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Impact of team composition on student perceptions of interprofessional teamwork: A 6-year cohort study

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ABSTRACT

Interprofessional education (IPE) provides students with opportunities to learn about the roles and responsibilities of other professions and develop communication and teamwork skills. As different health professions have recognised the importance of IPE, the number of disciplines participating in IPE events is increasing. Consequently, it is important to examine the effect group structure has on the learning environment and student knowledge acquisition during IPE events. The purpose of this study was to determine the effect of group composition on student perceptions of interprofessional teamwork and collaboration when participating in a case-based IPE forum. To examine this construct, six cohorts of students were divided into two groups: Group-one (2010–2012) included students from five professions. Group-two (2013–2015) included students from 10 professions. The only other change for group-two was broadening the case scenarios to ensure a role for each profession. At the conclusion of the case-based IPE forums, both groups demonstrated a statistically significant increase in 'readiness for interprofessional learning' and 'interdisciplinary education perceptions'. However, participants in group-one (2010–2012) demonstrated a greater change in scores when compared to group-two (2013–2015). It was concluded a case-based IPE forum with students from numerous health professions participating in a discussion about broad case scenarios was moderately effective at introducing students to other health professions and increasing their knowledge of others' identities. However, a smaller grouping of professions with targeted cases was more effective at influencing student perceptions of the need for teamwork. When planning an IPE event, faculty should focus on intentional groupings of professions to reflect the social context of healthcare teams so all students can fully participate and experience shared learning.

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Introduction

Since the release of the core competencies for interprofessional education (IPE) (Interprofessional Education Collaborative Expert Panel, 2011) and the advent of the National Centre for IPE and collaborative practice in 2012 (U.S. Department of Health and Human Services, 2012), IPE has exponentially grown in healthcare education in the United States (e.g. Greer, Clay, Blue, Evans, & Garr, 2014; Josiah Macy Jr. Foundation, 2012; Reeves, Tassone, Parker, Wagner, & Simmons, 2012; Rodger, Hoffman, & the World Health Organization Study Group on Interprofessional Education and Collaborative Practice, 2010).

IPE activities are generally well received by students (e.g. Bain, Batt, Darvill, & Greenwood, 2016; Reeves, Goldman, Burton, & Sawatzky-Girling, 2010; Reeves et al., 2012) and can provide opportunities to learn skills in leadership, teamwork, and identifying patient-centred goals (Buring et al., 2009). Through participation in IPE interventions, students gain may confidence and report increased knowledge of the roles and responsibilities of other health professionals (Dacey, Murphy, Anderson, & McCloskey, 2010; Delunas & Rouse, 2014; Saini et al., 2011). Additionally, students can develop more positive attitudes and perceptions towards interprofessional clinical decision-making (Hood et al., 2014; Lapkin, Levett-Jones, & Gilligan, 2013) and gain skills necessary for collaborative care (Reeves et al., 2010). As students build confidence in their clinical skills and knowledge, and increase their awareness of the need for collaboration, participation in IPE interventions will likely serve as a valuable instrument to bridge classroom learning with the patient care setting (Blue, Mitcham, Smith, Raymond, & Greenberg, 2010; Körner et al., 2016; Miers et al., 2007). However, best practices of how to incorporate IPE into healthcare education and an understanding of the best specific strategies for translating IPE into interprofessional team-based care are not clear at this time (Abu-Rish et al., 2012; Gurenlian, 2015; Zwarenstein, Goldman, & Reeves, 2009).

While the best methods for implementing IPE activities are unknown, the majority of IPE activities are one-time events that consist of case-based or problem-based learning through small group discussions (Abu-Rish et al., 2012; Tofil et al., 2014). With scheduling being one of the largest barriers to implementation of IPE activities, (Abu-Rish et al., 2012; Curran, Deacon, & Fleet, 2005) and the increase in health professions incorporating IPE into their curricula (Interprofessional-Education-Collaborative,

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2016; Zorek & Raehl, 2013), case-based IPE events will likely continue to grow as they are a viable way to circumvent potential scheduling problems between colleges and programmes.

Learning during these case-based IPE events may be explained through social constructivist theory of learning (Ballard, 2016), as these events promote learning through a social context by having two or more students from different health professions learn about, with, and from each other to provide patient care in a collaborative team environment. Through this social context, student learning is influenced by social encounters within a collaborative circumstance and knowledge is shaped through collaborative communication or shared problem solving (Hean, Craddock, & O'Halloran, 2009). Several authors suggest that knowledge transition is a process that occurs through social and environmental interactions, and that knowledge exchange must happen in a mutually created context (Fuhrman, 1994; Graham et al., 2006; McWilliam, Kothari, Ward-Griffin, Forbes, & Leipert, 2009; Thomas, Saroyan, & Dauphinee, 2011). The social constructivist perspective suggests that learning does not occur in isolation of the social context, but rather is mediated by the social environment (Davis, Maher, & Noddings, 1990; Graham et al., 2006; McWilliam et al., 2009; Thomas et al., 2011).

The influence on student learning of one social context, group composition, during case-based IPE events is unknown (Thomas, Menon, Boruff, Rodriguez, & Ahmed, 2014). Early research related to group size and performance suggests an increase in group size is related to a significant drop in performance (Ingham, Levinger, Graves, & Peckham, 1974). Shiang-Shaw (2013) supported early work demonstrating that group size significantly affects participation, whereas smaller groups had higher participation rate and improved learning scores. In addition, smaller groups also reported higher learning satisfaction rates (Shiang-Shaw, 2013). Although studies have looked at group size (Kalaian & Kasim, 2014; Oliver & Marwell, 1988), group performance (Koles, Stolfi, Borges, Nelson, & Parmelee, 2010) and intergroup relations (Stewart, Courtwright, & Barrick, 2012), very little work has addressed group composition, group structure, and perceptions of teamwork and collaboration within IPE events.

An interprofessional faculty team at our institution examined this issue related to group composition and performance when we expanded our case-based IPE forum from five professions in 2010–2012 to 10 professions in the years 2013–2015. The objective of this study was to examine students' perceptions of teamwork and collaboration before and after changing the composition of health professions represented and increasing the number of students participating in a case-based IPE forum. To our knowledge, this is the first study to investigate the impact of group composition with multiple cohorts of students participating in a case-based IPE event.

Methods

To analyse the effect of increasing the numbers of health professions represented during the IPE forum, a two-group quasi-experimental mixed model design was employed. This model allowed an investigation of change within both groups over time (pretest/post-test) and an assessment of the differences between groups. Group-one consisted of student cohorts from 2010 to 2012 and included representatives from five professions: dietetics, nursing, occupational therapy, physical therapy, and speech language pathology. Participants in group-two consisted of student cohorts from 2013 to 2015 and included representatives from professions in group-one plus five new professions: athletic training, exercise-science, health education, psychology, and pharmacology (UAMS).

During each year of the IPE forum students were randomly divided into pre-stratified interprofessional tables to discuss roles, team goals, and outcomes for written case scenarios. Faculty from each of the represented fields facilitated discussions. This protocol has previously been reported in the literature (Lairamore, George-Paschal, McCullough, Grantham, & Head, 2013a; Lairamore, George-Paschal, McCullough, Grantham, & Head, 2013b). The only changes made between group-one and group-two included the number of disciplines represented and a broadening of the case scenarios to ensure a role for students representing each health profession. Students in group-one discussed a single case pertaining to a patient post haemorrhagic stroke in the intensive care setting. Students in group-two discussed two cases, one being an elderly individual with frequent falls and the second being a paediatric client with autism and socioeconomic challenges (cases are available from the authors upon request).

Sample

Participants included 1,375 health profession students who participated in a case-based IPE forum from 2010 to 2016. Data were analysed from 977 students from the University of Central Arkansas and 14 students from the University of Arkansas for Medical Sciences who returned both pretest and post-test surveys [n = 991 total, 2010–2012 (n = 479/594: completed surveys/total participants), 2013–2015 (n = 512/781: completed surveys/total participants)]. See Table 1 for demographic data.

Instrumentation

Pre and post ratings on the Readiness for Interprofessional Learning Scale (RIPLS) and Interdisciplinary Education Perceptions Scale (IEPS) were investigated for groups of

Table 1. Demographic data.

Group	Profession	N	Sex female/male	Graduate/undergraduate	Years in college mean (sd)
Group-one 2010–2012	Dietetics[a]	24	18/6	14/10	4.8 (1.4)
	Nursing	161	104/57	0/161	4.1 (1.7)
	OT	124	81/43	5/119	4.6 (1.6)
	PT	136	78/58	136/0	5.3 (1.1)
	SLP	34	24/10	34/0	4.4 (1.3)
Group-two 2013–2015	Dietetics	46	45/1	12/34	3.67 (1.6)
	Nursing	107	98/9	2/105	4.07 (1.3)
	OT	79	68/11	44/35	4.75 (1.2)
	PT	141	92/49	141/0	4.92 (0.7)
	SLP	50	48/2	50/0	3.88 (0.9)
	Health science	41	28/13	1/40	3.02 (1.2)
	AT & exercise science	21	11/10	0/21	3.1 (1.1)
	Pharmacology	14	9/5	14/0	6.0 (1.7)
	Psychology	13	11/2	13/0	5.23 (2.0)

sd = standard deviation, AT = athletic training, OT = occupational therapy, PT = physical therapy, and SLP = speech language pathology.
[a]Dietetics 2011–2012.

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health profession students participating in a case-based IPE forum. The RIPLS and IEPS instruments are recommended for measuring the efficacy of IPE in preparing students for practice due to their public accessibility, common use, applicability for diverse populations, and sound psychometric properties (Thannhauser, Russell-Mayhew, & Scott, 2010).

The RIPLS is a 19-item tool that uses a 5-point Likert scale to assess the readiness of healthcare students for interprofessional learning. The RIPLS includes three subscales that measure healthcare students' personal attitudes towards teamwork and collaboration, positive and negative personal identity, and roles and responsibilities (Parsell & Bligh, 1999). Original work with the RIPLS revealed that the 19-item, three-factor scale had an internal consistency of 0.9 (Parsell & Bligh, 1999). This has been supported by additional work, which also demonstrated good internal consistency (0.84–0.9). Items 1–9 address teamwork and collaboration and have a reported internal consistency of 0.80–0.88. Items 14–16 address positive professional identity and have a reported internal consistency of 0.76–0.81, while items 17–19 address roles and responsibilities and have a reported internal consistency below 0.43.(Mahler, Berger, & Reeves, 2015; McFadyen, Webster, & Maclaren, 2006; McFadyen et al., 2005; Parsell & Bligh, 1999).

The IEPS was developed to assess professional perceptions and related affective domains about team collaboration between the students' profession and other professions. The IEPS is an 18-item tool that uses a 5-point Likert scale to assess competency and autonomy, perceived need for cooperation, and perception of actual cooperation, and understanding of others' roles (Luecht, Madsen, Taugher, & Petterson, 1990). Original work with the IEPS demonstrated an internal consistency ranging from 0.51 to 0.82, with an overall internal consistency of 0.87 (Luecht et al., 1990). Items 1, 5, 7, 10, and 13 address competency and autonomy and have a reported internal consistency of 0.78–0.83. Items 2 and 14–17 address perception of actual cooperation and have a reported internal consistency of 0.83–0.84. (Luecht et al., 1990; McFadyen, Maclaren, & Webster, 2007).

Data collection

RIPLS and IEPS surveys were distributed using Qualtrics software (Provo, UT) and completed 1–7 days prior to participating in the IPE forum, and completed again within 3 days after participating in the IPE forum. The dependent variables under consideration were the total scores on the RIPLS and IEPS surveys, the scores on the RIPLS subscales related to (1) attitudes towards teamwork and collaboration and (2) positive professional identity, and the scores on the IEPS subscales related to (1) competency and autonomy and (2) perception of actual cooperation. Additionally, we assessed differences between pre-testing and post-testing for each profession on the total scores for both the RIPLS and IEPS.

Data analysis

A mixed model ANOVA was used to compare differences between groups and within groups from pre to post testing using IBM® SPSS® Statistics version 22. The main effect for the independent variable of time (pre to post-testing), the main effect for the independent variable of group (group-one vs. group-two), and the interaction effect of the combined variables (time x group) were investigated. A p value of ≤0.05 was considered significant for both the interaction and main effects. Data were included only if participants fully completed both pretest and post-test surveys. After rearranging reverse coded items on the RIPLS (items 10–12, 17–19), data were analysed for RIPLS-total scores, the RIPLS subscale of teamwork and collaboration, and the RIPLS subscale of positive professional identity. After rearranging reverse coded item number 11, data were analysed for IEPS-total scores, the IEPS subscales of competency and autonomy, and the IEPS subscales of perceptions of cooperation.

Additionally, paired sample t-tests were used to investigate differences in RIPS-total scores and the IEPS-total scores between pre-testing and post-testing for each profession. A p value of ≤0.05 was considered significant.

Ethical considerations

The study was reviewed by the institutional review board (IRB) compliance officer and was determined to be exempt from further IRB review based on: (1) it presented no more than minimal risk, (2) students were anonymously surveyed and no identifying information was collected such as name and age, and (3) the research was on the effectiveness of instructional techniques. (DHHS, CFR 46.110, 2017).

Results

There was a significant within-group main effect for time, where both the RIPLS-total and IEPS-total scores increased from the beginning to the end of the IPE forum for both groups ($p < 0.001$). Participants in group-one (2010–2012) demonstrated a larger change in both RIPLS-total ($p < 0.001$) and IEPS-total ($p < 0.001$) scores when compared to group-two (2013–2015). See Figures 1 and 2.

The scores from the RIPLS subscales of teamwork and collaboration and positive professional identity demonstrated a similar trend demonstrating an increase in mean scores for both groups from the beginning to the end of the IPE forum ($p < 0.001$). Participants in group-one (2010–2012) demonstrated a larger change in RIPLS teamwork and collaboration scores ($p < 0.001$, partial eta squared = 0.011) when compared to group-two (2013–2015); however, there was no significant difference between groups when comparing change in RIPLS positive professional identity scores ($p = 0.49$). See Figure 3 for details.

There was no significant interaction between group and time when comparing the scores from the IEPS subscales of competency and autonomy ($p = 0.19$) and perception of cooperation ($p = 0.18$). However, both groups demonstrated a significant increase in scores from pre-testing to post-testing ($p < 0.001$ for both subscales), and a significant difference was found between the groups for both

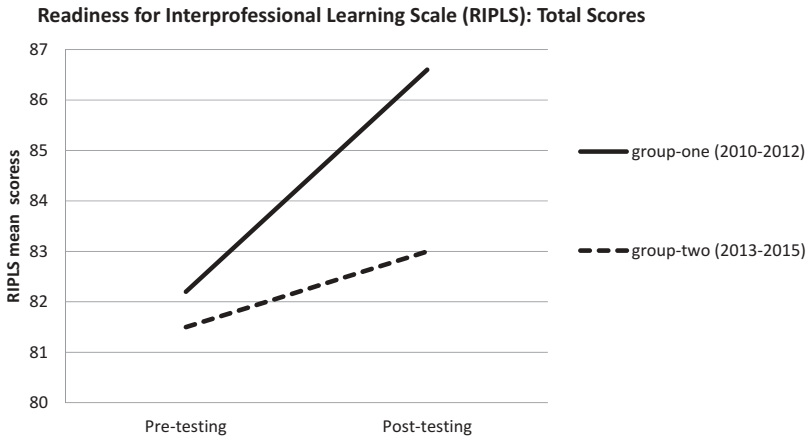

Figure 1. Mean readiness for interprofessional learning scale: total scores before and after the case-based IPE forum for students in different groups. Significant differences were found for the interaction effect: group x time ($p < 0.001$), time: pre-testing to post-testing ($p < 0.001$), and between groups ($p < 0.001$).

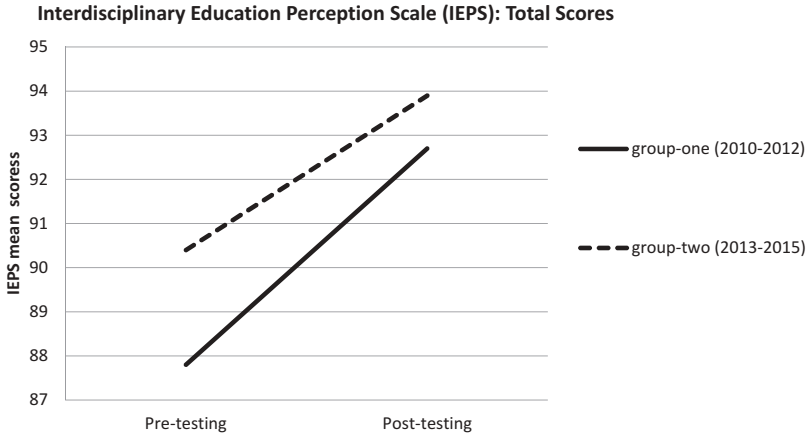

Figure 2. Mean interdisciplinary education perceptions scale: total scores before and after the case-based IPE forum for students in different groups. Significant differences were found for the interaction effect: group x time ($p < 0.013$), time: pre-testing to post-testing ($p < 0.001$), and between groups ($p < 0.001$).

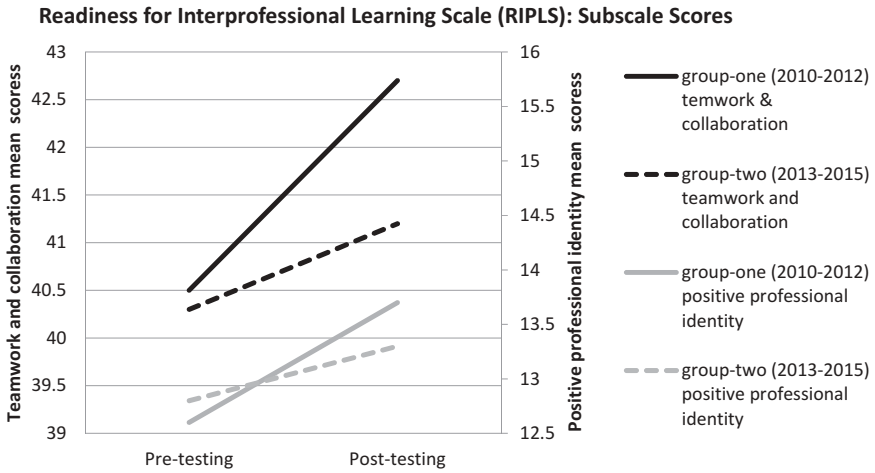

Figure 3. Readiness for interprofessional learning scale: subscale scores for teamwork and collaboration and positive professional identity before and after a case-based IPE forum for students in groups with different compositions. Significant differences were found for the interaction effect (group x time) for both subscale, pre-testing to post-testing for both subscales, and between groups for the teamwork and collaboration subscale.

subscales: competency and autonomy ($p < 0.001$, partial eta squared 0.077) and perception of cooperation ($p < 0.001$, partial eta squared 0.016). Therefore, we can conclude the groups were inherently different, but one group did not experience a greater amount of change when compared to the other group (Figure 4).

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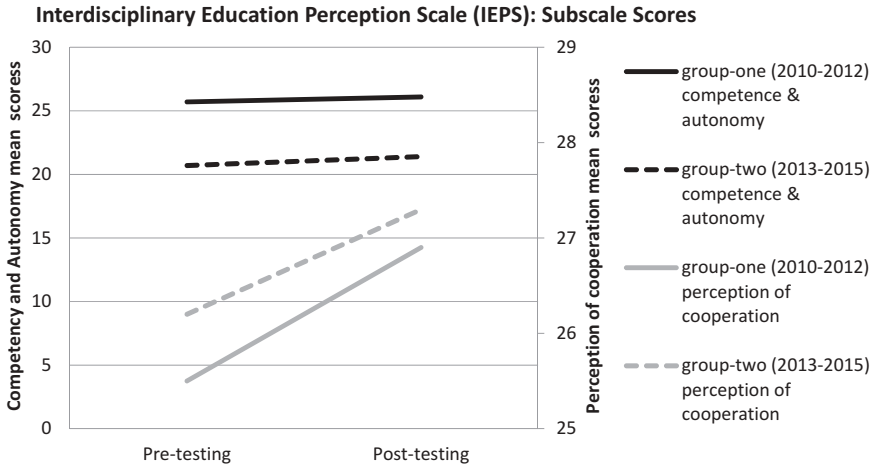

Figure 4. Interdisciplinary education perception scale: subscale scores for competency and autonomy and perception of cooperation before and after a case-based IPE forum for students in groups with different compositions. Significant differences were found between pre-testing and post-testing and between groups for both subscales.

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Differences in RIPS-total scores and the IEPS-total scores between pre-testing and post-testing for each profession are presented in Table 2.

Discussion

The findings observed for the RIPLS-total, IEPS-total, and both RIPLS subscales of teamwork and collaboration and positive professional identity suggest students from group-one (who had focused cases with fewer health professions represented) may have developed a greater understanding of the need for interprofessional teamwork and its impact on one's own profession, tended to be more ready to share expertise with others, and likely had a greater willingness to understand the value of other professions (Luecht et al., 1990; Parsell & Bligh, 1999). We hypothesise these findings are directly related to the social context from which the students interacted during the case discussions. With the smaller groupings of professions, every health profession had a vital role in the case scenario with the ability to contribute to discussions because they were intentionally assembled into groups and a social context that fostered higher levels of active engagement. In contrast, broad cases that attempt to encompass a larger number of health professions may have diminish the social context and student engagement; as the case becomes less focused on the professions involved in the discussion. For example, it is logical to include students from medicine, nursing, occupational therapy, physical therapy, and speech language pathology to collaboratively work on a case for a patient with traumatic brain injury in an acute care setting, as this is a common encounter in healthcare practice. However, adding details such as the patient is a high school athlete has a history of an eating disorder, and has a history of depression, in order to accommodate other professions would not necessarily add positively to the social encounters of students working on this case.

As the number of professions involved in an IPE activity increases, different and varied cases should be developed for targeted groupings of students (4–5 professions) to keep the cases socially relevant to each profession instead of creating one case with extraneous details in an attempt to include all health professions.

Interestingly the IEPS subscales of competency and autonomy and perception of actual cooperation did not

Table 2. Pretest and post-test scores (mean and standard deviation) by profession.

		RIPLS (total)		IEPS (total)	
	Profession	Pre	Post	Pre	Post
Group-one 2010–2012	Dietetics	83.6 (7.4)	87.1 (7.6)[a]	89.4 (9.4)	93.5 (8.5)[a]
	Nursing	79.8 (7.7)	85.7 (7.8)[a]	86.8 (8.4)	91.9 (9.0)[a]
	OT	85.4 (6.6)	87.9 (8.8)[a]	88.2 (7.5)	94.1 (7.7)[a]
	PT	80.9 (8.2)	85.6 (7.6)[a]	88.2 (7.0)	92.1 (7.7)[a]
	SLP	85.8 (6.7)	89.7 (4.4)[a]	89.2 (6.7)	93.9 (6.2)[a]
Group-two 2013–2015	Dietetics	84.1 (10.3)	83.9 (11.5)	91.9 (10.2)	96.0 (9.6)[a]
	Nursing	81.0 (11.0)	83.1 (10.5)[a]	90.4 (8.9)	93.9 (11.5)[a]
	OT	83.2 (7.9)	86.1 (6.9)[a]	89.5 (9.5)	94.5 (8.2)[a]
	PT	79.7 (8.6)	80.9 (11.3)	90.8 (7.5)	93.6 (8.3)[a]
	SLP	86.8 (8.0)	84.9 (11.7)	92.0 (6.9)	95.0 (7.6)[a]
	Health science	79.5 (12.4)	81.9 (11.3)	88.4 (10.4)	91.9 (11.1)[a]
	AT & exercise science	75.0 (10.1)	77.3 (11.4)	87.8 (9.2)	92.1 (8.1)[a]
	Pharmacology	80.9 (8.5)	84.6 (9.8)	88.7 (9.6)	94.3 (8.1)[a]
	Psychology	82.8 (5.9)	84.7 (8.1)	91.5(6.9)	90.0 (11.9)

AT = athletic training, OT = occupational therapy, PT = physical therapy, and SLP = speech language pathology.
[a]Indicates significant difference from pre-testing to post-testing ($p \leq 0.05$).

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demonstrate the same results observed in the RIPLS-total, the RIPLS subscales, and the IEPS-total. Both groups demonstrated positive changes after the case-based IPE forum in relation to these subscales; however, neither group had significantly more change than the other. The more focused cases did not appear to have a greater influence on students' perceptions of the perceived competence and autonomy of their own profession, nor their perception of actual cooperation between their own profession and other professionals (Luecht et al., 1990). These findings may be supported by previous work which demonstrated that IPE in health professional programmes, regardless of group structure or group size, can enhance students' attitudes and perceptions towards collaborative teamwork and improved clinical decision-making skills (Lapkin et al., 2013).

We theorise that perceptions of the competency and autonomy of one's own profession may be developed within the students' professional programmes and curriculum and may not be significantly influenced by a single IPE activity. For example, Kuhrik, Kuhrik, Rimkus, Tecu, and Woodhouse (2008) found that simulation training for nurses improved confidence and competence in assessing and responding to emergencies, while improving interpersonal skills and effectiveness in team settings. Additionally, perceptions of actual cooperation in a healthcare environment will likely be developed from previous clinical experiences (McFadyen et al., 2007). While participating in a case-based IPE forum may increase the understanding of the need for teamwork, it likely has less influence on students' perceptions of what is actually happening in healthcare.

The current study has multiple limitations that may impact the interpretation of the data. First, students were allocated to group-one and group-two based on the year they participated in the IPE forum. This may have resulted in confounding factors we were unable to address, which are inherently present in any study investigating student cohorts. Second, while team leaders adhered to standardised procedures, contact with facilitators was not consistent amongst students. Given the various professional backgrounds of facilitators, emphasis on different aspects of case studies may have taken place. Third, students in each group had different cases to review. The differences in the cases could have impacted the students' understanding and perception of professional roles and the need for teamwork and collaboration. Fourth, some students were required to attend the IPE workshop as part of their coursework, while others were not. This may have impacted students' openness to the concept of IPE. Fifth, all students were asked to complete the post-test survey within 3 days of participating in the IPE forum; however, some students were given time during their coursework to complete the surveys while other students were not. This likely led to the varied response rate we observed between professions. Finally, problems with the RIPLS have recently been brought to light. Because the RIPLS was one of the first IPE instruments developed it has been widely accepted; however, the internal consistency of the roles and responsibilities sub-scale has low internal consistency (Mahler et al., 2015; McFadyen et al., 2005, 2006), and there is a lack of consistency in the underlying factor structures (Mahler et al., 2015). Because of the lack of internal consistency in the roles and responsibilities sub-scale, it was not analysed during the current study and no inferences about roles and responsibilities should be made from this work.

Future research should include rigorous studies to investigate whether targeted cases and intentional groupings of students from different health professions influence student perceptions of teamwork and collaboration. Future studies should also move beyond investigating perceptions to assessing actual team behaviours and interactions amongst students from different professions during IPE activities. We propose concept maps and sociograms could potentially be used to quantify student interactions during IPE activities. Finally, longitudinal studies should be performed to investigate whether case-based IPE experiences are leading to improvements in interprofessional practice.

Concluding comments

The use of a case-based forum as an instructional method for IPE resulted in improved students' perceptions of professional identities and the need for teamwork and collaboration with other health professions. However, the incorporation of an IPE forum with a larger grouping of professions participating and a broad case scenario was less effective for introducing students to other health disciplines and increasing knowledge of other professions' identity when compared to implementing an IPE forum with a targeted case and fewer professions involved. Additionally, the larger grouping was less effective at influencing student perceptions of the need for teamwork and collaboration. Reflection on these results indicates that future case-based interprofessional activities should use cases that are focused around intentional professional groupings reflecting the social context of healthcare teams so that every student has a vital professional role in the case(s) they are assigned.

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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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