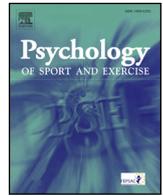




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Testing a coaching assessment tool derived from adult education in adult sport

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ABSTRACT

Objectives: The effective tailoring of instructional approaches to adult learners is beneficial in educational domains. No tool exists to assess coaches' use of adult-tailored methods in Masters (> 35+ years-old) sport. This study tested the content (face) and factorial (convergent, discriminant) validity of a self-report survey, derived from instructor assessment in adult education, for Masters sport coaches' assessment of adult-oriented approaches.

Design: Phase 1 involved a systematic search to nominate a survey for import to sport. Phase 2 involved the vetting of face validity among the researchers, and with 12 Masters coaches. Phase 3 tested the fit of a hypothesized factor structure to survey data from Masters coaches.

Method: Twelve coaches (8 m, 4 f, ages = 27–75 years) representing eight sports judged the face validity of the Instructional Perspectives Inventory (IPI), resulting in descriptive statistics for each item's suitability. A multi-sport sample of 383 Masters coaches (271 m, 110 f, 2 undisclosed; $M_{age} = 49.32$, $SD = 13.60$) completed the IPI, with responses submitted to confirmatory factor analyses and exploratory structural equation modeling.

Results: Frequencies revealed awkwardness with items from disparate factors of the IPI, especially reverse-coded factors. The hypothesized measurement model was ill fitting to data obtained from sport coaches.

Conclusions: Importing an established adult instructor survey from education and establishing its preliminary validity in adult sport was challenging. The resultant survey, even with minor modifications, proved insensitive to the context of Masters sport. Future research should translate content from emerging qualitative literature on the coached Masters context into a more viable quantitative instrument.

1. Introduction

As adult sport participation, or Masters sport, has grown exponentially in recent decades, a corresponding body of empirical literature has slowly developed (see Dionigi, 2016; Jenkin, Eime, Westerbeek, & van Uffelen, 2018; Young, Callary, & Rathwell, 2018). Recently, several works dedicated to the coached context of adult sport have appeared, opening up spaces in dialogue around coaching middle-aged and older adults (e.g., Callary, Rathwell, & Young, 2015; Callary & Young, 2016; Ferrari, Bloom, Gilbert & Caron, 2017; Hoffmann, Young, Rathwell, & Callary, 2019; Rathwell, Callary, & Young, 2015). The vast majority of these works are qualitative, serving to describe how adult-tailored coaching approaches have numerous benefits to adult sports-persons, including a heightened sense of self-confidence, motivation and authentic interest in sport, basic needs satisfaction, increased social

belonging, skill acquisition, improved performance, and active lifestyle gains.

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

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older athletes are non-existent.

Several recent qualitative studies have described the coaching strategies and techniques that are preferred by adult sportspersons and the personal attributes they appreciate from a coach. Ferrari et al. (2017) found that adult swimmers (aged 49–64 yrs) liked coaches who effectively communicated teaching feedback and motivational messaging to establish positive environments, and who conveyed organizational competency in planning workouts while maintaining flexibility to suit the adults' schedules. Swimmers (aged 45–65 yrs) valued having a coach who could share what they learned from their own athletic experience and professional development, and who used discretionary judgment when making decisions related to ranking and role assignment (Callary et al., 2015). These swimmers appreciated coaches who were relatable and wholly involved, who fostered reciprocal caring for the sport program, and who respected adults' time by efficiently managing training activities. Moreover, a pan-Canadian collaborative group addressing older adult physical literacy (Jones et al., 2018) stated "that quality physical activity experiences depend to an extent on tailoring instructional leadership and programs to older adults' preferences" (p. 11), underscoring the importance of organizations investing in trained coaches in adult sport.

A series of qualitative studies has specifically examined how adult-learning principles manifest in sport coaching and whether there are notable benefits of using approaches that are tailored to adults (Callary et al., 2018; Callary, Rathwell, & Young, 2017; MacLellan, Callary, & Young, 2018; MacLellan, Callary, & Young, 2019). In keeping with prominent coaching researchers' (e.g., Jones, 2006) endorsement of theories from education to frame inquiry on psychosocial topics of coaching, the aforementioned qualitative studies drew from Knowles, Holton and Swanson's (2012) *andragogy* in practice model. The andragogical framework is a well-known adult learning model that outlines principles for how instructors can interact and design activities to facilitate learner-centric interventions that align with adults' mature self-concept. Similarly, Henschke's (2014a) work on instructional methods has helped conceptualize best practices for teaching adults and helping adults learn. These models share common features, specifically the importance of teacher empathy and trusting in adults to direct many aspects of their own learning, considering how a teacher can transfer responsibility to adults, accommodating and personalizing the learning process, and acknowledging that adults' prior experiences are an asset. These andragogical features have proven fruitful in traditional adult education domains where learning is verbal-cognitive (e.g., corporate training and classrooms). Case studies in Masters swimming (Callary et al., 2017), canoe and kayak (MacLellan et al., 2018; 2019), dragon boat (Young & Callary, 2018), and women's synchronized skating (Currie, Young, & Callary, 2019), affirmed that adult-oriented principles, or andragogical principles, were commonly and intentionally employed by coaches. These studies described substantial (though not perfect) alignment of andragogical principles with preferred approaches by coaches in Masters sport (Callary et al., 2017; MacLellan et al., 2019). Furthermore, andragogical approaches were more prevalent and more nuanced in their application among middle-aged and older sportspersons compared to when they were invoked with teen-aged athletes (MacLellan et al., 2018). Callary et al. (2017) noted that coaches' approaches with adult sportspersons were more effective when they were aligned with andragogical principles.

With the understanding that adult-tailored coaching approaches may result in tangible benefits, and descriptions of adult-learning principles from qualitative studies, a promising next step is to more broadly assess the pertinence of adult-oriented coaching approaches. Broader issues of assessment implicate a need to complement what has been found qualitatively with a quantitative strategy (Henschke, 1989). There is need to develop a survey instrument that allows coaches to reliably report on various valid principles of adult-oriented coaching as they relate to their coaching practice. Such self-report inventories are central to personal and more formalized coach development protocol

wherein coaches receive feedback from multiple sources, including data-based sources, to reflect and deliberate on their craft (Hoffmann, Duguay, Guerrero, Loughead, & Monroe-Chandler, 2017).

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

2. Phase 1: targeted literature review

We conducted a targeted literature search with four search engines (Pubmed, Psycinfo, Jstor, and Proquest) and within Google Scholar in September 2016 to identify articles employing quantitative instruments for assessing andragogy. Search terms included "andragogy" in combination with "measurement", "survey", "validation", "psychometrics" or "questionnaire". Our initial search returned 23 items. We pursued a secondary search of references in these items, and those noted in Knowles et al.'s (2012) and Holton, Swanson Wilson, and Bates' (2009) reviews of andragogical instruments. This secondary search returned an additional 10 items. Each item was inspected to ensure it related to (a) data collection with a quantitative survey that could be recovered, (b) for which authors made an effort to report at least basic measurement considerations, and (c) surveys were for English-speaking respondents. Applying these criteria, we retained 14 survey tools (see table in Supplementary Appendix). Next, we vetted each of the retained surveys according to several criteria. Foremost, we were interested in identifying surveys that had been used to explicitly assess the perceptions of instructor-coaches, and not for adult students alone. Next, we judged the quality of these studies for addressing measurement issues, which we rated on a scale ranging from minimal considerations (e.g., descriptive data and distributions) to increasingly more substantial considerations such as internal consistency reliability and those additionally related to factorial validity (e.g., exploratory factor analyses) and how survey items validly converged on factors (see measurement quality column in Supplementary Appendix). We were also interested in identifying survey inventories that showed breadth in assessing multiple adult learning principles (i.e., several constituent factors/sub-scales); for example, those that foreclosed assessment around one or two factors were deemed to provide little discrimination in assessing instructor-coaches' use of different facets. We also sought to identify an instrument that had been used widely, i.e., an instrument that has been adopted by multiple researchers and refined in successive studies, indicating its acceptance among academics in diverse adult learning domains. Our notations and appraisal of all the surveys are in the Supplementary Appendix.

Of the 14 retained tools, many of the instruments had scant psychometric reporting; the highest quality inventories had been subjected to exploratory factor analyses, but not confirmatory factor analyses. Only Henschke's (1994; 2014a) Instructional Perspectives Inventory

(IPI) showed respectable measurement quality, including a line of subsequent studies in different samples of adult educators to verify internal consistency reliability, convergent validity on multiple factors, evidence of concurrent validity (Stanton, 2005) and predictive validity (Vatcharasirisook, 2011). The IPI showed a lineage across successive studies with minor modifications, in samples ranging from educators in community colleges/universities, in medical technology education, state social service agencies, health care settings, elementary school principals, educators of youth workers and in banking and hospitality services, and with life coaches (see Supplementary Appendix). Finally, the IPI was the only tool of the 14 that has been adapted to measure andragogy from the perspective of the coach (i.e., business and life coaches of adults; Lubin, 2013).

The IPI (Henschke, 1989) is a self-scoring, self-assessment tool that answers the question: “What beliefs, feelings and behaviors do adult educators need to possess to practice in the emerging field of adult education?” (p. 86). It has been used regularly to assess instructors’ perceptions of the frequency of their andragogy in practice in various domains, including graduate-school education, collegiate teaching staff development, medical technology instruction, nursing education, foreign language education, banking, health care and hospitality education, and business and life coaching. The IPI has been employed in 18 subsequent studies in adult learning and has been essential to many publications in the field (Henschke, 2014b). It has shown strong convergent validity on as many as seven factors, but consistently showing validity for at least five andragogical principles, and has been tested for internal consistency reliability (Henschke, 2014b). Compared to all other andragogical surveys, it is associated with modest psychometric reporting. Lubin (2013) modified the IPI to validly assess business and life coaches in the management domain. She found evidence for acceptable internal consistency reliability. The seven factor means and levels derived from Lubin’s sample were consistent with Henschke (1994) and further interviews with the coaches corroborated the construct validity of items attributed to each scale. With no universally accepted andragogical tool available, and based on the tools retrieved in a systematic search, we concluded that the IPI (Henschke, 1994), and the coaching variant (Lubin, 2013), represented the most suitable self-report instrument for investigating coaches’ perceptions of andragogical teaching behaviours within adult sport.

3. Phase 2: face validity

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

3.1. Method

3.1.1. Researcher vetting

Henschke’s (1994) and Lubin’s (2013) IPI inventories were the foundation for this phase. The left column of Table 1 shows the 45 items that were next vetted independently by the three authors. Each researcher judged each item for whether: it was articulated in an easily understood way; it represented an andragogical principle; it was relevant for coaching adult athletes (> age 35). The authors were qualified reviewers, with each bringing different expertise to the procedure. The first author had research expertise on the social psychology of adults’ motivation for Masters sport, is a former high-performance athletics coach and physical educator, and at the time was a Masters athlete. The second author brought research expertise on leadership

and coaching, and had published on participatory and performance narratives relating to Masters sport. The third author had research expertise in coaching and coach development, was serving as an advisor to national and international organizations developing coaching curriculum, and was presently a coach of Masters alpine skiers.

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

Although efforts were made to retain all original items, decisions were taken to delete eight items. Item 44 (left side of Table 1; “experiencing unconditional positive regard”) was not based on actions/competencies for guiding adults, and we deemed it too arduous to arrive at a new articulation of an action/competency. We determined that items 1, 21, 38 and 42 (left side, Table 1) were superfluous with the inherent nature of teaching motor skills in sport. We judged apathy (item 27, left side) as less prevalent among Masters participants because they are not usually obligated to be at practice (whereas obligation and thus apathy might be more common in a corporate training setting). Instead, we reframed this item to capture the essence of Henschke’s (1994) items for a coach’s insensitivity towards learners, portraying it instead as “frustration with adult athletes who are difficult to coach” (new item 28, right side of Table 1). In resolving this, we deleted an item for learner inattentiveness (item 41, left side) because it was effectively assessed with the new item 28. We interpreted Lubin’s (2013) role-play item (item 35, left) as vague and modified it to represent sport-specific roles that are simulated (new item 32, right). By addressing this, we determined that Henschke’s item 10 (left side) was now redundant and deleted it. Finally, Henschke’s item relating to listening teams (item 24, left) was deleted because we already considered it represented in an item that assessed coach’s use of discussion groups (item 31, right). This step of vetting resulted in 37 items drawn from Henschke and Lubin’s respective IPI inventories with minor modifications for comprehension within sport coaching populations.¹ The descriptions for each of the seven factors are provided in Table 1 (Henschke, 2014a).

3.1.2. Coach vetting

Twelve Masters coaches participated in the next step of vetting for face validity. Initially, 26 email invitations were sent to Masters sport coaches across Canada. These coaches were identified from a roster of former participants (who had consented to be contacted again), or were identified from publicly available contact information on adult sport websites. Table 2 shows demographic information, experience, coaching involvement and certification of the respondents. Those who agreed to participate were sent an electronic copy of the 37 survey items along with a spreadsheet and were asked to assess each item based on three criteria. On the spreadsheet, they judged the extent to which each item was “relevant for the coaching of Masters/adult athletes” and answered with either ‘agree’, ‘somewhat agree’, ‘disagree’, or ‘don’t know because the item doesn’t make sense or is awkward’. Respondents were invited to provide comments or feedback after each item. Participants returned their ratings and spreadsheet by email. All procedures followed ethical standards approved by the host institution.

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.

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 Empathetic coaches play close attention to development of a warm, close, working relationship with learners and respond to their learner's learning needs.		Coach empathy with athletes	
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 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.		Coach trust of athletes	
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 realities are like (H)	8	Trust your adult athletes to know their own goals, dreams, 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 Coaches plan learning facilitation in a way that learners are involved in the planning process, with evaluation and feedback included in the planning.		Planning and delivery of instruction	
1	Use a variety of coaching techniques (L)	16	Search for or create new coaching techniques for adult athletes
9	Search for or create new coaching techniques (L)	17	Establish coaching objectives
22	Establish coaching objectives (L)	18	Use a variety of coaching media in your sessions (telephone, internet, pictures, videos, etc.) (L)
23	Use a variety of coaching media in your sessions (telephone, internet, pictures, videos, etc.) (L)		
42	Integrate coaching techniques with subject matter content (L)		
Accommodating learner 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.		Accommodating athlete uniqueness	
6	Expect and accept learner frustration as s/he grapples with problems (H)	19	Expect and accept an adult athlete's frustration as s/he 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
Coach insensitivity toward learners 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.		Coach insensitivity toward athletes	
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)		
Experience-based coaching techniques/Learner-centered learning processes 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 learned subject to applications they have in mind.		Athlete-centered learning processes	

(continued on next page)

Table 1 (continued)

Item #	Henschke (1994): designated by H Lubin (2013): designated by L	Item #	Items used in the present study
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
		^a 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.

^a 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.

4. Results and interim discussion

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

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

Phase 2 frequencies also indicated that coaches judged statements related to the reverse-coded factor of coach-centered processes to be quite problematic. Particularly, the vetting process displayed poor ratings for "your [coaching] skills require no further refinements", stipulations that "your adults follow the precise learning experiences you provide them", and coaching "exactly what and how you have planned". Yet, these items are essential in the IPI for opposing the learner-centered items representing andragogy; within andragogy, it is not imperative for a coach to assume that what they have precisely communicated to athletes should be subsequently followed, instead allowing learners to discover information for themselves (MacLellan et al., 2018). Overall, these difficulties with reverse-coded items were not entirely surprising, as reverse-coded items had caused significant problems for internal consistency reliability in prior efforts among adult educators and had to be discarded (Holton, Wilson, & Baltés, 2009).

Many comments from our Masters coaches indicated that, despite their knowledge that these items were intentionally negative-valenced, they had difficulties accepting and endorsing reverse-coded items in the survey.

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

5. Phase 3: factorial validity

Phase 3 aimed to advance the survey items to tests of a measurement model to determine whether the conceptualized factor structure of the IPI could be ascertained based on self-report by sport coaches. The conceptual integrity of the survey inventory would be fully respected were the data to fit a model with seven factors (Lubin, 2013): coach empathy with athletes; coach trust of athletes; planning and delivery of instruction; accommodating athlete uniqueness; athlete-centered learning processes; coach-centered learning processes; coach insensitivity toward athletes. The latter two factors are antithetical to andragogic principles and were reverse-coded.

5.1. Method

5.1.1. Participants

Following institutional ethics clearance, coaches were contacted via recruitment emails that were forwarded by directors of Masters sport organizations and through social media platforms controlled by Masters sport organizations in Canada and the USA. Recruitment messages contained a link to our SurveyMonkey online survey. In total, 512 Masters coaches accessed our survey and 383 completed the study. Of

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 Mos Hrs per yr per wk	Certification, accreditation
Lawn Bowls	m, 71	16	55+, recreational, local players	7	Level 2 National Coaching Certification Program (NCCP); trained learning facilitator, evaluator
Canoe, Kayak	m, 27	10	40, recreational, local paddlers	10	Canoe/Kayak NCCP Competitive Development trained; fitness & lifestyle management diploma
Canoe, Kayak	f, 30	10	55, recreational, local paddlers, competitors at Masters nationals	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	Level 3 NCCP; diploma – National Coaching Institute (high performance coaching)
Judo	m, 75	55	43, recreational, local, provincial, national, international athletes	12	Level 3 NCCP; Pacific Sport Institute (affiliated Canadian elite coach)
Athletics	m, 51	10	52, recreational, local, provincial, national, international athletes	12	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	NCCP, accreditation level unspecified; owner and head coach, private coaching services for adult triathletes
Rowing	m, 63	20	40, skill levels not indicated	8	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	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	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	Level 3 NCCP
Lawn Bowls	m, 74	5	45, local, provincial, national players	8	Level 1 NCCP; Bachelor's degree in Physical Education & Recreation

the 383 coaches ($M_{age} = 49.32$, $SD = 13.60$), 271 were male, 110 were female, and 2 did not disclose their gender. The majority were from Canada ($n = 292$), while others were from the USA (59), UK (19), Australia (10), China (1), New Zealand (1), and 1 coach did not indicate a country. Our sample had coached their primary sport for a mean of 19.01 years ($SD = 12.74$), and reported having coached Masters/adult athletes for an average of 15.94 years ($SD = 11.34$). The majority of the coaches worked with golfers ($n = 223$) or swimmers (86), while others coached canoe/kayak (14), athletics (14), curling (7), triathlon (6), distance running (5), and 16 other recognized sports (29).

On average, the participants coached 9.41 months per yr ($SD = 2.84$) and coached adults for 12.09 h per wk ($SD = 10.85$) during those months. Our survey asked coaches to respond to questions about the ages of their athletes. For each of “under 20 yrs-old”, “20-30 yrs-old”, “31-40 yrs-old”, “41-54 yrs-old”, and “55+ yrs-old” categories, they reported whether they had “none”, “a few”, or “many” athletes (anchored at 1, 2 and 3, respectively). On average, coaches worked with “a few” to “many” athletes who were between 41 and 54 yrs-old ($M = 2.46$, $SD = 0.54$) and who were 55 yrs-old and older ($M = 2.41$, $SD = 0.58$). They coached “a few” 31-40 yrs-old athletes ($M = 2.27$, $SD = 0.48$), 21-30 yrs-old athletes ($M = 2.09$, $SD = 0.48$), and under 20 yrs-old athletes ($M = 2.09$, $SD = 0.72$). Therefore, although our coaches generally worked with more middle-aged and older athletes, they also worked with diverse age ranges.

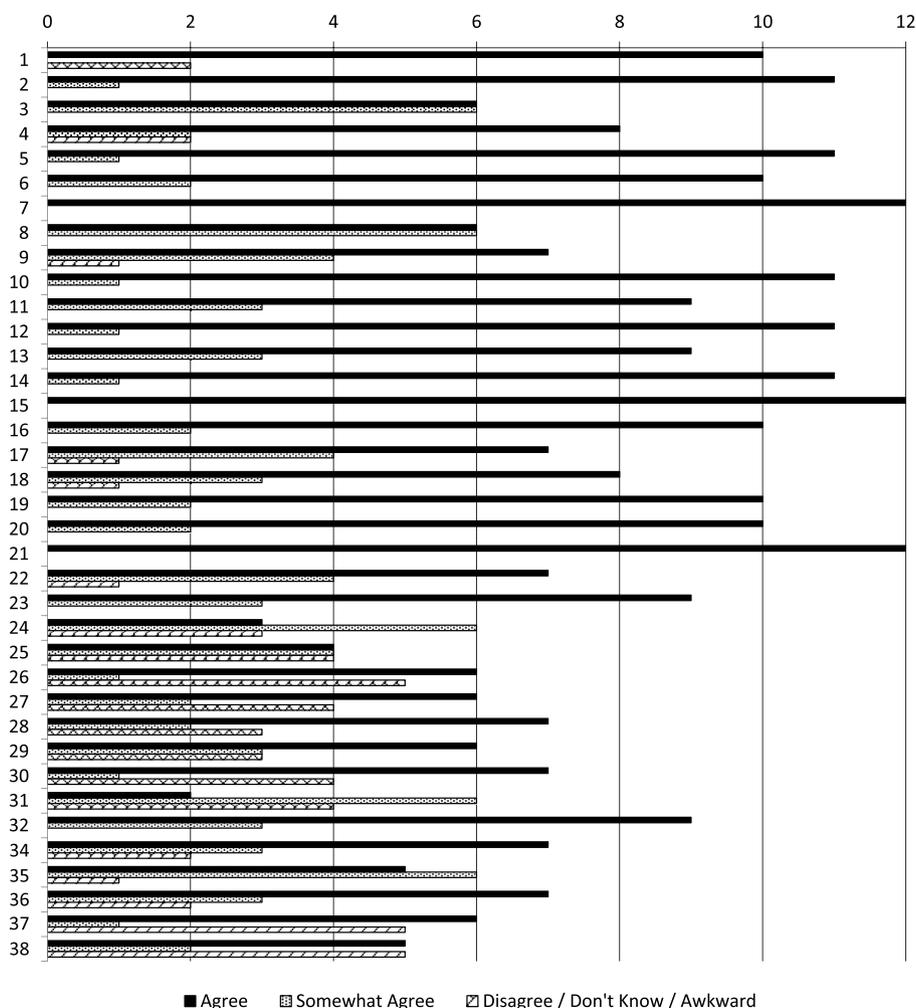
5.1.2. Instrument

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

5.1.3. A priori data analyses

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

Our rationale was, should the a priori IPI model show poor fit, we would proceed to employ ESEM to test the same factor structure, in a more lenient fashion than in CFA, but not as freely as the traditional approach of using an exploratory factor analysis. By allowing for cross-loadings between items to be freely estimated, ESEM allows for a better approximation of social science data than CFA, by accommodating data that may genuinely be inter-correlated (Marsh, Morin, Parker, & Kaur, 2014) when CFA would likely discard measurement models on account of these same circumstances. The advantage of ESEM over exploratory factor analyses at this stage is that it provides a more conservative approach and increases the possibly of retaining a model fit that aligns with the a priori structure. Traditionally, after CFA fails, many researchers default to exploratory factor analyses, which are not beholden to any hypothesized structure from a guiding conceptualization and are predominantly data driven. By using a target rotation in ESEM, one is able to adopt a “primarily confirmatory approach” to ESEM because non-intended factor loadings are set to load close to 0 (i.e., ~0) on their hypothesized factor (Marsh et al., 2014, p. 88). Like CFA, ESEM



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.

Fig. 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.

provides parameter estimates, goodness-of-fit statistics, and standard errors (Marsh et al., 2014). Thus, with ESEM being less restrictive than CFA, but attentive to the guiding *a priori* structure compared to EFA, we were prepared to employ such analyses should the initial CFA fail.

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

5.2. Results

5.2.1. Preliminary analyses

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

5.2.2. CFA

We conducted a CFA to test the fit of the 38 item, seven factor IPI (Table 1, right). Statistics indicated very poor model fit: CFI = 0.577, SRMR = 0.105, RMSEA = 0.084 (90% CI = 0.080–0.087), and $\chi^2/df = 3.691$. There was multicollinearity between the ‘accommodating athlete uniqueness’ factor and both the ‘coach trust of athletes’ ($r = 1.02$), and ‘planning and delivery of instruction’ ($r = 0.94$) factors. There was multicollinearity between ‘coach empathy with athletes’ and ‘coach trust of athletes’ ($r = 0.98$) (Table 4). All construct reliability (CR) scores were below 0.7 except for ‘coach insensitivity toward athletes’, indicating most factors had weak internal consistency reliability (Hair et al., 2010). Average Variance Extracted (AVE) scores for each factor were below 0.5, meaning that the majority of variance in each item was not explained by their respective factors. Taken together, the factor loadings and the AVE statistics suggested poor convergent validity within the resultant model (Hair et al., 2010). Finally, all factors had smaller AVE scores than Maximum Shared Variance (MSV) scores except for the ‘coach insensitivity toward athletes’ factor. MSV scores are calculated by determining the largest correlation each factor has with another and squaring the correlation coefficient. With this in mind, it could be concluded that the majority of factors explained less

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

ESEM								
Items	F1	F2	F3	F4	F5	F6	F7	CFA
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

variance within their own items than the variance in items they shared with any other factor. These results indicated poor discriminant validity amongst factors (Hair et al., 2010). These results altogether suggested the hypothesized factor structure was not appropriate.

5.2.3. ESEM

We used ESEM, with a target rotation, to test the fit of the 38 item, seven factor IPI (Table 1, right). The following criteria were used for our ESEM analyses: each item must have a primary factor loading ≥ 0.32 ($\geq 10\%$ overlapping variance); each item must not have cross loadings greater than 0.32 on unintended factors (Tabachnick & Fidell, 2013). We posited that responses to the 38 items would be explained by seven correlated factors. Statistics showed good fit: CFI = 0.904, SRMR = 0.029, RMSEA = 0.047 (90%

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

Factors	F1	F2	F3	F4	F5	F6	F7
F1	-						
F2	0.98**	-					
F3	0.86**	0.88**	-				
F4	0.88**	1.02**	0.94**	-			
F5	-0.13	-0.13	0.00	-0.09	-		
F6	0.28	0.32	0.48**	0.45**	0.53**	-	
F7	0.40	0.38	0.35	0.43**	0.41	0.59**	-
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.

CI = 0.042–0.052), and $\chi^2/df = 1.856$. The factor loading matrix is in Table 3. Notably, inspection of the factor loadings showed inconsistencies between the hypothesized structure and the data. More specifically, items 1, 3, 6, 9, 10, 19, 20, 21, 24, 25, 33, 36, and 38 failed to load on their respective factors, and items 1, 3, 6, 9, 10, 13, 16, 19, 20, 21, 24, 33, 38 had problematic cross-loadings on unintended factors. When considering the low loading items and cross loadings, 17 of the 38 items (or 45% of all items) were problematic. Finally, the ‘accommodating athlete uniqueness’ factor was not represented by any of its intended items. Taken together, our ESEM results support our conclusion from our CFA that the hypothesized factor structure was not appropriate for our adult sport coach data.

5.2.4. A posteriori exploratory analyses

Although the hypothesized factor structure of the IPI was not supported, it was still possible that the IPI items could fit our data if they were represented by a different factor structure. Although we had not initially intended to pursue this possibility, given our knowledge at this stage that the *a priori* model was ill-suited, we elected to conduct further exploratory analyses. Using the SPSS and Mplus software programs, we used a data driven approach to find an alternative factor structure with better fit. We ran a parallel analysis with an eigenvalue Monte Carlo simulation to determine the number of factors to extract. Results suggested that the data were best supported by a three-factor structure. With the Mplus software program, the three-factor structure was tested through ESEM analyses with a geomin rotation, which was an exploratory approach (unlike the confirmatory ESEM approach we used in our *a priori* analyses). Unlike in the previous ESEM analyses, where items were ‘targeted’ to a specific factor, all items in this analysis were free to load on all three factors. Items were then removed for having low factor loading ≥ 0.32 and for having cross loadings > 0.32 on multiple factors. Through this process, it was not possible to uncover a model that had both good model fit, and no problematic items. After multiple attempts, the best model achieved was a two-factor, 11 item structure that had no problematic items and adequate fit: CFI = 0.903, SRMR = 0.045, RMSEA = 0.093 (90% CI = 0.078–0.087), and $\chi^2/df = 3.691$. However, it is important to note that many factors and 27 items were lost in this process. The process ‘felt’ data-driven, and the final factor structure was interpreted to have little theoretical or practical relevance. For instance, one factor was represented by three items: have difficulty understanding your athletes’ points-of-view (item 25); get annoyed with the many questions your athletes ask (item 30); feel your skills require no further refinements for coaching your athletes (37). This factor did not tie to an andragogic principle, and was believed to provide limited practical use for coaches. Thus, these

continued exploratory analyses provided support that the IPI items could not be salvaged with respect to a rich, multi-faceted factor structure in our adult sport coach data.

6. Discussion

This three-phase investigation sought to develop a survey that allows coaches to reliably report on valid principles of adult-oriented coaching as they relate to their coaching practice. Our first aim was to nominate a survey tool from the neighbouring field of adult education for testing in the adult sport domain. After conducting a systematic literature search, we identified the IPI (Henschke, 1994; 2014a) as a candidate instrument. The IPI had been used by instructors in numerous domains to assess their andragogical practices, by adult learners to assess andragogic teaching, showed modest psychometric support relative to other instruments in the field, and had been applied to the role of coaching (i.e., life/corporate coaches; Lubin, 2013).

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

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

Our conclusion is that the IPI taken from a parallel domain of adult learning is ill fitting and inappropriate for coach report in adult sport. Thus, our results epitomize evidence justifying Hagger and Chatzisarantis’ (2009) strong caution against assuming that established self-report scales from another domain (e.g., education) can be equally valid in the sporting context. Our three-phase investigation followed their recommendations to verify face validity (in our case, from expert researchers in adult sport, and also from experienced coaches of adult sportspersons) and convergent validity (via CFA and ESEM). In particular, the internal vetting and external coach vetting for face validity highlighted problems related to awkwardness of phrasing that could not be remedied by our conservative approaches to wordsmithing. It is very likely that these issues related to phrasing also underpinned the difficulties that were borne out by our poor evidence relating to convergent (factorial) validity; clearly, items that conceptually were supposed to capture the essence of certain latent constructs did not load together well. Overall, our efforts to reliably import an established tool from a parallel domain were not successful; the language of the items may have been insufficiently sensitive to the domain of adult sport and the coaching of adult sportspersons, meaning we fell short on a contextually-specific survey.

Hagger and Chatzisarantis (2009) instructed sport psychology researchers to remain cognizant of macro- and micro-level distinctions in research on validity. We remain convinced that macro-level use of andragogical conceptualizations to understand coaching approaches in

Masters sport is valid, though the current investigation showed micro-level measures that are founded upon instruments from the adult education domain are invalid. We appreciate those who may take different positions, for example, who might state we moved beyond conservative wordsmithing of the IPI to make it more suitable to sport (thus changing the structure of the latent factors), or who might suggest that the ill-fitting results were particular to the sample recruited in this study. However, we had committed to retain the *a priori* structure in line with the operational definitions of each factor. Moreover, given our relatively diverse samples of coaches (e.g., from various sports, coaching a wide range of adults), we submit that the inappropriateness of the IPI was related to broader issues of validity than our sample. In particular, the observed items and *a priori* factor structure were not formulated based on essential nuances, lexicon, and intonation of experiences in the Masters coaching context.

While the items derived from the IPI were not fitting in the current study (i.e., at the micro-level), there exists notable macro-level evidence that an andragogical model borrowed from education can be aptly used for exploring coaching in Masters sport (Callary et al., 2017; Callary & Young, 2019; MacLellan et al., 2019). With this in mind, the next step should be the development of a coach report instrument whose content appreciates the nuances, lexicon, and intonation of experiences in the Masters coaching context. One approach would be to begin by scrutinizing an emerging set of rich, descriptive, qualitative studies detailing the practices and personal attributes of Masters sport coaches (Callary et al., 2017, 2015; Currie et al., 2019; Ferrari et al., 2017; MacLellan et al., 2019, 2018; Morris-Eyton, 2008; Rathwell et al., 2015). These qualitative works appreciatively document various approaches, strategies, actions and practices that sport coaches apply to satisfy learning and training needs/preferences of adults. The content in these works can be framed within a sport andragogy, or adult athlete learning perspective (Callary et al., 2017). Using a reliable process of vetting, investigators could endeavour to effectively translate designated items from such qualitative works into andragogical survey items that could be advanced for testing. Such a strategy conforms to Morse’s (2010) recommendations for how to integrate and execute mixed-methods research on a dedicated topic over time. Morse discussed how qualitatively informed research could subsequently inform and help generate a survey instrument as long as researchers maintained a consistent theoretical drive (e.g., andragogy/adult sport learning) and took steps to pursue incremental validity, effectively incorporating meaning and quantity into the same line of inquiry. In line with Morse, we therefore recommend borrowing from prior “big-Q” qualitative findings of researchers sensitive to the Masters sport coaching domain and translating these works into initial “small-q” quantitative trials related to coach self-assessment. We anticipate, over time, that subsequent quantitative trials (centered on accruing evidence for validity and replication) may result in a robust, contextually sensitive, survey tool that ultimately achieves “big-Q” quantitative status.

Author statement

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.

Declaration of competing interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.psychsport.2019.101632>.

References

- Callary, B., Rathwell, S., & Young, B. (2015). Masters swimmers' experiences with coaches: What they want, what they need, what they get. *SAGE Open*, 5, 1–14. <https://doi.org/10.1177/2158244015588960>.
- Callary, B., Rathwell, S., & Young, B. W. (2017). Alignment of masters swim coaches' approaches with the andragogy in practice model. *International Sport Coaching Journal*, 4, 177–190. <https://doi.org/10.1123/iscj.2016-0102>.
- Callary, B., Rathwell, S., & Young, B. W. (2018). Coach education and learning sources for coaches of Masters swimmers. *International Sport Coaching Journal*, 5, 47–59. <https://doi.org/10.1123/iscj.2017-0056>.
- Callary, B., & Young, B. W. (2016). What women are saying about coaching needs and practices in Masters sport. *Canadian Journal for Women in Coaching*, 16(3), 1–5.
- Callary, B., & Young, B. W. (2019). What's good for the goose is good for the gander: Using adult learning principles to synergize coach education and coaching practices in Masters sport. In B. Callary, & B. Gearity (Eds.). *Coach education and development in sport: Instructional strategies*. London: Routledge.
- Currie, C., Young, B. W., & Callary, B. (2019). Coaching a female Masters team sport: Considerations of interdependence relationships. Presented at the 12th international Council of coaching excellence global coaching conference Tokyo, Japan.
- Dionigi, R. A. (2016). The competitive older athlete: A review of psychosocial and sociological issues. *Topics in Geriatric Rehabilitation*, 32, 55–62. <https://doi.org/10.1097/TGR.0000000000000091>.
- Ecclestone, N. A., & Jones, C. J. (2004). International curriculum guidelines for preparing physical activity instructors of older adults, in collaboration with the aging and life course, World Health Organization. *Journal of Aging and Physical Activity*, 12, 467–479. <https://doi.org/10.1123/japa.12.4.467>.
- Ferrari, B., Bloom, G. A., Gilbert, W. D., & Caron, J. G. (2017). Experiences of competitive masters swimmers: Desired coaching characteristics and perceived benefits. *International Journal of Sport and Exercise Psychology*, 15, 409–422. <https://doi.org/10.1080/1612197X.2015.1114504>.
- Hagger, M. S., & Chatzisarantis, N. L. D. (2009). Assumptions in research in sport and exercise psychology. *Psychology of Sport and Exercise*, 10, 511–519. <https://doi.org/10.1016/j.psychsport.2009.01.2004>.
- Hair, J., Black, W., Babin, B., & Anderson, R. (2010). *Multivariate data analysis* (7th ed.). Upper Saddle River, NJ: Pearson Prentice Hall.
- Henschke, J. A. (1989). Identifying appropriate adult educator practices: Beliefs, feelings and behaviors. In C. Jeffries (Ed.). *Proceedings of the annual midwest research-to-practice conference in adult* (pp. 89–95). St. Louis, MO: Continuing & Community Education. Retrieved at: <http://www.umsl.edu/~henschkej/articles/ResearchtoPractice1989Info.pdf>.
- Henschke, J. A. (1994). Challenge and change. In C. J. Polson, & F. M. Schied (Eds.). *Commission of professors of adult education: Proceedings of the annual conference* Nashville, TN, 74–80. Retrieved at: <https://files.eric.ed.gov/fulltext/ED427180.pdf>.
- Henschke, J. A. (2014b). Andragogical curriculum for equipping successful facilitators of andragogy in numerous contexts. In V. C. X. Wang, & V. C. Bryan (Eds.). *Andragogical and pedagogical methods for curriculum and program development* (pp. 142–168). Hershey, PA: IGI Global. <https://doi.org/10.4018/978-1-4666-5872-1>.
- Henschke, J. A. (2014a). Developing competence in andragogy - some elements and contexts. Paper presented at the American association for adult & continuing education conference. Charleston, SC. Retrieved November 16, 2016 at <http://www.lindenwood.edu/education/andragogy.pdf>.
- Hoffmann, M. D., Duguay, A. M., Guerrero, M. D., Loughead, T. M., & Monroe-Chandler, K. J. (2017). 360-degree feedback for sport coaches: A follow-up to O'Boyle (2014). *International Sport Coaching Journal*, 4, 335–344. <https://doi.org/10.1123/iscj.2017-0063>.
- Hoffmann, M. D., Young, B. W., Rathwell, S., & Callary, B. (2019). Comparing groups of masters athletes with varying degrees of coaching for psychological need satisfaction and thwarting. *International Journal of Sports Science & Coaching*. <https://doi.org/10.1177/1747954119887300>.
- Holton, W. F., Swanson Wilson, L., & Bates, R. A. (2009). Toward development of a generalized instrument to measure andragogy. *Human Resource Development Quarterly*, 20, 169–193. <https://doi.org/10.1002/hrdq.20014>.
- Jenkin, C. R., Eime, R. M., Westerbeek, H., & van Uffelen, J. G. Z. (2018). Sport for adults aged 50+ years: Participation benefits and barriers. *Journal of Aging and Physical Activity*, 26, 363–371. <https://doi.org/10.1123/japa.2017-0092>.
- Jones, R. L. (2006). *The sports coach as educator: Re-conceptualising sport coaching*. New York: Routledge.
- Jones, C. J., & Rose, D. J. (2004). International guidelines for training physical activity instructors for older adults. *Journal of Aging and Physical Activity*, 12, 1–2. <https://doi.org/10.1123/japa.12.1.1>.
- Jones, G. R., Stathokostas, L., Young, B. W., Wister, A. V., Chau, S., Clark, P., Duggan, M., Mitchell, D., & Nordland, P. (2018). Development of a physical literacy model for older adults—a consensus process by the collaborative working group on physical literacy for older Canadians. *BMC Geriatrics*, 18(13), 1–16. <https://doi.org/10.1186/s12877-017-0687-x>.
- Knowles, M. S., Holton, E. F., III, & Swanson, R. A. (2012). *The adult learner* (7th ed.). New York, York: Routledge.
- Lubin, M. M. (2013). *Coaching the adult learner: A framework for engaging the principles and processes of andragogy for best practices in coaching*. Doctoral dissertation, Virginia Polytechnic Institute and State University. Retrieved from https://vtechworks.lib.vt.edu/bitstream/handle/10919/22017/Lubin_MM_D_2013.pdf.
- MacLellan, J., Callary, B., & Young, B. W. (2018). Same coach, different approach? How masters and youth athletes perceive learning opportunities in training. *International Journal of Sports Science & Coaching*, 13, 167–178. <https://doi.org/10.1177/1747954117727202>.
- MacLellan, J., Callary, B., & Young, B. W. (2019). Adult learning principles in masters sport: A coach's perspective. *The Canadian Journal for the Study of Adult Education*, 31, 31–50. Retrieved at: <https://cjsae.library.dal.ca/index.php/cjsae/article/view/5424>.
- Marsh, H. W., Morin, A. J. S., Parker, J. K., & Kaur, G. (2014). Exploratory structural equation modeling: An integration of the best features of exploratory and confirmatory factor analysis. *Annual Review of Clinical Psychology*, 10, 85–110.
- Morris-Eyton, H. (2008). *Andragogy: Fact or fiction within a swimming coaching context? Unpublished master's thesis*. Johannesburg, South Africa: University of Witwatersrand.
- Morse, J. (2010). Procedures and practice of mixed method design: Maintaining control, rigor, and complexity. In A. Tashakkori, & C. Teddlie (Eds.). *SAGE Handbook of mixed methods in social and behavioral research* (pp. 339–364). Thousand Oaks, CA: SAGE.
- Muthén, L. K., & Muthén, B. O. (2012). *Mplus user's guide* (7th ed.). Los Angeles, CA: Muthén & Muthén.
- Rathwell, S., Callary, B., & Young, B. W. (2015). Exploring the context of coached masters swim programs: A narrative approach. *International Journal of Aquatic Research and Education*, 9, 70–88. <https://doi.org/10.1123/ijare.2014-0068>.
- Rose, D. J. (2019). *Physical activity instruction of older adults*. Champaign, IL: Human Kinetics.
- Stanton, C. (2005). *A construct validity assessment of the instructional perspectives inventory*. St. Louis, MO: Doctoral dissertation, University of Missouri-St. Louis) Publication No.: AAT3173438.
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics*. Boston, MA: Pearson.
- Vatcharasirisook, V. (2011). *Organizational learning and employee retention: A focused study examining the role of relationships between supervisors and subordinates*(unpublished doctoral dissertation). St. Louis, MO: University of Missouri.
- Young, B. W., & Callary, B. (2018). Doing “more for adult sport”: Promotional and programmatic efforts to offset adults' psychosocial obstacles. In R. Dionigi, & M. Gard (Eds.). *Sport and physical activity across the lifespan: Critical perspectives* (pp. 263–282). London, UK: Palgrave Macmillan. https://doi.org/10.1057/978-1-137-48562-5_14.
- Young, B. W., Callary, B., & Niedre, P. C. (2014). Exploring novel considerations for the coaching of Masters athletes. *International Sport Coaching Journal*, 1, 86–93. <https://doi.org/10.1123/iscj.2014-0052>.
- Young, B. W., Callary, B., & Rathwell, S. (2018). Psychological considerations for the older athlete. In O. Braddick, F. Cheung, M. Hogg, J. Peiro, S. Scott, A. Steptoe, C. von Hofsten, & T. Wykes (Eds.). *Oxford research encyclopedia of psychology* (pp. 1–26). New York: Oxford University Press. <https://doi.org/10.1093/acrefore/9780190236557.013.180>.