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Metacognition, Macrocognition and Moral Reasoning in Collaborative Team Decision-Making: Implications for Healthcare Education

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ARTICLE INFORMATION

ABSTRACT

Interprofessional education improves clinical practice by facilitating student practitioners' understanding of other provider roles, collaborative attitudes, and team behaviors. However, there is a paucity of research examining cognitive processes and mechanisms involved in collaborative decision-making in the interprofessional field. The purpose of this study was to assess the role of metacognition and macrocognition in communication and decision-making across individual and collaborative teams. 392 first-year graduate healthcare students representing eight disciplines read a vignette from the Defining Issues Test (DIT) of moral judgement and rated their moral decisions individually and as an interprofessional team. Mixed methods were utilized. Paired samples *t*-tests showed significant differences between individual and group scores for all six questions. Exploratory Factor Analysis identified three latent factors of the DIT: Accountability, Law, and Empathy. Mediation analyses found the relationship between Accountability and Empathy factors was accounted for by the Law factor. A Thematic Analysis supported these findings. Changes from perceived vulnerable accountability stem from metacognitive systems and psychological safety buffered by protection within the same system and grounded in medical law. This allows crucial communication and team cohesiveness in interprofessional teams, facilitating an ethical shared mental model that may benefit patient outcomes.

Keywords: Collaboration; decision-making; macrocognition; metacognition; moral reasoning

Introduction

Healthcare is an increasingly collaborative, interprofessional field and, as such, it is essential for healthcare professionals to collaborate and communicate with those from other health professions to assure the best practice for patient outcomes. Interprofessional education (IPE) should be considered as a means of improving clinical practice by developing an understanding of other healthcare roles and developing collaborative attitudes and behaviors (Waltz, 2020). IPE proponents assume that interprofessional practice is strongly associated with improving patient outcomes and managing unmet healthcare needs ((WHO), 2010; Anderson & Bennett, 2020). According to the Interprofessional Education Collaborative (IPEC), two of the core competencies are Teams and Teamwork and Interprofessional Communication (Batteson & Garber, 2019). Collaboration allows for deep discussions where students can compare opinions, debate topics, construct theories and share knowledge (Shukor et al., 2014). In general, the quality of patient care is dependent on the collaborative approach of multiple healthcare professionals making ethical and moral judgements while dealing with complex situations (Schut & Driessen, 2019).

Medical and professional schools are given the task of teaching future healthcare providers the necessary skills to handle difficult patient dilemmas (Madani et al., 2017). Because students are put into places of authority early on in their healthcare careers, their advanced studies must provide them with sufficient support throughout their moral and professional development (Hegazi & Wilson, 2013). Understanding ethical decision-making in teams is essential to the healthcare field because it is increasingly relying on interprofessional healthcare teams to make consequential patient decisions, calling for interprofessional ethics (Chen et al., 2020; Wiles et al., 2016). However, medical education fails to emphasize the skills needed for interprofessionalism during academic preparation, which leads to barriers in clinical practice (Batteson & Garber, 2019).

Despite the evident need for interprofessionalism in healthcare, relationships between healthcare providers from different fields remain conflictual, strained, and variable in commitment to interdisciplinary collaboration (Adamson et al., 2018). Team psychological safety allows interprofessional healthcare teams, composed of individuals from different disciplines, to communicate effectively and collaborate on shared tasks successfully (Edmondson & Lei, 2014). Without team psychological safety, engaging in interprofessional decision-making may be obstructed by low self-esteem, reluctance to discuss sensitive topics, and ignorance to multiple viewpoints.

Although IPE is recognized as important for health professional training and required to be in graduate curricula by most accrediting bodies, not much is known about the cognitive processes that drive effective teaching and learning strategies in the healthcare field and facilitate better outcomes when working in collaborative teams. The paucity of research on these cognitive mechanisms prevents educators from using learning models as frameworks to endorse collaborative behaviors in this context. Robust research on collaborative teams of early healthcare professionals is warranted to pinpoint possible cognitive mechanisms and processes responsible for successful team decision-making and cohesion. This is a critical initial step for IPE as the outcome competencies are more aligned with cognitive and behavioral skills rather than content knowledge.

Metacognition

Flavell (1979) originally defined metacognition as the knowledge about (awareness of one's thinking) and regulation of (the ability to manage one's own thinking processes) cognitive activities in learning processes (Veenman et al., 2006). Since Flavell coined the term "metacognition" in 1979, a large body of research stemmed from his initial idea (Veenman et al., 2006). One of the research fields in which metacognition has flourished is education (Rickey & Stacy, 2000). A review study suggested that metacognition is a powerful predictor of learning (Wang et al., 2015). Furthermore, Hattie (2009) conducted a synthesis of over 800 meta-analyses that related to student achievement and learning approaches and found that metacognitive strategies showed an effect size of .69 which shows a strong relationship between the variables.

Metacognitive strategies –such as self-regulation– are crucial for education, allowing students to guide their learning processes by defining their own goals, monitoring their process, and seeking out

help when needed (Darling-Hammond et al., 2020). Regulation of information allows the student to problem solve, be strategic in their learning approach, and evaluate what they know and what they do not. This regulation is crucial for students to develop higher level thinking competencies. More importantly for healthcare students, having the ability to regulate their knowledge may help them develop the skills necessary to collaborate with colleagues from other healthcare professions. Implementing concepts of metacognition into an education course and assessing its impact would benefit healthcare education research.

Metacognitive regulation underpins a range of teaching approaches, all of which were identified as having a high impact on student learning (Hattie, 2009). Research suggests that teaching metacognitive principles promotes students' academic achievements (Bransford et al., 2014). This demonstrates that a focus on metacognition is a valuable component in education. It is argued that a standard component of the taught curriculum in any school of education should be developing sound metacognitive strategies in student learning experiences (Bransford et al., 2014). Metacognition is not only important to, but rather central in formal learning. In order to produce high quality, successful students, educators must utilize metacognition as a learning framework to inspire reflective and advanced thinking. Thus, it is evident that metacognition is a critical skill that must be targeted and taught in the education system.

Macrocognition

Macrocognition is an approach to developing new knowledge among interprofessional team members (O'Hara et al., 2018). Macrocognition research focuses on cognitive processing, goal-oriented action, and how cognition adapts to complexity (Ward et al., 2017). There are five functions of macrocognition: sensemaking, re-planning, detecting problems, deciding, and coordinating (Patterson et al., 2020), all of which are essential for effectively working in interprofessional teams. Teams tend to distribute macrocognitive functions in various ways among members (Wagner et al., 2019). During critical decision-making, 60% of macrocognition consists of sensemaking, anticipation, and communication processes (Lin et al., 2019). To further examine critical decision-making in teams, researchers should consider macrocognition as a framework. Previous research has found a lack of macrocognition in clinicians, leading to inaccurate understanding of patient situations (Islam et al., 2016).

Morality

In addition to the metacognitive skills, such as communication and teamwork, needed to arrive upon an accurate diagnosis, processes such as cognitive moral development are essential to the healthcare field. For example, the growth of cognitive moral development enhances clinical reasoning – a required skill for healthcare practitioners – which is crucial to learn during medical education (Min Simpkins et al., 2019). Clinical reasoning combines medical goals of care with ethical judgments, mediated by values and morals (Paes et al., 2019). Likewise, professional identity formation is a fundamental process during the training of healthcare professionals, highlighting the establishment of core values, moral principles, and self-awareness (Holden et al., 2012), all of which are dependent on metacognition. Cognitive moral development, clinical reasoning, and professional identity formation all emphasize the importance of moral decision-making, or morality, which are becoming increasingly used in interprofessional fields. Combining these three core concepts of morality in interprofessional healthcare, this study examined metacognition and macrocognition by administering a test of morality in healthcare students working in interprofessional groups.

Relevance to Healthcare Education

It is known that early healthcare students have difficulties applying conceptual knowledge to clinical cases, that they lack metacognitive awareness, and that higher-level cognitive actions correlate with diagnostic accuracy (Kiesewetter et al., 2016). The Defining Issues Test of Moral Judgement Development (DIT) has been used in studies on individual professions in the healthcare field (i.e., medicine, nursing, dentistry, pharmacy, occupational therapy, physical therapy, veterinary medicine, allied health, and clinical laboratory sciences; (Reale et al., 2018). However, no previous study has used

the DIT as a moral development test in interprofessional groups. The medical and healthcare field is an integrated practice, so to fully understand the collaboration and ethical judgement of practitioners, researchers must look at participants as they work in interprofessional teams. In current medical education, there is a correlation between a regression in moral development and clinical teaching (Hren et al., 2011). Although clearly an important issue, medical education has yet to engage in interprofessional collaboration for the purpose of advancing students' professional identity formation and reducing unnecessary diagnostic errors.

Need and Significance

The purpose of the research was to assess the role that metacognition/macrocognition might play in differences in communication and decision-making between individuals versus in collaborative teams. This paper reports an analysis of pre- and post-test scores using the Defining Issues Test of Moral Judgement Development. The current study addressed several research questions. The first study aim was to identify if individuals scored differently on the DIT when they were in interprofessional teams versus when they were answering the questions on their own. Second, our study tested whether interprofessional teams scored more ethically than when answering as individuals. Our hypothesis was that using a moral reasoning tool, such as the DIT, with interprofessional teams would facilitate macrocognitive learning and group decision-making, differing from regular metacognition. The goal of this analysis was to explore if macrocognition should be at the basis of IPE learning. Implications of the analysis on the importance of collaboration in medical education and interprofessional team science education are discussed.

Methods and Materials

The Defining Issues Test of Moral Judgment Development (DIT) (Rest et al., 1974) is an easy-to-administer test that was developed to assess the understanding and interpretation of moral issues. Although it was initially conceptualized based on Kohlberg's developmental stages (1969), the DIT shifted to a developmental model that sees growth as a gradual shift from lower to more complex conceptions of social and moral cooperation, known as Rest's Four Component Model (Rest, 1983). The Four Component Model identifies four abilities necessary for effective moral functioning: ethical sensitivity, moral judgment, moral motivation, and moral character (Bebeau, 2002). Expanding on Kohlberg's measurement of moral justice, Rest incorporates moral action in the DIT framework, which is considered essential to decision-making (Ellertson et al., 2016).

The DIT examines this model of moral development based on schemas, which organize the information from life events and act as an aid to individuals while they gain novel knowledge (Rest et al., 1999). Used in over 40 countries and across various disciplines, the DIT is the most widely used measure of ethical judgement and moral development. The DIT has been used in multiple studies measuring the association between ethical development, ethical action, and ethical decision-making (Center for the Study of Ethical Development, 2017). The present study is using the DIT to examine decision-making, specifically looking at metacognition and macrocognition to analyze how people make their ethical and moral decisions in healthcare teams. The DIT is scored using four questions ranked in order of importance. These rank scores are summed to represent each moral stage. The answers fall into a three-level model that was designed based on Kohlberg's original six stages of moral development. These three moral schemas are: the Personal Interests schema, the Maintaining Norms schema, and the Postconventional schema (Thoma & Dong, 2014). Each scale score discriminated significantly among age groups ($p < .01$), as did the Principled Morality score (P-Score). The P-score indicates the level of moral reasoning. The validity of the P-score with respect to age group was estimated to be .48 (Martin et al., 1977). The reliability based on test re-tests and internal consistency is high with an estimated .70-.80, meaning that this test is highly reliable in assessing moral reasoning, further validating our results.

Procedure

This study gained approval from the Institutional Review Board (IRB) prior to initiating study procedures. Participants read a vignette based on Lawrence Kohlberg's (1969) semi-structured moral development interview that targets a moral dilemma. The vignette describes a person requesting a lethal dose of medication prescribed by a physician to alleviate her pain in her end-of-life phase, also known as physician-assisted suicide. According to the American Medical Association, physician assisted suicide occurs when a healthcare professional facilitates a patient's death by providing the means or information necessary for a patient to take his or her own life (AMA, 2016). Physician assisted suicide has been debated in the United States for decades ("Physician-assisted suicide: toward a comprehensive understanding. Report of the Task Force on Physician-assisted Suicide of the Society for Health and Human Values," 1995). The vignette was chosen to describe a relevant healthcare dilemma that is proven difficult and fraught with opportunity for error.

> "Mrs. Bennett is 62 years old, and in the last phases of colon cancer. She is in terrible pain and asks the doctor to give her more pain-killer medicine. The doctor has given her the maximum safe dose and is reluctant to increase the dosage because it would probably hasten her death. In a clear and rational mental state, Mrs. Bennett says that she realizes this; but she wants to end her suffering even if it means ending her life. Should the doctor give her an increased dosage?"

After reading the vignette, participants had to initially decide as individuals what course of action the character should take in the moral situation. Next, they were instructed to rate six short-response statements (see Table 1) on a five-point scale ranging from "great importance" to "no importance" (Martin et al., 1977) in making their ethical judgement (Thoma & Dong, 2014). The participants then ranked the four most significant items in order of importance in making their decision. Once the participants finished the individual portion of the DIT, they were placed in interprofessional teams of six to eight people and were instructed to discuss their answers and come up with a consensus on a group answer.

Table 1. *The Six DIT Questions*

Question 1	Isn't her healthcare team obligated by the same laws as everybody else if giving an overdose would be the same as killing her?
Question 2	Does the state have the right to force continued existence on those who don't want to live?
Question 3	Wouldn't the healthcare team feel guilty from giving Mrs. Bennett so much drug that she died?
Question 4	Would the healthcare team show more sympathy for Mrs. Bennett by giving her the medicine or not?
Question 5	Should the healthcare team deny her this option and continue with the current prescription?
Question 6	Should the healthcare team nominate a leader from amongst them best suited to deal with the situation?

Note. Six questions from the DIT, defining issues test of moral development, were given to the students.

Each student then reflected on how and why they came to their conclusion when working as individuals and when working as an interprofessional team by responding to an open-ended question. The open-ended question was required to submit for a grade in the course. The open-ended reflection question was phrased as:

> "Working alone (without discussing with other members of the group), please reflect on the answers you gave earlier as an individual and those that were by agreement of the group. Identify what you see as the similarities and differences."

The open-ended questions were imported and coded in the qualitative program NVivo (March 2020) to structure the analysis. Written responses ranged from a few words to several paragraphs. The responses were coded by one author (MC) into relevant and repetitive themes. Responses were placed into several categories if appropriate. The results were then discussed and debated between the two authors (MC & TB) to come to a consensus. Three themes and subthemes were distinguished with a description, keywords, and common phrases. Common keywords and phrases were displayed with percentages of how common they were addressed. This particular moral issue targets the moral reasoning dilemma of property rights versus value of human life (Martin et al., 1977). Given the health disparities currently experienced by millions of Americans, and the negative impact that social determinants of health have on health outcomes for sub-populations, being able to train pre-licensure health professionals to be able to consider 'the value of human life' collaboratively and fully could improve health outcomes for many communities.

Sampling

392 first-year graduate healthcare students at a medical university in the Midwestern USA participated in the study (male= 44%). Students participated in this study as part of a first-year course on interprofessional healthcare practice. Eight programs were represented: Medicine (31.2%), Psychology (2.3%), Podiatry (16.3%), Pharmacy (9.8%), Physician Assistant (11.7%), Pathology Assistant (5.8%), Physical Therapy (8.3%), Nurse Anesthesia (2.5%), and non-degree students (12.1%).

Ethical Considerations

The quantitative and qualitative data was collected in a scheduled IPE classroom setting and the study was part of the educational activities focusing on IPE teamwork. The participants were given informed consent the prior week and were offered alternative classwork to do if they did not want to undertake the study. Students were informed that they could stop participating at any time and could ask for their data to be removed at any time. All data was kept on the PI's computer that was password protected. Participation in the study resulted in minimal risk to students.

Ethical review board name: Rosalind Franklin University of Medicine and Science
Date of ethics review decision: August 14 the 2019
Ethics assessment document issue number: NHS12-002.

Findings

A paired-samples t-test was conducted on the data and reported a significant difference between individual and group scores $t(385) = 35.1$, $p <0.001$. Significant differences were also found between the change scores in both the individual and group scores for all six questions.

Exploratory Factor Analysis

Threats to the construct validity of the DIT have been highlighted in previous research (Bailey, 2011). To test for this and to assess if there were differences in loadings between individual and group scores, an EFA was run on the data to assess the construct validity and to explore what underlying

constructs would emerge with this sub-population and context. Additionally, the EFA determined if the scores from the six DIT responses for individuals and the six DIT responses from groups clustered together or in dimensions (see Table 2). Monte-Carlo Parallel Analysis is a simulated EFA that assists researchers in determining how many factors have emerged and is used alongside the Cattell (1966) rule and eigenvalues. A Monte-Carlo Parallel Analysis evidenced a three-factor solution: accountability (individual; metacognition), law (teams; metacognition/macrocognition), empathy (decision-making; macrocognition).

Table 2
Factor Loadings Based on Questions

Factor 1	1. Isn't her healthcare team obligated by the same laws as everybody else if giving an overdose would be the same as killing her?	Individual
	1. Isn't her healthcare team obligated by the same laws as everybody else if giving an overdose would be the same as killing her?	Group
	2. Does the state have the right to force continued existence on those who don't want to live?	Individual
	3. Wouldn't the healthcare team feel guilty from giving Mrs. Bennett so much drug that she died?	Individual
	5. Should the healthcare team deny her this option and continue with the current prescription?	Individual
Factor 2	2. Does the state have the right to force continued existence on those who don't want to live?	Group
	3. Wouldn't the healthcare team feel guilty from giving Mrs. Bennett so much drug that she died?	Group
	5. Should the healthcare team deny her this option and continue with the current prescription?	Group
Factor 3	4. Would the healthcare team show more sympathy for Mrs. Bennett by giving her the medicine or not?	Individual Group
	6. Should the healthcare team nominate a leader from amongst them best suited to deal with the situation?	Individual Group

The first dimension (Accountability; accounting for 22.3% of the variance in the data set) consisted of five of the items from the DIT. Four out of the five items were from the Individual DIT scores. The highest loading item was question 5 for individual scores: "Should the team deny her (the patient) this option and continue the current prescription?" (.71). The lowest loading item was question 1 for group scores: "Is the team obligated by the same laws as everyone if the overdose kills her?" (.41). Reliability analysis of dimension one reported a Cronbach's Alpha of .66.

The second dimension (Law; accounting for 12.8% of the variance in the data set) consisted of three items from the DIT group scores. The highest loading item was question 5 for group scores: "Should the team deny her (the patient) this option and continue the current prescription?" (.75). The

lowest loading item was question 3 for group scores "Would the team feel guilty about killing the patient with the high dose?" (.73). Reliability analysis of dimension two garnered a Cronbach's Alpha of .67.

The third dimension (Empathy; accounting for 10.5% of the variance in the data set) consisted of four items from the DIT individual and group scores. The highest loading item was question 6 for group scores: "Should team members nominate a leader best suited to deal with this situation?" (.73). The lowest loading item was question 4 for individual scores: "Would the healthcare team show more sympathy for Mrs. Bennett by giving her medication or not?" (.43). Reliability analysis of dimension three garnered a Cronbach's Alpha of .12 (Table 3).

Table 3
Cronbach's Alpha and ICC of factors.

Dimensions	Cronbach's Alpha	Significance	95% CI Lower	95% CI Upper
Accountability	.66	p <.001	.61	.71
Law	.67	p <.001	.61	.73
Empathy	.12	p = .05	.03	.26

Note. Preliminary results of interest on the three dimensions found.

The first factor was accountability, as 4 out of the 5 items were from the individual scores and reflected accountability to Mrs. Bennet's health over her wish to end her suffering. This was reflected in the top loading item "Should the team deny her (the patient) this option and continue the current prescription?" Furthermore, because the first factor included mostly individual items suggests that this factor represents the participants answering metacognitively as individuals without group discussion.

The second factor was Law, which had only group items included in it. The top loading item was the same as the first factor "Should the team deny her (the patient) this option and continue the current prescription?" but was a group item and not an individual on suggesting that the team answered this together having the same concerns as they did as individuals. The other two items reflected state laws around euthanasia and medical overdoses. This factor also suggests that the team is coming together to work as a group.

The third item was Empathy and included both individual and group items. The top loading item was "Would the healthcare team show more sympathy for Mrs. Bennett by giving her medication or not?" which suggests that the group was being empathic of Mrs. Bennet's situation. Furthermore, because the two items in this factor were both individual and group it suggests that the team were able to discuss the issue both metacognitively and macro cognitively as a team. The naming of the factors was also influenced from the results of the qualitative data. The pattern of individual/group items across the three factors was of interest to us so we ran an ANOVA to explore this further.

ANOVA

Once three dimensions were found in the results, the relationship was examined between the groups to assess for significant overlap. A one-way analysis of variance was conducted on the factors to ascertain the possible relationship between Accountability, Law, and Empathy. Statistically significant differences were found between all three factors. There was a statistically significant difference between Law, Accountability and Empathy, $F(223, 391) = 5.38$, $p<.001$, with Law having the highest mean (M=3.07), followed by Accountability (M=2.68) and finally Empathy (M=2.52).

Mediation

After finding significant differences between all three dimensions, the factors were examined as a predictive model to assess the order of underlying cognitive processes. A mediation analysis was run on the factors to explore a possible predictive model of collaborative decision-making. The mediation model was run using PROCESS with Accountability as our independent variable as the participants answered the questions by themselves in the first instance and the items under the accountability factor reflected this. Law was our mediator as the items reflected the students working together, and Empathy was our dependent variable as it reflects patient care. This order best reflected our research goals of assessing the change from metacognition to macrocognition to test the mediation, in which a bootstrap confidence interval was examined. The overall model was significant, $F(1, 390)=$ 40.54, $p<.001$. The bootstrap confidence interval: [.003, .08] does not include 0, therefore showing significance. This indicates that the relationship between Accountability (metacognition) and Empathy (macrocognition) was mediated by Law (metacognition/macrocognition; Figure 1). Effect sizes are calculated to assess the magnitude of the relationship between variables, which provides more information to the researcher than relying on significance alone. The indirect effect size between Accountability and Law was .38 and considered a medium effect, conversely the indirect effect size of Law on Empathy was small at .09. This suggests that Accountability (metacognition) and Law (metacognition-macrocognition) have a stronger relationship than Law (metacognition-macrocognition) has on Empathy (macrocognition) and teams moving from individual thinking to group thinking happens when shared Accountability occurs.

Figure 1
Mediation Model from Responses
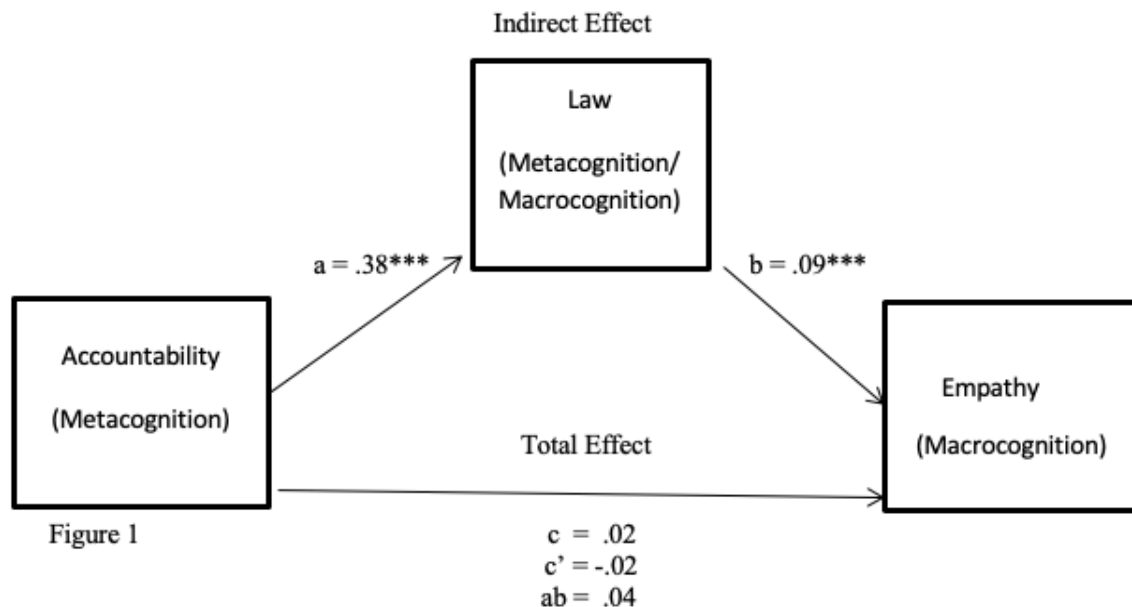
Note. This figure demonstrates the indirect effect as a result of our mediation model.

Qualitative Research Findings

Interprofessional groups filled out forms individually explaining their thought process and how they came to conclusions on the task individually and with a group. Feedback from students was divided into four separate themes: different perspectives, accountability, law, and empathy (see Table 4 in Appendix). The themes from the student responses to the open-ended questions reflected the findings of the path model. Students confirmed that they would be nervous to make moral decisions on their

own but when in groups could share perspectives and knowledge of medical law allowing them to be more empathic to their patients.

Discussion

The purpose of the research was to explore what cognitive mechanisms may be involved in learning behavior, facilitation of collaborative behaviors, and changes in thinking from a meta to macro level among pre-licensure healthcare students. One of the main cognitive mechanisms implicated was the psychological system safety in groups. It was found that law mediated the relationship between accountability and empathy and concluded that psychological safety in groups allows for the understanding of laws and can facilitate the evolution of individual decision-making, diminishing individual accountability, leading to more empathic patient centered care. Once these thought processes are fully explored through research, they can be included in pre-licensure curriculum to ensure proficient learning of collaborative behaviors. Our hypothesis was that metacognition and macrocognition could play a central role in facilitating student learning of collaborative behaviors but there has been a paucity of research examining these processes in this context. Although macrocognition is a fairly new construct, metacognition has been an integral component of mainstream education for over four decades but has not yet been thoroughly examined or included in the IPE and research field. Furthermore, there has been no research on exploring a mediation path model of what mediates the change from thinking as an individual healthcare provider to thinking collaboratively about patient needs.

Result

Three dimensions were discovered: Accountability, Law, and Empathy. These dimensions have all been found to impact clinical decision-making, increasing the relevancy of our findings to medical students. Numerous studies have found that accountability impacts clinical judgments among healthcare providers by motivating them to achieve accuracy, enhancing their biases towards patient diagnoses, such as chronic pain (Chibnall et al., 2014). Additionally, medical institutions are responsible for teaching students the principles of medical ethics, the legal responsibilities of physicians, and the professional aspect of clinical practice (i.e., attitudes and behavior) (Parker et al., 2018). Lastly, the ability to see the world from someone else's perspective and to understand or feel what that person is feeling has been found to be a multi-faceted skill and prized asset to healthcare providers (Ekman & Krasner, 2017).

Results from the study are suggestive of differences in moral reasoning scores in individuals compared to collaborative team decision-making and the possible underlying cognitive constructs involved in metacognition and macrocognition in team decision-making. We found significant differences in DIT scores between individuals and groups, with groups scoring higher (ranked items as more important) on the DIT than individuals. This finding highlights that groups feel more secure, because they perceive to have more psychological system safety (Edmondson & Lei, 2014) working together. This has never been factored into IPE and practice.

Using the DIT as both a stimulus and outcome in this research allowed the DIT to act as a simulated case that can drive serious discussion in interprofessional classroom settings and can act as a proxy for the Values and Ethics competency of the interprofessional domains (IPEC, 2016). The factors that emerged appear to reflect psychological system safety barriers to treatment of patients from an individual level to a group level possibly confirming that interprofessional practice could improve holistic patient outcomes if pre-licensure training included robust cognitive approaches to learning that included metacognitive and macrocognitive components. This would allow not only regulation of information facilitating problem solving in novel situations but also assist in the students to be able to regulate new and old knowledge and develop macrocognitive skills to enable them to successfully develop a shared mental model with their colleagues and fully collaborate and adapt to complex situations to ensure the best outcome for their patients (Ward et al., 2017). The qualitative data supports these findings as the students reported that they felt more secure making decisions for Mrs. Bennet

when in groups rather than individually. Our findings are important because interprofessional practice could best be utilized in addressing population health issues surrounding chronic health conditions and health disparities and the need to focus on the patient's environment (social determinants of health). Healthcare practitioners need to learn how to 'do healthcare' differently to serve those at heightened risk and need and these findings may assist in early training models.

Our findings posit that the change from perceived vulnerable accountability stems from metacognitive system/psychological safety (Edmondson & Lei, 2014) and is buffered by protection within the same system and shared macrocognition grounded in medical law. This allows crucial communication and team cohesiveness in IP teams facilitating an ethical shared mental model that may benefit patient outcomes. Assessing the cognitive processes underlying the evolution of metacognition to macrocognition in a team-based healthcare scenario has not been conducted before. The results of this study have highlighted not only possible cognitive mechanisms that mediate this process but also provide important components that need to be included in the design of future interprofessional team-based educational programs for pre-licensure healthcare students. Research has proven that healthcare students must be trained in metacognitive skills, such as thinking about their thinking processes, reflection on their knowledge and skills; beliefs about personal norms, values, and morals during their graduate education (Wilhelmsson et al., 2012). Our findings show gaps in current healthcare professions education regarding metacognition, macrocognition, and shared decision-making. It is important that pre-licensure healthcare programs provide their students with a solid foundation of metacognitive and macrocognitive skills, essential for every aspect of their future profession.

Limitations and Recommendation

This study took place in a classroom setting, which led to several confounding variables that could not be controlled for, such as classroom distractions, time limitations and a full discussion of the importance of a shared mental model after the study had finished. This study also lacked the ability to assign participants to a control group. In addition, because this project was part of a larger parent study, the prompt was not directly assessing the hypotheses of the current study. Without direct instructions to mention their change in thought process after the group discussion, it was difficult to discern when the change from metacognition changed into macrocognition. Most of the answers addressed whether their group responses were similar or different than their personal responses, however details of these similarities and differences were relatively vague. In other words, the students may have explained their cognitions but did not expound what metacognitive skills they used while deliberating this assignment. In addition, without a more precise prompt, many responses reflected non-complete decisions, such as "we must talk to an ethicist and read the laws."

Future studies need to replicate the research design with a different experimental measure of moral reasoning and decision-making that has wording and instructions more suitable to first-year pre-licensure healthcare students. This study was completed by interprofessional healthcare students who seemed to lack an understanding of the morality task or the relevance of the task to their profession. To better involve the student participants, it could be beneficial for researchers to create a fictional vignette that focuses on an interprofessional patient case. An interprofessional patient case could interest a wider variety of students, including those who may not act as the primary physician in direct patient care. Another future direction for this research is to create a standardized patient video simulation that the participants would view in lieu of reading the vignette from the DIT. This simulation provides for a realistic patient experience, which should increase the relevance of the activity for the students. To test if the moral vignette portrayed by the standardized patient is effective in the moral reasoning of the participants, there could be two groups of student participants, a control group that watches a regular patient simulation video and the experimental group who will watch the moral reasoning simulation video. Future qualitative studies may directly ask for what the final decision should be, requesting a definitive answer. Furthermore, future studies could benefit from multiple choice answers regarding their final decision to provide some guidance in the scope of the task and a basis for their group conversation.

Conclusion

IPE can impact clinical practice by facilitating student practitioners' understanding of other provider roles, collaborative attitudes, and team behaviors. Our results suggest there are differences in individual moral reasoning in comparison to deciding on moral decisions in a collaborative team which seems to be grounded in psychological system safety. Based on our findings, there are underlying cognitive constructs involved in metacognition and macrocognition that are utilized when collaborating within a team and therefore these constructs should be implemented in education courses. These findings are a significant contribution to advances towards understanding team behavior and further developing effective interprofessional healthcare education. Understanding macrocognitive processes in interprofessional teams can help shape and improve medical education by emphasizing the teaching of macrocognitive skills that will facilitate collaboration in healthcare teams.

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