Coach exactly what and how you have planned |
| 20 | Try to make your presentations clear enough to forestall all learner questions (H) | 36 | Try to make your coaching instructions clear enough to forestall all of your adult athletes' questions |
| 25 | Believe that your coaching skills are as refined as they can be (L) | 37 | Feel your skills require no further refinements for coaching your adult athletes |
| 34 | Require learners to follow the precise learning experiences you provide them (H) | 38 | Require your adult athletes to follow the precise learning experiences you provide them |

Note. Henschke's (2014a) descriptions for each factor are provided immediately below each factor heading in the left hand column.

* Item 33 in the right column was not submitted to coach vetting of face validity (Phase 2); it was added in Phase 3 to ensure at least three possible items loading per factor for measurement model testing purposes.

Table 2

Demographic Characteristics of Adult Sport Coaches in Phase 2

| Sport | Sex, age | Yrs as adult coach | Mean age of athletes, estimated skill level of athletes | Coaching involvement | | Certification, accreditation |
|----------------------|----------|--------------------|---|----------------------|------------|--|
| | | | | Mos per yr | Hrs per wk | |
| Lawn Bowls | m, 71 | 16 | 55+, recreational, local players | 7 | 4-5 | Level 2 National Coaching Certification Program (NCCP); trained learning facilitator, evaluator |
| Canoe, Kayak | m, 27 | 10 | 40, recreational, local paddlers | 10 | 7 | Canoe/Kayak NCCP Competitive Development trained; fitness & lifestyle management diploma |
| Canoe, Kayak | f, 30 | 10 | 55, recreational, local paddlers, competitors at Masters nationals | 6 | 6 | Canoe/Kayak NCCP Competitive Development trained; master's thesis in coach development |
| Lawn Bowls | f, 73 | 10 | 70, beginner players, learn to train, train to compete, active for life | 4 | 9 | Level 3 NCCP; diploma – National Coaching Institute (high performance coaching) |
| Judo | m, 75 | 55 | 43, recreational, local, provincial, national, international athletes | 12 | 7 | Level 3 NCCP; Pacific Sport Institute (affiliated Canadian elite coach) |
| Athletics | m, 51 | 10 | 52, recreational, local, provincial, national, international athletes | 12 | 10 | No certification; 40 years competing, from local to Olympics level, plus 10 years of learning to coach Masters athletes through trial and error |
| Triathlon | m, 45 | 15 | 40, recreational, local, provincial, national, international athletes | 12 | 20 | NCCP, accreditation level unspecified; owner and head coach, private coaching services for adult triathletes |
| Rowing | m, 63 | 20 | 40, skill levels not indicated | 8 | 3 | Level 5 NCCP; Masters rowing club coach; university head coach; kinesiology professor |
| Athletics | f, 62 | 18 | 58 (30-73), recreational, local, provincial, national, international athletes | 12 | 10 | Level 4 NCCP; diploma – National Coaching Institute (high performance coaching); Road Runners Club of America certified; US Track & Field & Cross-Country Coaches Association endurance event specialist |
| Alpine ski racing | m, 68 | 20 | 50, skiers at varying levels in Masters races | 3 | 8-10 | Level 3 NCCP; performance level trained coach; trained entry and development level course facilitator, evaluator; Level 3 ski instructor |
| Athletics (Racewalk) | f, 65 | 10 | 54, local, provincial and national racewalkers | 12 | 2 | Level 3 NCCP |
| Lawn Bowls | m, 74 | 5 | 45, local, provincial, national players | 8 | 10 | Level 1 NCCP; Bachelor's degree in Physical Education & Recreation |

Table 3. ESEM and CFA Factor Structures for the 38-item 7-factor Model.

| Items | ESEM | | | | | | | CFA |
|---|-------------|-------------|-------------|--------------|-------|-------------|-------|------|
| | F1 | F2 | F3 | F4 | F5 | F6 | F7 | |
| F1 (Coach Empathy With Athletes) | | | | | | | | |
| Item 1 | <u>0.12</u> | 0.32 | 0.02 | -0.12 | 0.00 | 0.36 | 0.01 | 0.45 |
| Item 2 | 0.48 | 0.16 | 0.22 | -0.14 | -0.05 | -0.12 | -0.04 | 0.58 |
| Item 3 | <u>0.16</u> | 0.25 | 0.23 | 0.46 | 0.01 | -0.07 | 0.13 | 0.56 |
| Item 4 | 0.56 | 0.25 | -0.14 | -0.06 | -0.01 | 0.00 | 0.07 | 0.58 |
| Item 5 | 0.67 | 0.05 | 0.07 | -0.07 | -0.06 | -0.10 | 0.13 | 0.60 |
| F2 (Coach Trust of Athletes) | | | | | | | | |
| Item 6 | 0.42 | <u>0.13</u> | 0.07 | 0.31 | -0.06 | -0.08 | 0.28 | 0.56 |
| Item 7 | 0.22 | 0.71 | -0.18 | -0.08 | -0.03 | -0.07 | 0.02 | 0.67 |
| Item 8 | -0.01 | 0.47 | -0.04 | 0.13 | -0.04 | -0.08 | 0.30 | 0.46 |
| Item 9 | 0.28 | <u>0.29</u> | 0.10 | 0.37 | 0.01 | 0.11 | -0.20 | 0.59 |
| Item 10 | 0.36 | <u>0.25</u> | 0.26 | 0.24 | 0.10 | -0.10 | -0.16 | 0.62 |
| Item 11 | -0.07 | 0.71 | -0.05 | -0.02 | 0.00 | 0.01 | 0.08 | 0.58 |
| Item 12 | 0.09 | 0.60 | 0.09 | 0.06 | -0.09 | 0.14 | -0.05 | 0.72 |
| Item 13 | 0.02 | 0.40 | 0.35 | 0.00 | -0.02 | -0.03 | -0.03 | 0.58 |
| Item 14 | 0.05 | 0.47 | 0.17 | -0.25 | 0.03 | 0.14 | -0.07 | 0.53 |
| Item 15 | 0.18 | 0.38 | 0.05 | -0.27 | -0.03 | 0.02 | -0.11 | 0.45 |
| F3 (Planning and Delivery of Instruction) | | | | | | | | |
| Item 16 | 0.03 | 0.18 | 0.36 | 0.36 | 0.00 | 0.00 | 0.05 | 0.53 |
| Item 17 | 0.07 | 0.16 | 0.42 | 0.13 | -0.05 | 0.22 | -0.03 | 0.57 |
| Item 18 | 0.25 | 0.10 | 0.45 | -0.21 | 0.08 | 0.07 | -0.07 | 0.54 |
| F4 (Accommodating Athlete Uniqueness) | | | | | | | | |
| Item 19 | 0.13 | 0.34 | 0.04 | <u>-0.35</u> | 0.03 | 0.23 | -0.16 | 0.37 |
| Item 20 | 0.05 | 0.40 | 0.22 | <u>0.31</u> | -0.03 | 0.05 | -0.01 | 0.62 |

| | | | | | | | | |
|--|-------|-------------|-------------|--------------|-------------|-------------|-------------|------|
| Item 21 | 0.04 | 0.46 | 0.14 | <u>-0.08</u> | -0.15 | 0.01 | -0.06 | 0.53 |
| Item 22 | -0.08 | 0.12 | 0.31 | <u>0.13</u> | 0.15 | -0.23 | 0.31 | 0.25 |
| Item 23 | 0.20 | 0.15 | 0.16 | <u>-0.09</u> | -0.04 | 0.20 | 0.03 | 0.40 |
| Item 24 | -0.03 | 0.25 | 0.27 | <u>0.12</u> | -0.02 | 0.01 | 0.27 | 0.46 |
| F5 (Coach Insensitivity Toward Athletes) | | | | | | | | |
| Item 25 | -0.11 | 0.22 | 0.14 | -0.14 | <u>0.31</u> | -0.13 | 0.39 | 0.39 |
| Item 26 | 0.10 | -0.08 | 0.02 | -0.08 | 0.50 | 0.16 | -0.06 | 0.49 |
| Item 27 | -0.11 | 0.02 | 0.02 | 0.00 | 0.62 | 0.00 | -0.08 | 0.61 |
| Item 28 | 0.04 | 0.10 | -0.11 | -0.10 | 0.73 | 0.03 | -0.24 | 0.59 |
| Item 29 | 0.11 | -0.15 | 0.01 | 0.01 | 0.64 | -0.01 | 0.07 | 0.66 |
| Item 30 | -0.05 | 0.00 | -0.02 | 0.18 | 0.61 | 0.02 | 0.17 | 0.67 |
| F6 (Athlete-Centered Learning Processes) | | | | | | | | |
| Item 31 | -0.14 | 0.09 | 0.01 | 0.01 | 0.22 | 0.54 | -0.02 | 0.38 |
| Item 32 | 0.17 | 0.01 | 0.13 | -0.24 | -0.07 | 0.48 | 0.04 | 0.24 |
| Item 33 | -0.13 | -0.03 | 0.37 | -0.03 | 0.16 | <u>0.15</u> | 0.37 | 0.54 |
| F7 (Coach-Centered Learning Processes) | | | | | | | | |
| Item 34 | 0.12 | -0.21 | 0.12 | -0.07 | 0.04 | 0.32 | 0.58 | 0.49 |
| Item 35 | 0.12 | 0.23 | -0.21 | 0.06 | 0.06 | 0.09 | 0.46 | 0.58 |
| Item 36 | 0.25 | 0.15 | -0.19 | -0.01 | 0.06 | 0.17 | 0.09 | 0.32 |
| Item 37 | -0.06 | 0.00 | 0.01 | 0.19 | 0.22 | -0.35 | 0.53 | 0.30 |
| Item 38 | 0.13 | 0.05 | -0.26 | 0.02 | 0.07 | 0.60 | <u>0.07</u> | 0.29 |

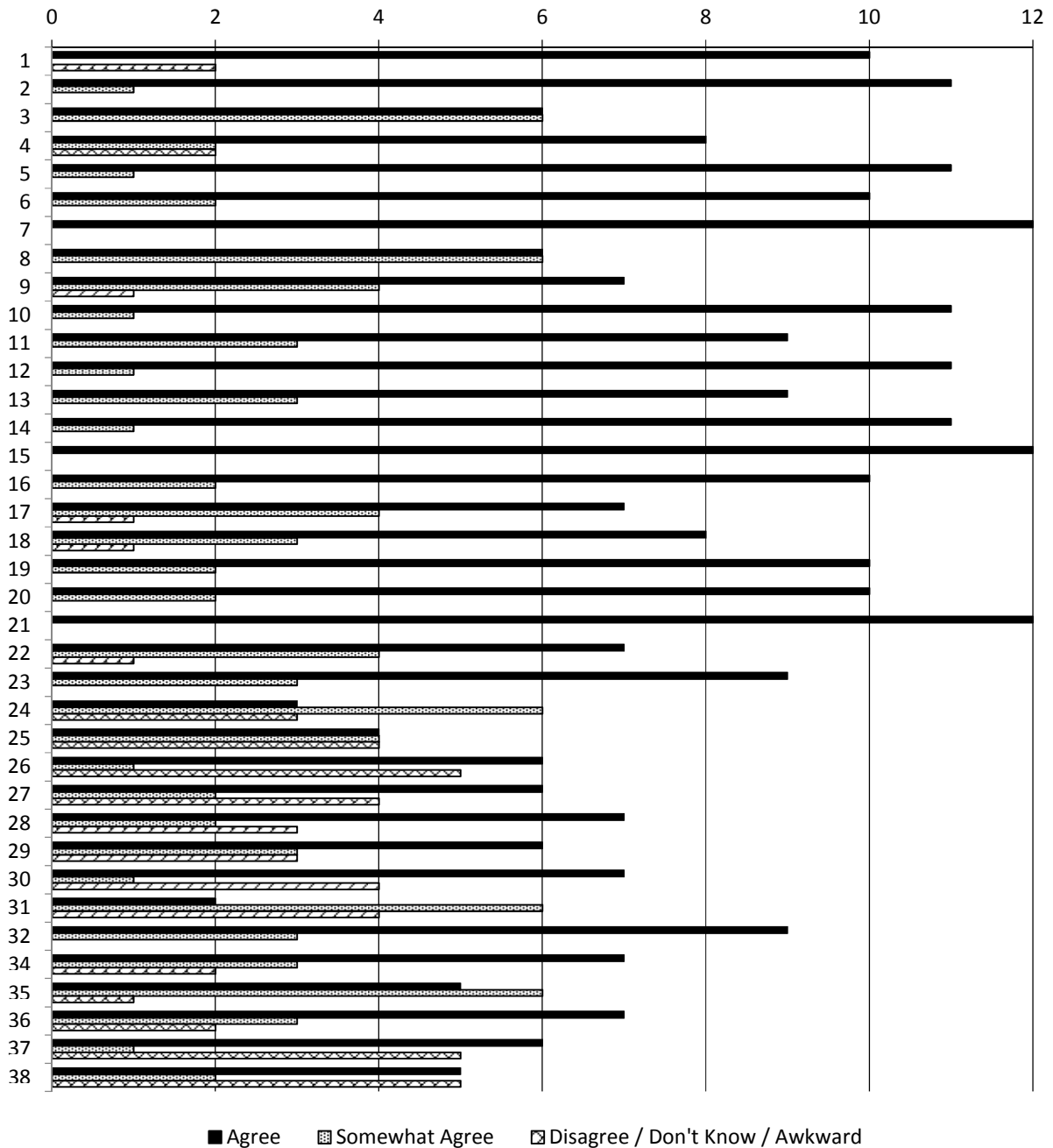
Note. The item order corresponds with the items found in the right column of Table 1. For both ESEM and CFA solutions, all parameter estimates are standardized. Items that failed to load on their respective factors are underlined and problematic cross loadings are in bold. In order to conserve space, we only present the CFA target loadings for each *a priori* factor since all non-target loadings are zero. F1 = Coach Empathy With Athletes, F2 = Coach Trust of Athletes, F3 = Planning and Delivery of Instruction, F4 = Accommodating Athlete Uniqueness, F5 = Coach Insensitivity Toward Athletes, F6 = Athlete-Centered Learning Processes, F7 = Coach-Centered Learning Processes

Table 4. *Correlation Matrix from the CFA for the 38-item 7-factor Model.*

| Factors | F1 | F2 | F3 | F4 | F5 | F6 | F7 |
|---------|-------|--------|-------|-------|-------|-------|------|
| F1 | - | - | - | - | - | - | - |
| F2 | .98** | - | - | - | - | - | - |
| F3 | .86** | .88** | - | - | - | - | - |
| F4 | .88** | 1.02** | .94** | - | - | - | - |
| F5 | -.13 | -.13 | .00 | -.09 | - | - | - |
| F6 | .28 | .32 | .48** | .45** | .53** | - | - |
| F7 | .40 | .38 | .35 | .43** | .41 | .59** | - |
| CR | 0.69 | 0.83 | 0.56 | 0.59 | 0.74 | 0.35 | 0.49 |
| AVE | 0.31 | 0.34 | 0.30 | 0.21 | 0.33 | 0.16 | 0.17 |
| MSV | 0.96 | 1.04 | 0.88 | 1.04 | 0.20 | 0.28 | 0.35 |
| ASV | 0.45 | 0.51 | 0.46 | 0.52 | 0.07 | 0.18 | 0.19 |

Note. F1 = Coach Empathy With Athletes, F2 = Coach Trust of Athletes, F3 = Planning and Delivery of Instruction, F4 = Accommodating Athlete Uniqueness, F5 = Coach Insensitivity Toward Athletes, F6 = Athlete-Centered Learning Processes, F7 = Coach-Centered Learning Processes; CR = Composite reliability, AVE = Average variance extracted, MSV = Maximum shared variance, ASV = Average shared variance.

Figure 1. Frequency counts from vetting by 12 coaches for the 37 items from the IPI inventory in Phase 2



Note. Items numbers on the vertical axis correspond to items the right hand side of Table 1. The exception, missing from this figure, is item 33, which was added in Phase 3.

Highlights:

Highlights are mandatory for this journal. They consist of a short collection of bullet points that convey the core findings of the article and should be submitted in a separate editable file in the online submission system. Please use 'Highlights' in the file name and include 3 to 5 bullet points (maximum 85 characters, including spaces, per bullet point).

- Tested validity of a self-assessment tool from adult education with sport coaches
- Validity testing was performed on the Instructional Perspectives Inventory
- The survey had issues with face validity and demonstrated poor factorial validity
- The survey was not sensitive to the context of coaching in Masters sport
- Assessment of adult-oriented coaching should build from sport andragogy literature

Running head: ADULT ORIENTED SPORT COACHING SURVEY

Borrowing on adult education to test a coaching assessment tool in adult sport

Declarations of interest: none.

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