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ORIGINAL ARTICLE

The Interprofessional Collaborative Competency Attainment Survey (ICCAS): A replication validation study

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ABSTRACT

This study replicates a validation of the Interprofessional Collaboration Competency Attainment Survey (ICCAS), a 20-item self-report instrument designed to assess behaviours associated with patient-centred, team-based, collaborative care. We appraised the content validity of the ICCAS for a foundation course in interprofessional collaboration, investigated its internal (factor) structure and concurrent validity, and compared results with those obtained previously by ICCAS authors. Self-assessed competency ratings were obtained from a broad spectrum of pre-licensure, health professions students (n = 785) using a retrospective, pre-/post-design. Moderate to large effect sizes emerged for 16 of 20 items. Largest effects (1.01, 0.94) were for competencies emphasized in the course; the smallest effect (0.35) was for an area not directly taught. Positive correlations were seen between all individual item change scores and a separate item assessing overall change, and item-total correlations were moderate to strong. Exploratory factor analysis was used to understand the interrelationship of ICCAS items. Principal component analysis identified a single factor (Cronbach's alpha = 0.96) accounting for 85% of the total variance—slightly higher than the 73% reported previously. Findings suggest strong overlaps in the proposed constructs being assessed; use of a total average score is justifiable for assessment and evaluation.

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Introduction

The lack of well-developed measures of interprofessional collaboration with evidence of validity is an acknowledged problem in the interprofessional education and collaborative practice (IPECP) community and literature (IOM Report, 2015). In general, the field also suffers from an over reliance on attitudinal measures as a means to evaluate IPE curricula (Blue, Chesluk, Conforti, & Holmboe, 2015). One way to build research capacity is to replicate psychometric studies of existing assessment tools that focus on discrete behaviours. In this article, we report the results of administering the Interprofessional Communication and Collaboration Attainment Survey (ICCAS) in a large, introductory IPECP course designed for pre-licensure health professions students. Our primary purposes were to: (1) understand the extent to which the ICCAS was appropriate for our population and curriculum, and (2) to examine the validity of the ICCAS for this use. In particular, we sought to examine the internal (factor) structure of the ICCAS data, compare these results with those reported previously by ICCAS authors, and identify possible next steps in validity research. In so doing, our aim was to contribute to the literature on the measurement of important IPECP constructs.

We first describe the ICCAS instrument and review the original validation study conducted by the University of Ottawa. We then describe the context of its replication at the University of Minnesota, focusing on our design, adaptation of the tool, data collection, and analysis. After presenting our results, we comment on the strengths and limitations of the instrument and offer recommendations for future use.

The University of Ottawa validation study of ICCAS

The ICCAS is a 20-item self-report instrument developed at the University of Ottawa, Canada, as part of a nationally funded initiative in IPE programme evaluation (MacDonald et al., 2010). Its items represent a distillation of behaviourally worded competencies that were derived from a literature review, and intentionally grouped to reflect constructs embedded in the Canadian Interprofessional Health Collaborative (CIHC, 2010) Competencies Framework. The CIHC comprises members from health organisations, health educators, researchers, health professionals, and students across Canada. The framework contains 39 competencies in 6 domains: communication, collaboration, roles and responsibilities, patient-/family-centred care, conflict management/resolution, and team functioning. Competencies were validated through a Pan-Canadian Delphi process (Curran et al., 2009).

The ICCAS items were developed by a small group of IPECP educators and researchers and content validated through a nominal group technique with a broad group of

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subject matter experts (MacDonald et al., 2010). In their psychometric study of the ICCAS instrument, the authors obtained data from 584 participants from 15 different IPECP programmes in Canada and New Zealand (Archibald, Trumpower, & MacDonald, 2014). Participants were predominantly at the pre-licensure stage. However, 57% chose not to disclose their professional affiliation. Nineteen different professions were represented in the sample, including nursing (16.1%), physical or occupational therapy (5.7%), social work (4.3%), and medicine or paramedicine (4.1%). The IPECP programmes themselves varied in terms of length, intensity, and approach.

The authors used a retrospective pre-post design to the self-assessment. That is, participants completed the instrument only once, at the conclusion of their course. At that time, they gave two separate sets of ratings on the 20 competencies, one for "pre" (before participating in the learning activities), and one for "post" (after participating in the learning activities). All items are positively worded, for example, "Before participating in the learning activities, I was able to: (1) promote effective communication among members of an interprofessional (IP) team." For both time periods, participants rated their abilities using a seven-point scale, agreeing or disagreeing with each statement (1 = *strongly disagree*, 7 = *strongly agree*).

The University of Minnesota study

As defined by the Committee on Standards for Educational and Psychological Testing, validity is a unitary construct (AERA, APA, & NCME, 2014). Evidence of validity can accrue from five sources: instrument content, response process, internal structure, relationship with other variables, and consequences of testing. In this study, we sought validity data regarding the instrument's content, internal structure (reliability and factor structure), and relationship to other variables, using a separate self-reported measure of overall change.

Research design

To obtain such data, we followed the University of Ottawa's methodology in administering the ICCAS in a retrospective, pre–post design. Students completing the instrument were enrolled in the "Fundamentals in Interprofessional Communication and Collaboration" (FIPCC) course. The FIPCC is a 12-hour, 1-credit, non-graded required course offered in the first semester of pre-licensure training.

Prior to adopting the ICCAS, the FIPCC course director and staff screened the items for content relevance to the FIPCC learning objectives. These objectives were derived from the Interprofessional Education Collaborative (IPEC) core competencies, which were developed by members of six professional associations in the United States (Interprofessional Education Collaborative Expert Panel, 2011). Similar to the CIHC in terms of framework and approach, the IPEC competencies are organised in four domains: (1) values and ethics; (2) roles and responsibilities; (3) interprofessional communication; and (4) teams and teamwork. We determined there was a close match between the course objectives and many, but not all of the ICCAS constructs and items. Most notably, the FIPCC course did not provide opportunities for patient/family interaction, nor specifically teach patient-centred care concepts. Nonetheless, we felt there was sufficient overlap in content to adopt the ICCAS as one of several course evaluation tools.

We made two changes to the instrument itself. First, we changed the rating scale from a seven-point Likert-type, "agree–disagree" format to a five-point, unbalanced, qualitative scale: 1 = *poor*; 2 = *fair*; 3 = *good*; 4 = *very good*; 5 = *excellent*. While having a seven-point scale might be preferable to a five-point scale because of slightly better discrimination in the former, the unbalanced five-point scale has the advantage of reducing response disposition and respondent burden (Ware, 1978). We changed to the qualitative scale because we felt it a better match with the essential task at hand, which was to ask students to rate their ability (rather than rate agreement).

Second, we added an item to capture students' assessments of how much their overall abilities had changed during the course: "Compared to the time before FIPCC, would you say your ability to collaborate interprofessionally is…" *(select one)*: 1 = *much better now*; 2 = *somewhat better now*; 3 = *about the same*; 4 = *somewhat worse now*; and 5 = *much worse now*. We refer to this as the "transition item," and consider it a solitary measure of ability, useful for assessing the concurrent validity of ICCAS items (Feinstein, 1987). Prior to administration, we conducted cognitive interviews with several students, reviewing the revised ICCAS to ensure their understanding of the questions and the retrospective pre–post response format (Dillman, Smyth, & Melani Christian, 2008). Based on these interviews, we determined there was adequate evidence of response process validity.

Data collection

Following the last class session in the fall of 2014, we administered the ICCAS to the entire cohort of FIPCC students (n = 1,023). Along with other evaluation forms, we distributed the ICCAS using an online survey tool at the University of Minnesota called "Qualtrics." Most FIPCC students were enrolled in the six schools that comprise the Academic Health Center: medicine (22.6%), pharmacy (16.2%), nursing (14.2%), dentistry (12.8%), veterinarian medicine (9.7%), and public health (7.1%). Remaining students were enrolled in occupational therapy, clinical laboratory science, social work, dietetics, and counselling psychology.

Data analysis

Data were downloaded from the Qualtrics database for analysis using the 9.3 version of SAS/STAT™ and version 13 of Stata™. First, we analysed differences in pre–post scores in terms of standardised effect sizes, based on Cohen's d calculations and 95% confidence limits. We interpreted "large" differences as those greater than 0.8, "moderate" differences as those between 0.79 and 0.50, and "small" differences as those less than 0.5 (Cohen, 1988). An item-by-item, visual comparison of University of Minnesota data was made with University of Ottawa

data. Second, we correlated item means with the transitional change item. Third, we conducted an exploratory factor analysis (EFA) of the 20 items using the students' "post" estimates of ability. Principal component analysis was used to extract factors, which were examined by varimax rotation. For the resulting factors, we calculated internal consistency (Cronbach's alpha coefficient) and proportion of variance explained by the resulting factor rotation.

Ethical considerations

All students were asked to complete the ICCAS as part of their end-of-course evaluation of FIPCC. Information gained from the ICCAS was used by course instructors to examine the value of changes they had made to the course since the previous year. At the University of Minnesota, use of de-identified, aggregate data collected as part of education course improvement is exempted from IRB review.

Results

Of the 1,023 students enrolled in FIPCC, $n = 785$ (77%) completed the ICCAS survey (Table 1). Overall, we found moderate to large effect sizes for 16 of the 20 items (Table 2). The two largest effects were seen in the areas emphasized most heavily by the course. "Understand the abilities and contributions of IP members" (1.01), and "Learn from IP members to enhance care" (0.94) were both emphasized throughout the 6-week course, and were the focus of specific learning activities and a final team project. Conversely, the smallest effect (0.35) was seen in an area not addressed by the course ("Include the patient and family in decision-making"). There were moderate, positive correlations between all of the items' mean change scores and the separate transitional item (0.37–0.53) (Table 3).

The EFA used the percentage of variance found with varimax rotation and the scree test to determine the number of factors to be extracted from the ICCAS. As shown in Table 4, our data identified a three-factor structure, with each factor

Table 1. Characteristics of Minnesota students enrolled in FIPCC (n = 1,023) and those who completed the ICCAS (n = 783).

	Medicine	Pharmacy	Dentistry	Veterinarian medicine	Public health	Nursing	Other programmes
Number of students enrolled in FIPPC	231	166	131	99	73	145	178
Number of students completing the ICCAS	189	139	120	70	56	76	133
ICCAS response rate	82%	84%	92%	71%	77%	77%	52%
Mean age ± SD	25.1 ± 3.0	24.4 ± 2.8	24.9 ± 3.2	25.1 ± 3.1	26.4 ± 3.0	21.9 ± 3.3	26.0 ± 3.3
Female (%)	50%	64%	55%	82%	56%	80%	76%
Race							
White	72%	75%	60%	82%	78%	72%	77%
Black	4%	3%	8%	4%	2%	8%	8%
American Indian	2%	1%	1%	0%	0%	3%	1%
Asian	10%	4%	10%	4%	12%	12%	6%
Other/unspecified	13%	3%	21%	10%	8%	4%	8%
Prior experience in health care (mean years + SD)							
Clinical	1.6 ± 1.7	1.1 ± 1.6	1.0 ± 1.6	2.8 ± 2.0	0.9 ± 1.7	0.9 ± 1.9	1.2 ± 1.7
Non-clinical	1.8 ± 1.9	1.5 ± 1.9	1.4 ± 1.9	2.5 ± 2.3	2.0 ± 1.9	1.1 ± 1.9	2.2 ± 2.1
Total experience	3.4 ± 2.9	2.6 ± 2.8	2.5 ± 3.1	5.4 ± 3.2	2.8 ± 2.8	2.1 ± 3.3	3.4 ± 3.1

The ICCAS was administered to 1,023 students enrolled in "Fundamentals of Interprofessional Communication and Collaboration" (FIPCC) at the University of Minnesota as part of course evaluation. The overall response rate to the ICCAS (77%) varied by school (71–92%), and was lower for other programmes (e.g., occupational therapy, clinical laboratory science, social work, dietetics, counselling psychology).

Table 2. Large, medium, and small effect sizes of ICCAS items, by proposed construct and site.

		University of Minnesota (n = 785)		University of Ottawa (n = 584)	
Construct	ICCAS item	Cohen's d	Difference	Cohen's d	Difference
Communication	Promote effective communication among IP members	0.72	Moderate	0.59	Moderate
	Actively listen to IP team members' ideas, concerns	0.51	Moderate	0.46	Small
	Express my ideas and concerns without being judgmental	0.54	Moderate	0.44	Small
	Provide constructive feedback to IP team members	0.52	Moderate	0.56	Moderate
	Express my ideas clearly and precisely	0.39	Small	0.47	Small
Collaboration	Seek out IP team members to address issues	0.78	Moderate	0.50	Moderate
	Work closely with IP team members to enhance care	0.72	Moderate	0.52	Moderate
	Learn from IP team members to enhance care	0.94	Large	0.52	Moderate
Roles and responsibilities	Identify and describe my abilities and contributions to the IP team	0.72	Moderate	0.51	Moderate
	Be accountable for my contributions to the IP team	0.43	Small	0.43	Small
	Understand the abilities and contributions of IP team members	1.01	Large	0.54	Moderate
	Recognise how others' skills and knowledge complement my own	0.98	Large	0.48	Small
Patient-centred care	Use an IP team approach with the patient to assess health	0.74	Moderate	0.51	Moderate
	Use an IP team approach with the patient to provide whole person care	0.69	Moderate	0.52	Moderate
	Include the patient/family in decision-making	0.35	Small	0.50	Moderate
Conflict management, team functioning	Actively listen to the perspective of IP team members	0.55	Moderate	0.44	Small
	Take into account the ideas of IP team members	0.60	Moderate	0.38	Small
	Address team conflict in a respectful manner	0.43	Small	0.41	Small
	Develop an effective care plan with IP team members	0.75	Moderate	0.48	Moderate
	Negotiate responsibilities within overlapping scopes of practice	0.79	Moderate	0.61	Moderate

ICCAS items were based on constructs embedded in the Canadian Interprofessional Health Collaborative Competencies framework. Standardised effect sizes, Cohen's d = post-score minus pre-score, divided by the standard deviation of pre- and post-scores (combined). Qualitative differences: "Large" = values of ≥ 0.8; "Moderate" = values between 0.50 and 0.79; "Small" = values below 0.50.

Table 3. Correlations between mean item change scores and the transitional item used at the University of Minnesota for FIPCC evaluation (n = 783).

	Transitional item	
ICCAS item	Cohen's *d*	*r*
Promote effective communication among IP members	0.72	0.53
Actively listen to IP team members' ideas, concerns	0.51	0.45
Express my ideas and concerns without being judgmental	0.54	0.42
Provide constructive feedback to IP team members	0.52	0.37
Express my ideas clearly and precisely	0.39	0.41
Seek out IP team members to address issues	0.78	0.42
Work closely with IP team members to enhance care	0.72	0.46
Learn from IP team members to enhance care	0.94	0.45
Identify and describe my abilities and contributions to the IP team	0.72	0.42
Be accountable for my contributions to the IP team	0.43	0.43
Understand the abilities and contributions of IP team members	1.01	0.45
Recognise how others' skills and knowledge complement my own	0.98	0.44
Use an IP team approach with the patient to assess health	0.74	0.49
Use an IP team approach with the patient to provide whole person care	0.69	0.48
Include the patient/family in decision-making	0.35	0.38
Actively listen to the perspective of IP team members	0.55	0.49
Take into account the ideas of IP team members	0.60	0.49
Address team conflict in a respectful manner	0.43	0.41
Develop an effective care plan with IP team members	0.75	0.50
Negotiate responsibilities within overlapping scopes of practice	0.79	0.49

The transitional item: "Compared to the time before FIPCC, would you say your ability to collaborate interprofessionally is…" *(select one)*: 1 = *much better now*; 2 = *somewhat better now*; 3 = *about the same*; 4 = *somewhat worse now*; and 5 = *much worse now*. Standardised effect sizes, Cohen's *d* = post-score minus pre-score, divided by the standard deviation of pre- and post-scores (combined).

Table 4. Item total score correlations based on student responses to the ICCAS at the University of Minnesota (n = 785).

ICCAS item	Item total *r*	Alpha if item deleted
Promote effective communication among IP members	0.72	0.95
Actively listen to IP team members' ideas, concerns	0.68	0.95
Express my ideas and concerns without being judgmental	0.70	0.95
Provide constructive feedback to IP team members	0.71	0.95
Express my ideas clearly and precisely	0.62	0.95
Seek out IP team members to address issues	0.69	0.95
Work closely with IP team members to enhance care	0.69	0.95
Learn from IP team members to enhance care	0.68	0.95
Identify and describe my abilities and contributions to the IP team	0.72	0.95
Be accountable for my contributions to the IP team	0.66	0.95
Understand the abilities and contributions of IP team members	0.76	0.95
Recognise how others' skills and knowledge complement my own	0.76	0.95
Use an IP team approach with the patient to assess health	0.64	0.95
Use an IP team approach with the patient to provide whole person care	0.71	0.95
Include the patient/family in decision-making	0.69	0.95
Actively listen to the perspective of IP team members	0.67	0.95
Take into account the ideas of IP team members	0.69	0.95
Address team conflict in a respectful manner	0.66	0.95
Develop an effective care plan with IP team members	0.75	0.95
Negotiate responsibilities within overlapping scopes of practice	0.77	0.95

The internal consistency of all 20 ICCAS items (Cronbach's alpha) is 0.96. Item deletion does not improve overall consistency of the instrument.

explaining about one-third of the variance; and a single factor accounting for 85% of the total variance. (This latter solution compares with the 73% of total variance from a single factor reported in the University of Ottawa study.) Factor structure suggested by the inflection point in the scree plot was slightly less clear. For the three individual factors, internal consistency (Cronbach's alpha) coefficients were high (0.87–0.90). However, based on eigenvalues, only the single factor (Cronbach's alpha = 0.96) had a value greater than 1.

Discussion

A plethora of assessment tools exist for the myriad of constructs one might wish to measure when conducting research on IPECP. For example, in a recent review of "teamwork" instruments, Havyers et al. (2013) identified 12,922 articles, 178 of which had to be reviewed in order to catalogue 73 unique instruments meeting inclusion criteria. We believe that for research on IPECP to advance, the field needs to collaboratively test and improve the most promising instruments, rather than create new ones; and to avoid context-specific tool development with applications to small samples in single sites. To this end, we support the Institute of Medicine (IOM) (2015) recent recommendation to stakeholders, funders, and policy-makers to commit resources to:

> [A] coordinated series of well-designed studies of the association between interprofessional education and collaborative behavior, including teamwork and performance in practice. These studies should be focused on developing broad consensus on how to measure interprofessional collaboration effectively across a range of learning environments, patient populations, and practice settings. (p. 4)

One way to work towards this IOM recommendation is to replicate psychometric studies, with attention to the standards of educational and psychological testing (Schmitz & Cullen, 2015).

At the University of Minnesota, we decided to adopt and study the ICCAS for two main purposes. First, we needed a way to evaluate a large, resource-intensive, interprofessional foundations course that had a history of moderate to low satisfaction ratings from students. Second, we wanted to build knowledge and understanding of how to measure core constructs in interprofessional collaborative practice. The ICCAS had demonstrated structural integrity in the previous University of Ottawa study, and had been used successfully in smaller studies, as well (e.g., Bain, Kennedy, Archibald, LePage, & Thorne, 2014). Although the ICCAS was formatted to reflect CIHC competency domains, and the FIPPC course was formatted to reflect IPEC competency domains, there is significant overlap between these two frameworks.

With respect to our first purpose, we found that the ICCAS was sensitive to the FIPCC course content as seen in the large effect sizes for areas emphasized in the course, and the smallest effect size for an area not addressed in the course. Along with a strong match between FIPCC course objectives and item content, this pattern contributes to the content validity of the ICCAS for courses like FIPCC. Additionally, the ICCAS items were consistently correlated with the transitional item, in which students were asked to reflect on the degree to which their overall ability to work interprofessionally had changed since the start of the course. This finding provides some modest evidence of concurrent validity.

With respect to our second purpose, we gained insights to the retrospective pre–post approach to rating, as well as the internal structure of the instrument. As with the University of Ottawa study, most of the effect sizes at the University of Minnesota were at least moderate in magnitude. Similar effects of up to three-quarters of a point were reported by Bain et al. (2014) in a pilot evaluation of a professional development programme for arthritis care team members.

Because the education programmes involved with both of our studies varied in terms of length, intensity, and format, it is difficult to know how much to attribute the pre–post changes to effective interventions alone. Using a retrospective pre–post approach to measurement counteracts the problems in actual pre–post designs, that is, over-estimated ability prior to intervention, and response shift bias, which can occur due to changes in subjects' frame of reference over the course of the intervention (Howard, 1980; Howard & Dailey, 1979). The retrospective approach, however, is not without flaws. It may, for example, introduce some post-score inflation, due to students' desire to reflect positively on their efforts and abilities (Drennan & Hyde, 2008). At the University of Minnesota, the FIPCC course evaluations submitted by students and faculty indicated more modest course impacts than the ICCAS change scores would suggest. Despite a potential for some post-score inflation, however, we believe the ICCAS results provide some positive evidence of student learning.

What does the ICCAS actually measure, and how should the instrument be scored? The factor structure that emerged from these analyses did not support a theoretical proposition that the constructs of collaboration, roles and responsibilities, patient-/family-centred care, conflict management/resolution, and team functioning are mutually exclusive. The internal consistency estimates of the three potential factors identified in the scree test plots were all high (0.90 and 0.87), but the factor loadings grouped items from multiple constructs together in non-unique, unthematic ways. The data provided a much stronger argument for a single-factor solution, which accounted for a high proportion of variance in both of our studies (85% at the University of Minnesota, 73% at the University of Ottawa). This, and the fact that all of the ICCAS items were inter-correlated, suggests strong conceptual overlap of these constructs, at least as they are taught in IPE programmes, and as they are perceived by IPE students.

In our view, a single-factor solution does not represent a "failure" of the ICCAS. Rather, it tells us something about the interconnected nature of what we are teaching and assessing. Repeated single-factor solutions, however (both in this and other studies), do raise questions about the underlying assumptions being made when factor analysis is used to validate instruments (Schmitz & Brandt, 2015).

Given the relative brevity of the ICCAS (20 items), reasonably strong individual item-total correlations, and the fact that overall reliability did not increase with item deletions, we see no need for item reduction. For the ICCAS to be useful in further validation studies, it will need to be scored at an individual, overall level. Given the level of item inter-correlations and evidence of a strong, underlying latent factor from our two studies, we recommend that the average score from all 20 items be used.

Going forward, we feel it would be important to study the relationship between self-reported behaviours (be they from the ICCAS or other similar tools) and more objective measures of collaborative practice through direct observation. Among other benefits, collecting behavioural data *in situ* provides arguably more accurate and meaningful scores, which in turn "may be more readily linked to important patient safety outcomes" (Havyer, ibid, p. 905). Although there are a number of work-based assessment tools available for this task (e.g., Curran et al., 2011; iTOFT Consortium, 2015), it can be logistically difficult and costly to collect these data. We believe that is why most psychometric research on interprofessional collaborative practice or teamwork (when it is done) is often limited to content validity and strategies for examining internal structure (e.g., internally consistency or inter-rater reliability, EFA) (see synthesis reviews by Havyer, ibid; Shoemaker et al., 2016; and Valentine, Nemblard, & Edmonson, 2015). More rigorous evidence linking IPECP results to external variables (e.g., criterion or predictive validity) are much less common.

The strengths of the study include (1) further content validity evidence of the instrument for a broad spectrum of health professionals for an introductory IPECP course; (2) confirmation of the relationship between ICCAS items and a solitary measure of change in interprofessional collaborative ability; and (3) further support for viewing the ICCAS items as measuring an underlying and unifying set of behaviours associated with team-based, patient-centred, collaborative care. Although this study sheds no new light regarding proposed constructs within a theoretical model of interprofessional collaborative practice, data reduction is often the goal

of factor analysis (Brown, 1976). The parsimony of a single-factor solution for the ICCAS can be considered a positive for the purpose of student assessment and IPE course evaluation. The limitations of the study include the fact that the ICCAS is a self-report instrument. We were not able to provide evidence of how these self-ratings correlate with objective measures of interprofessional collaborative behaviour. As with any replication, differences in factor structures and item effect sizes between the two studies likely reflect differences in our two samples. Both were predominantly if not exclusively comprised of pre-licensure students, but their different subgroupings of professionals may have affected student ratings. At the University of Minnesota, for example, we observed strong differences between medicine and other students on the ICCAS.

It is also possible that the University of Minnesota data may have been affected by our changing the response scale from seven to five points and substituting an unbalanced, qualitative scale for the previous Likert-type agree–disagree scale. Both scales are subject to positive response bias, however, and when we recalibrated the item scores from the five-point scale using a weighted formula to normalise the distribution, the results did not change. This limitation might even be considered a contribution, in that the ICCAS is robust to changes in response formats, as evidenced by the similarity in results across our two studies.

Concluding comments

The ICCAS is a sound instrument for self-assessed, interprofessional collaborative behaviours. It is short, easy to understand and administer, and helpful for evaluating IPE curricula. As can be said about most instruments, the ICCAS is best used along with other evaluation tools to understand course strengths, limitations, and effectiveness. Our research suggests that the constructs measured by the ICCAS overlap significantly; computing an average overall score for individual students is justifiable, and use of subscale scores is *not* supported. Further research is needed to examine the validity of the ICCAS data in terms of the relationship between self-assessed scores and external measures of interprofessional collaborative behaviour.

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Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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