Mindfulness fostering of interprofessional simulation training for collaborative practice

Douglas Ander, Emory University
MJ Kerry, ETH Zürich

Journal Title: BMJ Simulation and Technology Enhanced Learning
Volume: Volume 5, Number 3
Publisher: (publisher) | 2019-07-01, Pages 144-150
Type of Work: Article
Publisher DOI: 10.1136/bmjstel-2018-000320
Permanent URL: https://pid.emory.edu/ark:/25593/vxhkm

Final published version: http://dx.doi.org/10.1136/bmjstel-2018-000320
Accessed November 6, 2022 10:59 PM EST
Mindfulness fostering of interprofessional simulation training for collaborative practice

Matthew James Kerry,1 Douglas S Ander2

ABSTRACT

Introduction The setting demands imposed by performing in new, interdisciplinary cultures is common for modern healthcare workers. Both health science students and evidence-based workers are required to operate in professional cultures that differ from their own. As health organisations have placed increasing value on mindfulness for improving performance outcomes, so too have educational administrators embraced common, mindful competencies for improving training for improved patient outcomes. The training of future clinicians for diversified care teams and patient populations has become known as interprofessional education (IPE). Although the goals for IPE suggest that individual differences in trait mindfulness may serve an important determinant for training effectiveness, it has gone unstudied in extant simulation training research.

Methods To fill this gap, in this paper, we examine trait mindfulness’ predictive power for training outcomes across two IPE cohort samples using two, prospective observational designs.

Results Study 1’s Findings supported trait mindfulness’ prediction of perceived teamwork behaviours in training simulations between medical and nursing students (n=136). In study 2’s expanded sample to five health professions (n=232), findings extended trait mindfulness’ prediction of team efficacy and skill transfer, assessed 1 month after training.

Conclusion A final, follow-up assessment 16 months later extended mindfulness’ predictive validity to knowledge retention and teamwork attitudes. We discuss the theoretical and practical implication of our findings for advancing mindfulness research and IPE effectiveness assessment.

INTRODUCTION

Much extant mindfulness research has focused on intraunit relations (eg, profession/discipline).1 In contrast, the current study purposefully contextualises mindfulness in interprofessional education (IPE) simulation training. Specifically, we examine the predictive power of trait mindfulness for IPE training outcomes. In addition, the current work seeks to bridge two paradigmatic conventions of mindfulness research of individual level and team level.2 Specifically, we examine the impact of individual mindfulness on both individual- and team-level behaviours performed in non-technical skills simulation training.

In order to strengthen temporal inferences between mindfulness and training outcomes of interest, researchers must accurately assess mindfulness. In a review of mindfulness interventions,3 it was found that the majority of researchers (~60%) used pre–post self-report mindfulness measures, such as Mindful Attention Awareness Scale (MAAS).4 In constructing the MAAS, Brown and Ryan assert that the MAAS scale measures ‘a disposition … focused on the presence or absence of attention to and awareness of what is occurring in the present’ (Brown, p. 824).4

Although there is correlational evidence to suggest that trait- and skills-based mindfulness are related,5 modern measurement approaches (eg, item response theory)6 have supported self-report instruments as tapping primarily trait-based conceptions. For the current study, we adopt Brown and Ryan’s definition and trait-based measurement of mindfulness.7 Specifically, in the current study, we define trait mindfulness as stable individual differences for ‘being attentive to and aware of what is taking place in the present’ (Brown, p. 822).4

Mindfulness in IPE

The link between trait mindfulness and institutional IPE can be understood by the burgeoning field of safety science.6 For example, in a recent systematic review of mindfulness interventions,7 trait mindfulness was found to be predominately studied in association with safety behaviours. Similarly, the institutionalisation of IPE represents one piece of a larger quality improvement response to alarming patient safety reports.8 Mindfulness-based interventions have been implemented in hospitals (ie, ‘error wisdom’9), and empirical evidence has supported their effectiveness for reducing adverse events.10 As Grooms observed at the crossroads of institutional quality improvement and individual patient safety performance, ‘For quality improvement teams in healthcare, the overarching behavior that emerges within adaptation is mindful boundary management’ (Grooms, p. 170).11

There are numerous reasons to assess mindfulness’ predictive power for IPE outcomes. First, theoretically, Langer’s skills acquisition research indicates that deconstruction imposes demands for mindfulness in order to promote adaptation in novel learning settings.12 Several empirical findings support mindfulness as positively related to performance in novel learning environments.13 For example, a recent meta-analysis of team processes
and adaptive performance found that teamwork processes significantly related to team-adaptive performance. Second, the nomological net of constructs pertinent to IPE training complements that of mindfulness. For example, constructs identified as impactful for IPE outcomes include reflexivity, openness to experience and experiential learning.

Having briefly overviewed the relevance of mindfulness in the context of IPE training, we turn towards formulating our hypotheses. Specifically, the above-cited research is elaborated to inform expectations for mindfulness’ predictive power of learners’ IPE training outcomes. We organise our hypotheses and remaining subsections by our two, consecutive cohort study samples used for the current research report.

Mindfulness in teamwork processes
Perhaps more intuitive, the holistic lens of mindfulness may be reflected by the ‘boundary-spanning’ goals of IPE training. For example, mindful organisations and team adaptation are two literatures that predominately feature a common construct: ‘team boundary spanning’. Team boundary spanning considers the potential inputs and value to a team’s efforts to manage interconnections that exist outside the team. In the IPE context, training aims to restore the central valuation of the patient as interconnecting all health professions and practitioners. Paralleling IPE training aims, the empirical scope of mindfulness has been extended from individual outcomes to identifying its impact on group behaviours and team performance.

In a seminal research study in medical students, Shapiro et al found that mindfulness training significantly lowered anxiety and psychological distress. The stress-reducing benefits of mindfulness training in health professions education recently received meta-analytic support from a systematic review of randomised controlled trials. This has implications for students’ reception of IPE training as the IPE literature has suggested that compelling IPE training early in prelicensure students may induce a ‘distinctiveness threat’. Consequently, distinctiveness threat is argued to counteract IPE training goals by galvanising in-group norms and reducing psychological safety for engaging in IP teamwork behaviours.

Complementing the above-cited research on mindfulness’ personal stress reduction, Langer’s original information processing theorised mindfulness to further mediate appraisal of environmental extremities. For example, Hanley et al found trait mindfulness to positively predict task engagement following prior failure. Further supporting Langer’s theorisation for trait mindfulness to evidence as novelty-seeking behaviour in unfamiliar contexts, empirical findings have supported mindfulness’ positive association with exploration. Other empirical findings have indicated a significant positive association between self-reported mindfulness and dynamic-adaptive performance. Finally, a meta-analysis of trait mindfulness and workplace constructs indicated significant positive associations of mindfulness with work effort and interpersonal relations quality.

Taking together the above theoretical postulates and empirical findings, we begin with formulation of our first hypothesis for mindfulness and IPE training outcomes. Specifically, synthesising from observations above, to the extent that mindfulness is effective at reducing threat-stress reactions to IPE training, it is tenable that student mindfulness impacts students’ propensity to participate via teamwork behaviours during simulation trainings. Specifically, we predict that

**Hypothesis 1.** Mindfulness will predict perceived teamwork behaviours during IPE training.

**Mindfulness in proximal training outcomes**
Turning towards our second study, one of our primary objectives for strengthening mindfulness’ validity evidence in IP trainings was to examine its discriminant validity evidence. Deriving from foundational distinctions in the early team effectiveness literature between ‘taskwork versus teamwork’, subsequent theory has similarly distinguished process and outcome forms of team efficacy. Recent empirical findings have supported the factorial distinction between process- and outcome-focused forms of team efficacy. In parallel, the goals of early IPE training are different than training in postlicensure settings. Whereas practitioner training prioritises skill acquisition, early IPE aims to raise awareness, redress misconceptions and foster favourable IP experiences for future collaborations.

Extrapolating, the holistic training context and steady team membership over repeated performance cycles may provide stronger information exchange supportive of teamwork efficacy compared with taskwork efficacy. Furthermore, studies of repeated performance cycles (stable team membership) indicate that team member perceptions tend to converge over time. Based on our sample’s repeated performance cycles in the current training, as well as the above evidence, we make the following two predictions for mindfulness and teamwork efficacy:

**Hypothesis 2a.** Mindfulness will show stronger relations with teamwork efficacy compared with taskwork efficacy.

**Hypothesis 2b.** Mindfulness will predict teamwork efficacy.

In the IPE literature, training transfer is defined by D’Eon as ‘the ability to extend what has been learned in one context to new contexts’ (D’Eon, p. 65). Importantly, Hammick et al’s coding rubric broadly defines behavioural change as ‘the transfer of learning to the workplace or willingness of learners to apply new knowledge and skills’ (Hammick, p. 13). Learner willingness is aptly captured by Noe’s definition of motivation to transfer, specifically ‘trainee’s desire to use the knowledge and skills on the job’ (Noe, p. 503). Motivation to transfer has received meta-analytic support as the greatest trainee determinant of training transfer (ref. ; d=0.75). Although we expect curricula factors to impact transfer opportunities, we predict that individual mindfulness will operate across professional programmes to predict training transfer. This partly derives from recent meta-analytic evidence supporting trait mindfulness’ positive association with workplace relations and attentional effort, as well as negative associations with work stress, work withdrawal and burnout. This partly derives from recent meta-analytic evidence supporting trait mindfulness’ positive association with workplace relations and attentional effort, as well as negative associations with work stress, work withdrawal and burnout.

**Hypothesis 3.** Mindfulness will predict transfer of training.

**Mindfulness in distal training outcomes**
Arguments for helping to demonstrate IPE’s enduring impact on distal outcomes have called for a qualitative stream of IPE content, calibrated to students’ needs vis-à-vis the individual’s progressive training stage. Similarly, in a systematic review of IPE effectiveness, Reeves et al observed the importance of training authenticity, as perceived by students for measuring of long-term, distal outcomes. The interdisciplinary nature of the IPE training introduces new opportunities for mastery.
beyond the formal course curriculum. Those motivated by mindfulness and experiential learning may attach greater value to demands of the IPE training if they believe their teammates provide supplementary sources of expertise for a given topic (eg, patient safety). From these arguments and observations, we hypothesise that mindfulness will predict student retention of teamwork content presented in their early IP training:

**Hypothesis 4.** Mindfulness will predict IPE teamwork declarative knowledge.

Historically, the empirical evidence of early IPE effectiveness for attitude change has been presented as positive, though mixed. Systematic reviews, however, have been limited to descriptive summaries of directional findings (eg, ‘positive’/’mixed’/’no change’). A more recent meta-analysis of IP team training effectiveness affords stronger conclusions, such that interprofessional team training significantly improves learner and patient outcomes. Furthermore, if mindfulness predisposes trainees to normative changes for their profession, then increased uptake of IPE by professions may further raise student attitudes towards healthcare teams. Finally, IPE targets the onset of socialisation processes and signals IP valuation to new trainees. Consequently, expressed IP values (attitudes) are foundational to trainees’ normative practice. Taking the above evidence together with classic theoretical models of attitude formation, our final hypothesis for mindfulness and IPE training outcomes is:

**Hypothesis 5.** Mindfulness will predict attitudes towards healthcare teams.

**METHODS**

**Training delivery**

Identical trainings were delivered to both sample 1 and sample 2. Instructional delivery comprised a 4-hour session, beginning with a 1-hour introductory didactic lecture on teamwork skills using the Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) teaching material. This was followed by a 30 min ‘case studies’ video tutorial, which was presented to exemplify safety rationales for specific TeamSTEPPS skills. Following these didactics, students were assigned to IP teams (sized i=4–8 persons) for practising teamwork skills across two, clinical simulation vignettes.

Simulation vignettes were co-constructed by the paper’s authors and the IP faculty facilitator team (k=46 faculty). Specifically, initial drafting of clinical scenarios requiring teamwork was generated by the IP faculty facilitators. After review and copyediting by the secondary author, revisions were circulated to IP faculty facilitators for further feedback and preference ordering. This iterative reduction process continued through three rounds until consensus was reached on two, simulation vignettes for IPE student delivery. Each simulation vignette was piloted among third year student cohorts to refine content (high-level teamwork competency/low-level specialised medical knowledge), faculty’s moderation and feedback instructions, and administration length (approximately 15–20 min, each). All simulation vignettes were moderated by trained faculty facilitators, who introduced the simulation vignettes and gave feedback debriefings to student teams (see online supplementary appendix A).

**Sample and design**

A prospective, observational design with survey method was conducted over two student cohorts participating in IP simulation training at an academic medical centre located in the southeastern USA. The first cohort (sample 1) were first year medical and nursing students (136). The second cohort (sample 2) expanded to include first year medical, nursing, physical therapy and physician assistant students (233).

**Survey measures**

Both samples were sent an online survey questionnaire approximately 2 weeks prior to the IP simulation training session. Pretraining surveys were similar across samples in assessing student demographics and our focal mindfulness predictor variable. Because the IP training sessions were embedded in students’ normal curriculum, survey completion rates were generally high across the student cohort samples (87.2% and 80.91%, respectively). Students in both samples were administered questionnaires using Likert-type response scales ranging from 1=strongly agree to 5=strongly disagree. Each construct measure is detailed further below.

**Mindfulness**

Individual differences in mindful attention and awareness refer to stable trait tendencies to be attentive and aware of events in the moment. This trait was assessed with a shortened, five-item scale adopted from ref. An example item included (reverse-scored) is, ‘I rush through activities without being really attentive to them.’

**Sample 1 outcome measure**

In sample 1, one outcome (perceived teamwork) was assessed with an online survey administered 1 day after IP training delivery.

**Perceived teamwork**

This 15-item composite scale was designed to assess students’ perceptions of team behaviours during the clinical simulation. The general composite represented behaviours that were taught in students’ previous didactic lecture, which covered principal skills of cooperation, communication and coordination. A sample item is, ‘Members of my team helped each other when necessary.’

**Sample 2 outcome measures**

In sample 2, five outcomes were assessed with an online survey over two follow-up collection periods. Specifically, three proximal outcomes were assessed 1 month after IP training (task/teambuilding, transfer) and two distal outcomes were assessed 16 months at training follow-up (knowledge, attitudes).

**Task efficacy**

This nine-item scale was designed to assess student confidence in their abilities to perform effective teamwork behaviours that promote goal accomplishment. Students were asked to ‘indicate

---


2. Recruited participants received and gave their informed consent for enrolment before beginning the pretraining online survey. Pretraining surveys were administered approximately 2 weeks prior to the scheduled delivery of the IPE training sessions.

how confident you are about your current ability to successfully perform each behavior in a healthcare team situation’ on a scale from 1=not at all confident to 6=extremely confident. A sample item is, ‘Be assertive with people in a different professional program when required.’

Team efficacy
This three-item scale was designed to assess student self-efficacy for behaviors that promote positive team member relations. Students were asked to indicate their confidence about their ability to successfully perform each item in a healthcare team situation on a scale from 1=not at all confident to 6=extremely confident. A sample item is, ‘Remain polite and respectful toward other team members during a crisis situation.’

Transfer
Five items were used to assess the extent to which IPE learning was used in subsequent educational activities. Based on frequency indicators, a sample item is, ‘In the last month, how often have you observed or performed an SBAR?’

Knowledge
This five-item, multiple-choice measure was designed to assess student retention of declarative information presented in the TeamSTEPPS lecture. Correct answers were scored as ‘1’ and incorrect answers were scored as ‘0’. The sum of these questions indicated participants’ overall knowledge score. A sample question on this scale is, ‘Approximately how much of healthcare team communication is non-verbal?’

Team attitudes
Five items were adapted from Heinemann et al’s Attitudes toward Health Care Teams Scale to assess students’ evaluative judgements of IP teams.45 An example item is, ‘The give and take among team members in an interprofessional team helps them to make better patient care decisions.’

Analyses
A series of hierarchical regressions were conducted to evaluate the predictive validity of trait mindfulness on training outcomes. To control for potential confounding from individual-level demographics (age, gender), these variables were entered into the first step of the regression equation. The incremental predictive validity of trait mindfulness for IP training outcomes was evaluated by entering mindfulness in the second step of hierarchical regressions. Standard β coefficients are reported for interpretation. Tests results are organised by hypotheses.

RESULTS
Tables 1 presents the summary sample characteristics and study variable descriptive statistics. Univariate item-level descriptive statistics, frequency response patterns and graphical inspection of normal Q–Q plots provided tentative evidence for inferring univariate normal distributional assumptions. This supported accurate estimates for interpreting variables entered subsequent hierarchical regression analyses.

Table 2 presents all variable intercorrelations. Internal reliability estimates for all composite measures were acceptable and are displayed in bold in table 2. Table 2 is organised by sample 1 presented in the top half of the matrix, and sample 2 is presented in the bottom half of the matrix.

Results from sample 1’s hierarchical regressions are reported in the first column of table 3. Hypothesis 1 was tested by entering mindfulness in the second step of the regression equation for perceived teamwork. As shown in table 3, mindfulness added significant predictive power (3%) over demographics for perceived teamwork (β=0.21, F_2,39=4.07, p<0.05), supporting Hypothesis 1.

To test Hypothesis 2a for discriminant validity, we inspected sample observed correlations, which indicated that the association between mindfulness and task-focused efficacy was

### Table 1 Summary sample characteristics and variable descriptives by study/sample

<table>
<thead>
<tr>
<th>Sample 1</th>
<th>Sample 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size (N)</strong></td>
<td>136</td>
</tr>
<tr>
<td><strong>Age M (SD)</strong></td>
<td>21.51 (.54)</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>71%</td>
</tr>
<tr>
<td>Female</td>
<td>22%</td>
</tr>
<tr>
<td><strong>MAAS</strong></td>
<td>21.12 (4.69)</td>
</tr>
<tr>
<td><strong>Teamwork</strong></td>
<td>53.65 (10.95)</td>
</tr>
<tr>
<td><strong>Task self-efficacy</strong></td>
<td>15.68 (1.83)</td>
</tr>
<tr>
<td>Transfer</td>
<td>9.63 (3.22)</td>
</tr>
<tr>
<td>Knowledge</td>
<td>28.45 (4.49)</td>
</tr>
</tbody>
</table>

Means reported, SD in parentheses.
Sample 1 teams j=23. Sample 2 teams j=38.
MAAS, Mindful Attention Awareness Scale.

### Table 2 Intercorrelation matrix of study variables by study/sample

<table>
<thead>
<tr>
<th>Sample 1</th>
<th>Age</th>
<th>Gender</th>
<th>MAAS</th>
<th>Teamwork</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>–</td>
<td>–0.02</td>
<td>0.07</td>
<td>–0.07</td>
</tr>
<tr>
<td>Gender</td>
<td>0.10</td>
<td>–</td>
<td>0.84</td>
<td>0.15*</td>
</tr>
<tr>
<td>MAAS</td>
<td>0.12</td>
<td>0.10</td>
<td>0.78</td>
<td>0.93</td>
</tr>
<tr>
<td>Task self-efficacy</td>
<td>–0.10</td>
<td>0.09</td>
<td>0.05</td>
<td>0.89</td>
</tr>
<tr>
<td>Team self-efficacy</td>
<td>–0.03</td>
<td>20**</td>
<td>0.20**</td>
<td>0.47**</td>
</tr>
<tr>
<td>Transfer</td>
<td>–0.06</td>
<td>0.02</td>
<td>0.11</td>
<td>0.16*</td>
</tr>
<tr>
<td>Knowledge</td>
<td>–0.09</td>
<td>–0.08</td>
<td>0.07</td>
<td>–0.10</td>
</tr>
<tr>
<td>Attitudes</td>
<td>0.12</td>
<td>0.16*</td>
<td>0.16*</td>
<td>0.06</td>
</tr>
</tbody>
</table>

Sample 1, n = 136. Sample 2, n = 232.
*p<0.05, **p<0.01.
MAAS, Mindful Attention Awareness Scale; teamwork, perceived teamwork.
Table 3 Sample 2 hierarchical regression results for demographics and mindfulness on outcomes

| Predictors | Sample 1 outcome | Sample 2 outcome |         |         |         |         |         |
|------------|------------------|------------------|---------|---------|---------|---------|
|            | Teamwork         | Team efficacy    | Transfer| Knowledge| Team attitudes |
|            | 1                | 2                | 1       | 2       | 1       | 2       | 1       | 2       |
| Age        | −0.10            | −0.11            | −0.01   | −0.03   | −0.05   | −0.07   | −0.11   | −0.12†  | 0.14     | 0.13*   |
| Gender     | 0.01             | −0.01            | 0.20    | 0.17**  | 0.01    | 0.00    | −0.10   | −0.11†  | 0.18     | 0.16    |
| MAAS       | 0.21*            | 0.19**           | 0.11†   | 0.10†   | 0.13*   |         |         |         |         |
| R²         | 0.01             | 0.04             | 0.04    | 0.07    | 0.00    | 0.02    | 0.02    | 0.03    | 0.04     | 0.06    |
| R²Δ        | 0.03             | 0.03             | 0.03    | 0.02    | 0.02    | 0.01    | 0.01    | 0.02    |         |         |
| F         | 4.06*            | 8.32*            | 2.93†   | 2.28†   | 4.05*   |         |         |         |         |
| df         | 2134             | 1133             | 2229    | 1229    | 2230    | 1229    | 2223    | 1222    | 2230     | 1129    |

Sample 1, n=136. Sample 2, n=232.
*p<0.05, **p<0.01, †p<0.10.
df, degrees of freedom; MAAS, Mindful Attention Awareness Scale.

The positive relation between mindfulness and perceived teamwork provides indirect support for Allport's Contact Hypothesis. Furthermore, the positive relation corroborates normative empirical findings of first year trainees' increased preferences for IP learning over a 10-year time period of annual IP training instalments.

For Hypothesis 2, we extended the specificity of mindfulness' predictive power for the interprofessional training context. First, we found partial support for mindfulness' stronger association with team-focused compared with task-focused efficacy beliefs. Fisher's transformation and effect size comparisons indicated marginal significance in the expected direction (p = 0.05). Second, Hypothesis 2b stated that trait mindfulness would predict higher team efficacy. Results from hierarchical regressions indicated that mindfulness added significant incremental variance in predicting team efficacy. Support for our second hypothesis informs the IPE field's identification of student candidates for facilitator training towards delivering future IP activities.

Hypothesis 3 stated that trait mindfulness would predict higher training transfer. Results from hierarchical regressions indicated that mindfulness added marginally significant incremental variance in predicting training transfer. This partially supportive finding is consistent with arguments made by Freeth et al regarding curricula's central role for providing practice opportunities to support IPE transfer and sustainment into clinical practice.

Hypothesis 4 stated that trait mindfulness would predict higher IP knowledge. Results from hierarchical regressions indicated that mindfulness added significantly incremental variance in predicting distal knowledge retention. This partially supportive finding should encourage recent IPE trends for studying 'just-in-time' training, as well as advocates of customised content of IP trainings that are tailored to students' learning needs. In brief, equivalence in training onset (matriculation) does not imply comparable maturation in professional identity nor IP attitude formation.

Hypothesis 5 stated that trait mindfulness would predict higher team attitudes. Results from hierarchical regressions indicated that mindfulness added significant incremental variance in predicting team attitudes. Support for our fifth and final hypothesis informs the past mixed findings for IP's impact on team care attitudes. Specifically, compositional confounds of disciplines non-significant, r = 0.05, p > 0.05. In contrast, the association was significant for mindfulness and team-focused efficacy, r = 0.20, p < 0.05. Finally, we evaluated the correlational difference between team and task forms of efficacy beliefs. Specifically, we computed Fisher's r–z transformations in order to compare the relative strength of associations between mindfulness and team- and task-focused forms of efficacy. Results indicated a marginally significant difference, z(1) = 1.63, p = 0.05. Taken together with the observed correlations above, we interpret these findings largely supportive for Hypothesis 2a.

Regarding mindfulness' predictive power for more distal training outcomes, results reported in Table 3 were largely supportive. Specifically, for Hypothesis 4, mindfulness added marginally significant predictive power over demographics for knowledge (β = 0.19, F₄ = 8.32, p < 0.05), supporting Hypothesis 2b. Hypothesis 3, however, was only partially supported as mindfulness added only marginally significant predictive power over demographics for training transfer (β = 0.11, F₄ = 2.93, p < 0.10).

Regarding mindfulness' predictive power for more distal training outcomes, results reported in Table 3 were largely supportive. Specifically, for Hypothesis 4, mindfulness added marginally significant predictive power over demographics for knowledge (β = 0.19, F₄ = 8.32, p < 0.05), supporting Hypothesis 2b. For Hypothesis 3, however, it was only partially supported as mindfulness added only marginally significant predictive power over demographics for training transfer (β = 0.11, F₄ = 2.93, p < 0.10).

DISCUSSION
In this paper, we sought to bring evidence from mindfulness research to bear on training outcomes from IPE for improving collaborative practice. Building on mindfulness theorisations and IPE empirical findings, we developed a trait mindfulness predictor model for IP training outcomes. Five hypotheses were formulated and tested over two, independent cohort samples of IP trainees. Hierarchical regressions were used to examine the usefulness of mindfulness for predicting training outcomes, over and above individual-level demographics (age, gender) for IPE effectiveness assessment.

Designated to our first cohort sample, Hypothesis 1 stated that trait mindfulness would predict greater perceived teamwork behaviours. Results from hierarchical regressions indicated that mindfulness added significant incremental variance in predicting perceived teamwork. Support for our first hypothesis informs the IPE literature as to student characteristics that may predispose to greater propensity for active teamwork engagement.

Previously, we found partial support for mindfulness' stronger association with team-focused compared with task-focused efficacy beliefs. Fisher's transformation and effect size comparisons indicated marginal significance in the expected direction (p = 0.05). For Hypothesis 2b, we extended the specificity of mindfulness' predictive power for the interprofessional training context. For Hypothesis 2, we extended the specificity of mindfulness' predictive power for the interprofessional training context. First, we found partial support for mindfulness' stronger association with team-focused compared with task-focused efficacy beliefs. Fisher's transformation and effect size comparisons indicated marginal significance in the expected direction (p = 0.05). Second, Hypothesis 2b stated that trait mindfulness would predict higher team efficacy. Results from hierarchical regressions indicated that mindfulness added significant incremental variance in predicting team efficacy. Support for our second hypothesis informs the IPE field's identification of student candidates for facilitator training towards delivering future IP activities.

Hypothesis 3 stated that trait mindfulness would predict higher training transfer. Results from hierarchical regressions indicated that mindfulness added marginally significant incremental variance in predicting training transfer. This partially supportive finding is consistent with arguments made by Freeth et al regarding curricula's central role for providing practice opportunities to support IPE transfer and sustainment into clinical practice.
in predicting individual-level attitudes bias estimates and interpretations as a result of omitting relevant student characteristics, such as trait mindfulness.49

Theoretical implications
Theoretically and operationally, mindfulness is conceptualised as a relatively broad construct.12 This theoretic holism is well-suited for operationalisation in the purview of IPE’s substantive imperative (interconnecting disciplinary divides by raising awareness of the common, superordinate objective of care delivery: patient well-being). The relevance of trait- mindfulness in IPE training may extend theoretical insights for designing new mindfulness-based interventions. A particular provocative synthesis for future theoretical consideration is the dual beneficence of mindfulness training for both the subject (student/training facilitator) and the object (patient/clinical employee).

Practical implications
This study aligns with IPE’s competency value of embracing individual differences by studying mindfulness’ predictive power for IP training outcomes. Mapping individual differences to broadened professional competencies would adjoin interests for adjusting standards for admissions selection.50 For example, both health sciences accreditors and educators alike have embraced a wider variety of non-technical competencies for improving patient outcomes.51

Compared with IPE’s intervention effectiveness, much less attention has been given to antecedents for economising training delivery. Given early IPE’s challenge for demonstrating effectiveness on distal outcomes, understanding antecedents should improve training efficiency and promote its sustained development.52 Elaborating from earlier discussion, identification of student factors can help account for compositional effects (self-selection) and reduce confounding in aggregated comparisons between programmes (eg, mean difference tests between medicine and nursing).53 Moreover, within-profession, longitudinal IPE studies that account for baseline student composition would improve estimates of curricula dynamic effect on IPE training outcomes over time.54

Limitations
There are many limitations to the current study that warrant caution for interpretation and generalisation. First, while our design was longitudinal, there are likely a number of equivalent models that may fit the data equally well. It should also be emphasised that we did not directly assess outcome changes and, therefore, cannot determine from the current data whether the positive relations between trait mindfulness and training outcomes are determinants or correlates. In addition, without a control group, causality cannot be inferred.

Future directions
Future evaluations of mindfulness in IPE should prioritise the reproducibility of our findings. Furthermore, future research should aim to extend these findings with cross-validation studies. For example, the predictive power of mindfulness may be extended by cross-validation over specified instructional deliveries of IPE training. This is complemented by future generalisation studies over additional IPE training outcomes and criteria (eg, behavioural change, patient outcomes). As Reeves et al emphasise in the latest systematic review of IPE’s evidence, training criteria are ‘differing, but non-hierarchical’ (Reeves, p. 2).40 It is tenable that mindfulness’ broad conceptualisation may emerge as a particularly robust predictor of IPE’s substantively variegated, though non-hierarchical, competency criteria.

Concluding remarks
The accelerated growth in empirical studies of both mindfulness and IPE training has been incommensurate to our meaningful understanding of their respective researches. Trait mindfulness has been primarily studied in relation to individual safety behaviours, whereas IPE’s institutional designation as non-technical skills training has largely ignored the impact of individual traits on value-shared outcomes (patient safety).55 Understanding how IPE influences desired student competencies is important both for the selection into, and the sustainable development of, IP trainings towards improved collaborative practice and more mindful patient care.

Acknowledgements
STROBE reporting guidelines were adhered to in for the study’s conductance and write-up of this original research manuscript.

Contributors
MJK contributed IPE measurement selection, questionnaire programming, data curation, technical analyses and write-up of early manuscript drafts. DSA contributed initial project planning outreach to schools of allied health professions, as well as IPE literature review synthesis, IPE facilitator training and training delivery support, and expository write-up and copyediting.

Funding
The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests
None declared.

Ethics approval
Both studies were approved by the academic medical centre’s Institutional Review Board.

Provenance and peer review
Not commissioned; externally peer reviewed.

Data sharing statement
Additional unpublished data may be obtained through requests made to the secondary author.

© Article author(s) (or their employer(s) unless otherwise stated in the text of the article) 2019. All rights reserved. No commercial use is permitted unless otherwise expressly granted.

REFERENCES
8 Donaldson MS, Corrigan JM, Kohn LT. To err is human: building a safer health system (Vol 6); National Academies Press, 2000.