

THE EFFECT OF EMOTIONAL AWARENESS EXERCISES ON ADAPTIVENESS IN COPING AND EMPATHY WITH PRE-SERVICE TEACHERS IN MIXED REALITY SIMULATIONS

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ABSTRACT

The purpose of this mixed-methods convergent research study was to gain insight into the perceived importance of emotional awareness with two groups of pre-service teachers (PSTs) participating in a mixed reality simulator (MRS), as well as the impact of emotional awareness exercises in a MRS on adaptiveness in coping and empathy with the treatment group. Statistical significance was found on for the Affective Empathy QCAE subscale score for the treatment group. Three themes emerged from the qualitative data of survey responses: emotional awareness as it related to emotional state, emotional state and emotional awareness as it related to having an impact on performance, and emotional awareness as it related to the context of the simulator experience. Implications are provided for teacher educators using mixed reality simulations.

KEYWORDS

Mixed Reality Simulations, Emotional Awareness, Emotional Intelligence, Teacher Education

1. INTRODUCTION

Beginning teachers comprise a large portion of total teachers nationally and they are increasingly leaving the profession (Carver-Thomas & Darling-Hammond, 2019; Ingersoll, 2012). Approximately half of all new teachers leave the classroom within the first five years (Garner, Bender, & Fedor, 2018), and many novice teachers do not understand the highly emotional nature of the profession until their first year (Chang, 2009). Contributing to attrition among new teachers is the emotional impact of teacher-student interactions, as well as classroom management issues and feelings of inadequacy relating to the ability to affect change (Callahan, 2016; Carver-Thomas & Darling-Hammond, 2019). The emotional labor and high level of occupational stress required of teachers can lead to negative emotions such as anger and anxiety, which can be better managed by strong emotional intelligence skills (Brackett, Palomera, Mojsa-Kaja, Reyes, & Salovey, 2010; Castillo, Fernandez-Berrocal, & Brackett, 2013; Hagelskamp, Brackett, Rivers, & Salovey, 2013; Harvey, Evans, Hill, Henricksen, & Bimler, 2016; Tsouloupas, Carson, Matthews, Grawitch, & Barber, 2010; Valente, Lourenço, Alves, Dominguez-Lara, 2020; Valente, Veiga-Branco, Rebelo, Lourenco, & Cristóvão, 2020).

There is broad agreement that emotional intelligence involves the awareness and management of one's own emotions and the emotions of others (Brackett, Rivers, & Salovey, 2011; Cherniss,

Extein, Goleman, & Weissberg, 2006; Mayer, Caruso, & Salovey, 2016; Mayer, Salovey, & Caruso, 2004; Mayer, Salovey, & Caruso, 2008). Despite the demands placed upon teachers that require a high level of social emotional competence, there is often little training offered regarding the importance of social emotional issues within the classroom or how to develop the skills needed to navigate such situations (Hargreaves, 1998; Jennings & Greenberg, 2009). The integration of social emotional learning (SEL) into pre-service teacher curricula results in a shift to student-centered pedagogy as well as improved emotional recognition and regulation skills (Aspelin, 2019; Waajid, Garner, & Owen, 2013). The use of mixed reality simulators such as Mursion® (2016) offer pre-service teachers the opportunity to explore the effects of actions taken in front of a classroom (Cohen, Wong, Krishnamachari, & Berlin, 2020; Gul & Pecore, 2020; Piro & O'Callaghan, 2019; Kamhi-Stein, Lao, & Issagholian, 2020; Larson, Hirsch, McGraw, & Bradshaw, 2010; Ledger & Fischetti, 2019) including the experience of emotions brought about by the emotional labor of teaching (Gundel & Piro, 2021).

Mixed reality simulators not only provide pre-service teachers with an opportunity to practice the act of teaching, but also allow for the practice of related cognitive and affective skills, such as the ability to confront stressors and manage student behaviors, in a safe environment that allows for the development of resilience and confidence without a negative impact on others (Dawson & Lignugaris/Kraft, 2017; Dieker, Rodriguez, Lignugaris/Kraft, Hynes, & Hughes, 2014; Gul & Pecore, 2020; Piro & O'Callghan, 2019; Ledger, 2020; Ledger & Fischetti, 2019). The purpose of this study was to investigate the impact of emotional awareness exercises on empathy and adaptiveness in coping for pre-service teachers using a mixed reality simulator through a convergent parallel mixed methods design.

2. LITERATURE REVIEW

2.1. Emotional Intelligence, Adaptiveness in Coping, and Empathy

The foundational embedded cognitive skills of appraisal, emotional recognition, emotional regulation, and proactive coping were found to cut across theories of emotional intelligence, empathy, and adaptiveness in coping. This theoretical framework was used to explore emotional intelligence, adaptiveness in coping, and empathy. The four-branch model of emotional intelligence is used to argue that emotional intelligence is comprised of perceiving emotion, facilitating thought using emotion, understanding emotions, and managing emotions, with each branch composed of more distinctive cognitive skills which aid the type of emotional reasoning delineated in that branch (Mayer et al., 2016; Mayer et al. 2004; Mayer et al., 2008). Additionally, the process of metacognition can serve as a process which allows for an individual to alter or adjust their judgment about an emotional state by evaluating the target, origin, valence, confidence, and content of emotional thoughts (Briñol, Petty, & Rucker, 2006). Because the experience of emotion requires high levels of appraisal and evaluation, emotional intelligence is also considered to be a member of the broader class of intelligences known as hot intelligences, which are intelligences involved in reasoning with information that has importance to the individual (Mayer et al., 2016; Mayer et al. 2004; Mayer et al., 2008). Emotional intelligence and emotional reasoning abilities have been shown to have a positive relationship with academic performance, to predict better social outcomes, to help people to cope more effectively with unpleasant emotions, and to better predict and cope with the actions of themselves and others (Brackett, Rivers et al., 2011; Mayer et al., 2016; Mayer et al. 2004; Mayer et al., 2008).

Adaptiveness in coping is a quality of coping strategies in which distress is reduced, or at worst not aggravated, although the determination of the adaptiveness of coping is dependent upon the individual as well as the context of the situation and requires flexibility in responding to the

situation (Kohn et al., 1997; Kohn et al., 2003; Skinner et al., 2003). The cognitive skill of appraisal is especially important to the interpretation of a situation as stressful, the recognition of the emotional state of oneself or others in a situation, and the selection of coping strategies appropriate to the situation (Chang 2013; Endler, 1997; Kohn et al., 1997; Kohn et al., 2003; Lazarus & Folkman 1984; Mclean et al., 2007; Schäfer et al., 2020; Skinner et al., 2003). As related to adaptiveness in coping, emotional regulation plays a dual role as it is both a cognitive skill that aids in the selection of coping strategies that are adaptive, and a quality of some coping strategies that encourage the activation of emotional regulation skills (Schäfer et al., 2020; Skinner et al., 2003).

Like emotional intelligence and adaptiveness in coping, the cognitive skills of appraisal, emotional recognition, and emotional regulation are all integral to cognitive and affective empathy (Eisenberg, 2000; Hall & Schwartz, 2019; Lockwood et al., 2014; Reniers et al., 2011; Vreeke & van der Mark, 2003). Cognitive empathy can be defined as the comprehension of the feelings and experiences of others, which is accomplished with the cognitive skill of appraisal, and the subsets of cognitive empathy include perspective taking and online simulation, an attempt at putting oneself in another person's position by imagining what that person is feeling (Reniers et al., 2011). Affective empathy involves the recognition of the emotional state of others as well as the ability to elicit a corresponding emotional state in oneself, with subsets including: (a) emotional contagion, the automatic mirroring of others' feelings, (b) proximal responsivity, the affective response when witnessing others' moods in close contact, and (c) peripheral responsivity, the affective response when witnessing others' moods in a detached context (Reniers et al., 2011).

A review of the literature revealed means by which emotional awareness, empathy, adaptiveness in coping were inextricably linked in an educational context. Teachers' emotional intelligence abilities have been shown to be positively related to self-efficacy beliefs, which in turn have been linked to lower levels of experienced stress, and higher levels of both interpersonal and intrapersonal emotional intelligence; emotional intelligence skills are also believed to allow for a more nuanced understanding of student behavior (Chan 2008; Valente, Lourenço, et al., 2020; Valente, Veiga-Branco et al., 2020; Verešová & Malá, 2012). Due to the importance of these abilities, skills targeted by SEL programs are important for teachers as well as students because of the potential to aid teachers in developing a positive classroom climate, promoting student engagement, enhancing mental flexibility, forming and maintaining relationships, appraising the emotional context of the classroom, and buffering against burnout (Brackett, et al., 2011; Castillo et al., 2013; Harvey et al., 2016; Poulou, 2017; Tsouloupas et al., 2010; Valente, Lourenço et al., 2020; Valente, Veiga-Branco et al., 2020).

Furthermore, shifts in teachers' emotional awareness have been linked to improved awareness of students' emotional states, leading to improved classroom climate and student engagement, as well as greater confidence in relationship management as teachers became more cognizant of the impact of their own attitudes and emotional responses (Castillo et al., 2013; Dolev & Leshem, 2016; Garner, Bender, & Fedor, 2018; Hargreaves, 1998; Nizielskiet al., 2012; Perry & Ball, 2007; Poulou, 2017; Valente, Lourenço et al., 2020). In an emotionally laden situation appraisal can be improved by the ability to appropriately identify verbal and non-verbal cues as well as the emotional state of oneself and others, skills associated with emotional intelligence (Chang, 2009; Joseph & Newman, 2010; Lazarus & Folkman, 1984). Non-verbal cues such as facial and postural expressions, as well as tone of voice are important sources of information for appraising the emotional state of others as is information about the situational, environmental, and cultural context (Mayer et al., 2016; Mayer et al. 2004; Mayer et al., 2008; Rivers, Brackett, Katulak, & Salovey, 2007).

Adaptive coping strategies, for which teacher self-efficacy and emotional intelligence are important personal resources, have been shown to have a positive impact on emotional exhaustion, teacher burnout, and the regulation of stress inducing situations. (Chan 2008; Chang, 2013; Mclean et al., 2007; Schäfer et al., 2020; Tsouloupas et al., 2010; Verešová & Malá, 2012).

Proactive coping, an adaptive strategy, has been found to protect against burnout and to improve classroom management by priming teachers to be mindful of and prepared to face potential problems in the classroom (Chang, 2013). This is especially important in teaching as the intense emotional experience resulting from the appraisal of a single disruptive classroom event was found to be positively associated with overall feelings of burnout, whereas situations that were appraised as changeable and within the control of the individual tended to provoke less psychological distress and may facilitate the use of proactive coping strategies (Chang, 2013; Mclean et al., 2007; Schäfer et al., 2020; Verešová & Malá, 2012).

2.2. Mixed Reality Simulations

The importance of the mixed reality simulator as a context for learning with pre-service teachers was also indicated by the literature. Mixed-reality environments are ones where elements of the real world and a virtual world are presented together in a single display and can be classified along a continuum from a wholly artificial world to one that only incorporates some virtual aspects to augment reality (Ludlow, 2015; Milgram & Kishino, 1994). Mursion®, formerly Teach Live, is one such mixed-reality application which combines a virtual learning environment with elements of a real-world experience such as responsive avatars (Dawson & Lignugaris/Kraft, 2017; Ludlow, 2015). Mursion® utilizes a “human-in-the-loop” approach combining digital puppetry with basic artificial intelligence, which allows for a human actor to directly control an avatar’s facial expressions and hold bi-directional conversations and at the same time allows for artificial intelligence to execute pre-recorded idle behaviors when the avatars are not directly under the control of a human (Nagendran, Pillat, Kavanaugh, Welch, & Hughes, 2013). This technology allows for realistic interactive scenarios which can be customized to a wide range of fields and applications (Mursion VR, 2016; Nagendran et al., 2013).

A current area of interest is the application of Mursion® to the development of empathy and soft skills, with applications to customer service, sales, and business management areas of particular interest and companies such as H&R Block and T-Mobile already utilizing the technology to help develop efficacy with their employees (Mursion® & Future Workplace, 2020).

Mixed reality simulators also served as a context for pre-service teachers to confront stressors, and to experience and learn to manage a wide range of emotions, leading to emotional growth and the development of resilience and confidence without a negative impact on others, with opportunities for observation and reflection identified by pre-service teachers as an important element of the mixed reality simulator experience (Dawson & Lignugaris/Kraft, 2017; Dieker et al., 2014; Gul & Pecore, 2020; Piro & O’Callaghan, 2019; Gundel & Piro, 2021; Ledger, 2020). Mixed reality simulators have been found to aid in pre-service teachers managing, appraising, and responding to student behavior, as well as improve teachers’ abilities to engage in perspective taking (Cohen et al., 2020; Larson et al., 2010; Pas et al., 2019; Stavroulia & Lanitis, 2019). Additionally, mixed reality simulators allow beneficial practice for pre-service teachers managing difficult behaviors and improve their ability to accurately appraise student behavior as disruptive or defiant, leading to improvements in redirection of behavior and overall classroom environment (Cohen et al., 2020; Larson et al., 2010). Though the mixed reality simulator Mursion® has received some criticism of the authenticity of the environment, it is overall viewed as a beneficial experience due to the encouragement of flexibility, reflection in the moment, and

the ability to identify the impact of teacher clarity, body language, tone, and expression (Gul & Pecore, 2020; Kamhi-Stein et al., 2020; Ledger & Fischetti, 2019).

3. METHODOLOGY

3.1. Research Design

This study followed convergent parallel mixed method design protocols in which qualitative and quantitative data were collected in parallel, analyzed separately, and then merged (Creswell & Plano Clark, 2018). The sample for both the quantitative and qualitative components of this study were drawn from students enrolled in two intact sections of an Introduction to Education course offering a mixed reality simulator experience focused on the high leverage practice of building classroom rapport and forming rules. Participants assigned to the treatment group participated three times in the treatment package consisting of the Pre-Simulator Check-in (PSCI) which occurred before each simulation experience and the Post-Simulator Reflection (PSR) which occurred after. All members of both the treatment and comparison group also participated in the qualitative component of the study, with case one bound by those who participated in the emotional awareness exercises and case two bound by those who did not. Three research questions guided this study:

1. Are there statistically significant differences between observed and expected scores of pre-service teachers for participation in treatment (treatment, no treatment) on mean scores of the Questionnaire of Cognitive and Affective Empathy (QCAE)?
Non-directional Hypothesis: There will be statistically significant differences between observed and expected scores of pre-service teachers for participation in treatment (treatment, no treatment) on mean scores of the QCAE.
2. Is there a statistically significant difference between observed and expected scores of pre-service teachers for participation in treatment (treatment, no treatment) on mean scores of the Personal Functioning Inventory (PFI)?
Non-directional Hypothesis: There will be a statistically significant difference between observed and expected scores of pre-service teachers for participation in treatment (treatment, no treatment) on mean scores of the Personal Functioning Inventory (PFI).
3. How do pre-service teachers participating in a mixed reality simulator perceive the importance of emotional intelligence and more specifically emotional awareness?

3.1.1. Setting and Sample

The research was conducted at a university in the Northeastern United States featuring a teacher preparation program with required mixed reality simulator experience embedded into the program. The teacher preparation program was accredited by the Council for the Accreditation of Educator Preparation (CAEP) and provided certification pathways for Elementary (K-6), Secondary (7-12), and Dual Certification (K-12). Throughout the course of the program pre-service teachers were expected to complete a total of four courses which feature mixed reality simulation experiences. Each simulation course required students to teach three 2- to 8- minute lessons focused on the development of a different high-leverage practice. The mixed reality platform used by this university was Mursion®, a mixed reality simulator.

The course targeted by this study was Introduction to Education, often the students' initial simulation experience, in which the mixed reality simulator experiences were focused on the high leverage practice of building classroom rapport and forming rules. Due to Covid-19 protocols both the Spring, 2021 and Fall, 2021 sections of the course completed their Mursion simulations

through Zoom. In the Zoom format pre-service teachers were able to see both themselves as well as the avatars during their simulation experience, although all other members of the Zoom call were asked to turn off their cameras when a simulation was ongoing to reduce distraction. Participants have control over starting the simulation by saying “start simulation”, over ending the simulation by stating “end simulation,” and have the ability to pause the simulator as desired (“pause simulation”). Pre-service teachers were provided with the task for their Mursion® simulation prior to each session to help them prepare for the experience and were asked to complete a reflection following each session. Image 1 depicts the mixed reality learning environment that the participants viewed for their simulations.



Image 1. Simulation Classroom: Middle School Classroom

The high leverage practice of building classroom rapport and forming rules were the focus on the mixed reality simulator experiences embedded into the coursework. In total, 27 pre-service teachers ($n = 27$) participated in the research study, with the treatment group ($n = 15$) drawn from one intact section in the Spring, 2021 semester and the comparison group ($n = 12$) drawn from one intact section in the Fall, 2021 semester. Table 1 provides the demographic information for participants.

Table 1. Sample Demographic Information

Case	Participant	Gender	Concentration Area	Prior career
1	Andrew	M	Social Studies, 6-12	No
1	Bailey	F	Spanish, 6-12	No
1	Dana	F	Social Studies, 6-12	No
1	Eddie	M	Music, K-12	No
1	Faith	F	Elementary, K-6	No
1	Gavin	M	English, 6-12	Yes
1	Henry	M	Elementary, K-6	No
1	Ian	M	Social Studies, 6-12	No
1	Jack	M	Health, K-12	No

1	Kent	M	Elementary, K-6	No
1	Laura	F	Social Studies, 6-12	Yes
1	Mary	F	Music, K-12	No
1	Nate	M	Social Studies, 6-12	No
1	Olivia	F	Elementary, K-6	Yes
1	Payton	F	Elementary, K-6	No
2	Mia	F	English, 6-12	No
2	Nora	F	Music, K-12	No
2	Ani	F	Music, K-12	No
2	Paige	F	Music, K-6	No
2	Quincy	F	Music, K-6	No
2	Riley	F	Music, K-12	No
2	Sara	F	Music, K-12	No
2	Tessa	F	Elementary, K-6	No
2	Gabe	M	Social Studies, 6-12	No
2	Vance	M	Music, K-12	No
2	Wyatt	M	Health, K-12	No
2	Zack	M	Music, K-12	No

3.2. Sampling Procedure

Sampling for the quantitative portion of this study was conducted utilizing convenience sampling (Patton, 1990). Sampling for the qualitative component utilized criterion sampling (Patton, 1990), focusing on the same participants from the quantitative sampling.

3.3. Instrumentation and Data Collection

This study utilized two instruments for the treatment, and four instruments for data collection. The Pre-Simulator Check-in (PSCI) and Post-Simulator Reflection (PSR) were used as components of the treatment package. The Student Demographic Questionnaire, Personal Functioning Inventory, Questionnaire of Cognitive and Affective Empathy, and a qualitative Exit Survey were all used for data collection.

3.3.1. Treatment Instruments

3.3.1.1. Pre-Simulator Check-in (PSCI)

A researcher created exercise aligned with the cognitive skills of appraisal, proactive coping, emotional recognition, and emotional regulation. In this exercise participants were asked to identify their current emotional state, what emotional state they would like to be in when starting their simulator experience, and to identify a strategy they can use to achieve the desired emotional state for their simulation experience.

Identification of emotional state was completed using a labelled version of the Mood Meter, a tool created by Yale University which asks participants to plot their mood using the axes of pleasantness and energy level (Brackett, 2020). While the Mood Meter is meant to serve as a tool for individuals to reflect upon their own emotional state, it demonstrates content validity through its alignment with the circumplex model of affect (Brackett et al., 2019).

The Pre-Simulator Check-in was administered to participants as a Google Form prior to their simulation experience and took less than 5 minutes to complete. Data were collected in two batches, first in the Spring 2021 semester and second in the Fall 2021 semester.

3.3.1.2. Post-Simulator Reflection (PSR)

A researcher created exercise aligned with the cognitive skills of appraisal, emotional recognition, and emotional regulation. The exercise asked participants to identify their current emotional state using the Mood Meter (Brackett, 2020) and to use perspective taking to respond to a student focused mock event related to their simulation experience. The Post-Simulator Reflection was administered to participants as a Google Form which took less than 10 minutes to complete.

3.4. Data Sources

3.4.1. Personal Functioning Inventory (PFI)

The Personal Functioning Inventory (Kohn, et al., 2003) was administered to all participants prior to their first simulation experience and after their final simulation experience in the course, with each administration of the inventory taking less than 10 minutes to complete. The PFI is a 30-item self-report inventory measured using a 5-point Likert scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Unsure*, 4 = *Agree*, 5 = *Strongly Agree*), with a single total score calculated by summing all responses. The purpose of the Personal Functioning Inventory is to measure the construct of adaptiveness, which can be defined as coping consistently with the goal being to reduce stress or to not aggravate it (Kohn, et al., 2003).

3.4.2. Questionnaire of Cognitive and Affective Empathy (QCAE)

The Questionnaire of Cognitive and Affective Empathy (Reniers et al., 2011) was administered to all participants prior to their first simulation experience and after their final simulation experience in the course, with each administration of the inventory taking less than 10 minutes to complete. The QCAE is a 31-item self-report questionnaire using a 4-point Likert scale (1 = *Strongly Disagree*, 2 = *Slightly Disagree*, 3 = *Slightly Agree*, 4 = *Strongly Agree*), to assess both cognitive and affective empathy (Reniers et al., 2011). The Questionnaire of Cognitive and Affective Empathy is unique in that it seeks to explore empathy as a multidimensional construct by measuring both cognitive and affective empathy, explicitly addressing constructs that comprise each type of empathy (Reniers, et al., 2011).

3.4.3. Student Demographic Questionnaire (SDQ)

This was a researcher created tool designed to gather basic demographic information as well as initial information about perceptions of emotional awareness and proactive coping. This survey took approximately 10 minutes to complete and was administered in the first three weeks of the course.

3.4.4. Qualitative Exit Survey (ES)

This was a researcher created tool designed to gather information about perceptions related to proactive coping and emotional awareness following students' third simulation experience. The survey was administered to all participants and included open ended as well as Likert scale items related to the constructs.

Data Collection in the Spring, 2021 semester spanned January to May and occurred in four phases: (a) administration of the Student Demographic Questionnaire, (b) first administration of the PFI and QCAE, (c) administration of the treatment package alongside each simulation session, (d) administration of the Exit Survey and the second administration of the PFI and QCAE. Data Collection in the Fall, 2021 semester spanned September to December and occurred in three phases: (a) administration of the Student Demographic Questionnaire, (b) first administration of the PFI and QCAE, (c) administration of the Exit Survey and the second administration of the PFI and QCAE.

3.5. Data Analysis

Data were analyzed following quantitative, qualitative, and mixed methods frameworks in accordance with the corresponding research question. For research questions one and two, which were both quantitative in nature, continuous data were converted into nominal categories due to the non-parametric nature of the data sets, which allowed for Chi-Square procedures to be used (Hinkle, Wiersma, & Jurs, 2013). A Chi-Square test for independence was used to assess between group differences for both research questions, and a Paired Sign Test (Laerd Statistics, 2018) was conducted as a follow-up analysis to determine change over time when significance was found in research question one. Due to the exploratory nature of this study, an a-priori p-value for these data analyses was set at 0.1 and following a Bonferroni correction to account for the three dependent variables, multiple measurements of the surveys, the adjusted p-value was set at 0.033 (Hinkle et al., 2013).

The third research question focused on the qualitative aspect of how pre-service teachers perceive emotional awareness in instruction and within the mixed reality simulator experience, and data were analyzed in accordance with the six-phase thematic analysis process outlined by Braun and Clark (2006) and the data were converted to percentages and visual representations.

4. RESULTS

4.1. Research Question One

Due to the non-parametric nature of the data, research question one explored the association between group membership and empathy using a Chi-Square test for independence to analyze differences between groups in agreement with items on the Cognitive Empathy and Affective Empathy Subscales. Descriptive information regarding the QCAE and all related subscales are provided in Table 2.

Table 2. Descriptive Statistics for the QCAE and Related Subscales

Test	Group	Administration	<i>n</i>	<i>mean</i>	<i>sd</i>	Skew	Kurtosis
Cognitive Empathy Subscale	Treatment	1	15	57.93	6.88	-0.46	-0.93
		2	15	61.60	5.88	0.01	-0.87
	Comparison	1	12	62.17	7.26	-.10	0.28
		2	12	62.50	8.31	-0.35	-0.88
Affective Empathy Subscale	Treatment	1	15	35.07	4.38	-0.03	-0.84
		2	15	32.73	4.70	0.30	-0.77
	Comparison	1	12	36.67	4.96	0.46	-0.88
		2	12	37.92	5.16	0.28	-0.24

Next, assumptions were met for the between group QCAE scores. Third, the Chi-square test for independence statistical significance for the Affective Empathy subscale used an adjusted *p*-value of .033, ($\chi^2 (1, 27) = 7.04, p = .008$). As shown in Table X, a Chi-Square test for independence indicated a significant association between Affective Empathy QCAE subscale score and group membership, using an a priori value of $p < .10$, ($\chi^2 (1, 27) = 7.04, p = .008$). This result is in partial support of the nondirectional hypothesis for research question one.

A Paired Sign Test was used for follow-up analysis on the Affective Empathy Subscale to identify if a statistically significant median difference existed from administration one to administration two. First the assumptions for the Paired Sign Test were met. A statistically significant difference using an a-priori *p*-value of .10 was found for the treatment group on the second subscale, Affective Empathy, between administration one (*Mdn* = 36) and administration two (*Mdn* = 32), $p = .035$.

Table 3. Two-Sample Case Chi-Square Calculation and Result for Affective Empathy Subscale

Group	Total Score	Observed (O)	Expected (E)	(O-E) ² /E	Residual (O-E)/ \sqrt{E}
Treatment	$x \geq 36$	3	8	3.13	-1.77
	$x < 36$	12	7	3.57	1.89
Comparison	$x \geq 36$	8	7	0.14	0.38
	$x < 36$	4	5	0.20	-0.45
χ^2				7.04	

Note: The Calculated χ^2 is greater than the critical value of 5.412. It is significant at $p = .008$

4.2. Research Question Two

Research question two explored the association between group membership and adaptiveness in coping using a Chi-square test for independence to analyze differences between groups in overall agreement with items on the PFI due to the non-parametric nature of the data. First, the descriptive statistics are demonstrated in Table 4.

Table 4. Descriptive Statistics for the PFI

Group	Administration	<i>n</i>	<i>Mean</i>	<i>sd</i>	Skew	Kurtosis
Treatment	1	15	100.60	15.34	-0.59	-0.86
	2	15	100.87	13.20	0.11	-0.95
Comparison	1	12	96.00	15.86	-0.03	-0.90
	2	12	98.08	17.30	1.88	4.37

Second, assumptions were met for the Chi-Square test. Third, a Chi-Square test for independence indicated no significant association between PFI score and group membership, ($\chi^2 (1, 27) = 1.37, p = .241$); thus, no further follow up tests were conducted. This result is not in support of the nondirectional hypothesis for research question two, as indicated in Table 5.

Table 5 Two-Sample Case Chi-Square Calculation and Result for Total PFI Score

Group	Total Score	Observed (O)	Expected (E)	(O-E) ² /E	Residual (O-E)/ \sqrt{E}
Treatment	$x > 90$	10	10	0.00	0.00
	$x \leq 90$	5	5	0.00	0.00
Comparison	$x > 90$	9	7	0.57	0.76
	$x \leq 90$	3	5	0.80	-0.89
χ^2				1.37	

Note: The Calculated χ^2 is less than the critical value of 5.412. It is not significant, $p = .241$

4.3. Research Question Three

Research question three was qualitative in nature and was used to explore the perceived importance of emotional awareness by pre-service teachers participating in a mixed reality simulator. Data were collected to address this research question through the Demographic Questionnaire and the qualitative Exit Survey and were analyzed following Braun and Clark (2006) thematic analysis protocol and descriptive statistics were used to visualize those results. Three themes emerged from the analysis of the data.

Theme one, emotional awareness as it related to emotional state, included the sub themes of emotional awareness as important for recognizing the emotional state of self and others, emotional awareness as helpful for regulating emotional state, and emotional awareness as an

understanding influenced by life experiences and further developed over time. Participants were asked to provide a definition for emotional awareness based on their understanding of the concept at both the beginning and the end of the study. These definitions varied in complexity, orientation, and focus although some common themes emerged when analyzing the definitions. As shown in Table 6, three common topics emerged from the definitions provided by both case one and case two: the ability to identify one’s own emotions, the ability to identify the emotions of self and others, and the ability to identify emotions of another.

Table 6 Topics Discussed by Participants in their Definitions of Emotional Awareness

Group	Demographic Questionnaire		Exit Survey	
	Topics	Participants	Topics	Participants
Case One	The ability to identify and/or manage one’s own emotions	Bailey, Dana, Eddie, Jack, Laura, Mary	The ability to identify and/or manage one’s own emotions	Bailey, Eddie, Henry, Jack, Laura, Mary, Nate, Olivia
	The ability to identify the emotions of self and others	Kent, Payton, Olivia	The ability to identify the emotions of self and others	Dana
	The ability to identify emotions of another	Faith, Nate	The ability to identify emotions of another	Faith, Gavin, Ian, Payton
	The impact of self on others	Andrew	The impact of self on others	Andrew
	The ability to express emotions	Henry	Unclear	Kent
	Knowing how to respond to others	Ian		
Case Two	The ability to identify and/or manage one’s own emotions	Ani, Tessa, Riley, Zack, Mia, Nora	The ability to identify and one’s own emotions	Sara, Riley
	The ability to identify to the emotions of self and others	Vance, Quincy	The ability to identify the emotions of self and others	Ani, Tessa, Mia, Nora
	The ability to identify emotions of another	Gabe, Paige	The ability to identify emotions of another	Wyatt, Gabe, Quincy, Zack
	The impact of self on others	Sara	Ability for appraisal	Paige
	Knowing how to respond to others	Wyatt		

Theme two, emotional state and emotional awareness as it related to having an impact on performance, included the sub themes of emotional awareness as important for identifying and responding to student needs, emotional awareness as important for the relationship between teachers and students, and emotional awareness as having an impact on teacher

performance. Prior to the first simulator experience, most of participants enrolled in case one and case two perceived emotional awareness to be important or very important across multiple contexts, with all participants in case one indicating they believed emotional awareness to be important or very important when encountering new situations or personally difficult situations. Similarly, all participants in case two indicated their belief that emotional awareness was important or very important when encountering new situations.

Finally, theme three, emotional awareness as it related to the context of the simulator experience, included the sub themes of emotional awareness as impacting simulator performance through pre-service teacher's own emotional state, emotional awareness as helpful for navigating the relationship between simulator performance and the avatars, and emotional awareness as useful for engaging proactive coping strategies for simulator performance. The exit survey asked participants to rate the perceived importance of emotional awareness and the component skills of emotional recognition, emotional regulation, appraisal, and proactive coping in the context of the mixed reality simulator. Although in the initial survey approximately 93% of participants in case one indicated they believed that emotional awareness would be important or very important in the simulator, that number fell to 80% on the exit survey. Similarly, approximately 92% of participants in case two indicated they believed that emotional awareness would be important or very important in the simulator, but unlike case one, that percentage was maintained on the exit survey. Despite this result, more than 83% of participants in both case one and case two rated the skills of emotional recognition, emotional regulation, appraisal, and proactive coping as important or very important.

4.4. Mixed Method Conclusion

The Affective Empathy subscale examined emotional contagion, the automatic mirroring of others' feelings, proximal responsivity, the affective response when witnessing others' moods in close contact, and peripheral responsivity, the affective response when witnessing other's moods in a detached context, as the components of affective empathy (Reniers et al., 2011). A Chi-Square Test for Independence indicated a significant association between Affective Empathy QCAE subscale score and group membership, using an adjusted value of $p < .033$, ($\chi^2(1, 27) = 7.04$, $p = .008$). Although the initial administration of the QCAE revealed eight participants self-reported agreement with items on the QCAE and seven participants self-reporting disagreement, the second administration indicated only three participants reporting agreement and 12 participants reporting disagreement. A Paired Sign test also revealed a statistically significant difference between medians for the treatment group on the second subscale, Affective Empathy, between administration one (Mdn = 36) and administration two (Mdn = 32), $p = .035$. This decline in self-reported agreement with items related to Affective Empathy indicated that participants in the treatment group were less likely to agree that their emotional expression was impacted by the emotional state of others, which aligned with the qualitative findings that participants in the treatment group were more cognizant of the need to regulate their own emotional state.

5. IMPLICATIONS

This study explored the impact of emotional awareness exercises on measures of empathy and adaptiveness in coping, as well as the perceived importance of emotional awareness, with pre-service teachers in the mixed reality simulator. Findings and implications were organized by research questions to first investigate the quantitative results, followed by the qualitative results, which were then compared in accordance with a convergent parallel mixed methods framework

Research questions one and two comprised the quantitative portion of this study. Analysis of research question one, which explored the link between the use of emotional awareness exercises and QCAE scores, found statistical significance relating to the Affective Empathy subscale. The findings demonstrated that participants in the treatment group became less likely to self-report affective responses to the mood of others over time and were less likely to self-report affective responses to the mood of others than participants in the comparison group. This result may reveal a metacognitive reflective process triggered by the Mood Meter component of the treatment package, as the use of metacognition may engage emotional self-awareness and self-management, thereby allowing for affective recognition of distress in another without mirrored feelings of personal distress because emotional regulation has been engaged (Bertrand et al., 2018; Powell, 2018; Reniers et al., 2011; Vreeke & van der Mark, 2003). Additionally, these findings also potentially revealed the development of affective skills within the treatment group, for example managing their own emotional displays, needed for a profession which necessitates a high degree of emotional labor (Chang, 2009; deCastro et al., 2004, Hargreaves, 1998; Hargreaves, 2001). Taken together, a recommendation is for teacher education programs to identify programmatic opportunities for pre-service teachers to practice identifying beneficial emotional states for a given situation, and potential means by which to achieve that emotional state, to prepare them for the emotional labor required in the profession.

Analysis of the data for research question two did not find statistical significance on the Chi-Square test for independence, indicating that the treatment and comparison group were both comparable as it related to the use of adaptive coping strategies. These findings may mirror those of Gul and Pecore (2020), whose qualitative study found that when coping with stress-inducing situations within the simulator participants engaged techniques such as taking a deep breath, stepping back, controlling emotions, and re-evaluating the situation, as within this study participants in both groups reported similar use of adaptive coping strategies regardless of use of emotional awareness exercises.

The qualitative portion of this study was comprised of research question three, which was analyzed using the thematic analysis framework of Braun and Clark (2006) and reported via descriptive statistics. The first theme to emerge from the data concerned emotional awareness as it related to emotional state. From the definitions of emotional awareness provided by pre-service teachers, the perceived importance of recognition and regulation of emotional state emerged as defining characteristics, which is in alignment with the Mayer and Salovey (1997, 2016) four-branch model of emotional intelligence. Participants also noted non-verbal cues served as important information sources for the appraisal process (Mayer et al., 2016; Mayer et al. 2004; Mayer et al., 2008; Rivers et al., 2007), and as such the use of the Mursion® simulator with pre-service teachers should be continued as it offers the opportunity to practice the act of appraisal in a simulated classroom environment prior to entering an actual classroom. Finally, participants identified emotional awareness as a concept that once understood influenced their perception and actions. Pre-service teaching programs may wish to consider a threshold learning framework (Piro & O'Callaghan, 2019) for emotional awareness. Incorporating emotional awareness as a threshold concept may encourage pre-service teachers to perceive emotional awareness as a disposition rather than a set of skills.

The second theme to emerge from the data were emotional state and emotional awareness as it related to having an impact on performance. Participants identified the importance of emotional awareness for responding to student needs, aligning with previous studies which found that the skills targeted by SEL programs aid teachers in promoting student engagement, forming relationships, and allowing for a more nuanced understanding of student behavior as well as the emotional context of the classroom (Castillo et al., 2013; Harvey et al., 2016; Tsouloupas et al., 2010; Valente, Lourenço et al., 2020; Valente, Veiga-Branco et al., 2020). Explicitly addressing

with pre-service teachers the importance of emotional awareness for responding to student needs may improve their ability to enhance student engagement, build relationships, and appraise classroom situations.

The final theme to emerge from the qualitative data analysis was emotional awareness as it related to the context of the simulator experience. Participants in this study specifically discussed the ability for emotional state to elevate performance as well as the need to manage anxiety in the simulator. As the simulations have been shown to be an emotionally laden experience (Gundel & Piro, 2021), it is essential for pre-service teachers to develop strategies for managing emotions to be successful in the simulator. Next, although there was some dissension about the realness of the avatars, overall participants expressed the importance of using emotional awareness abilities to respond to the avatars in the same manner as they would any student, similar to the findings of Kamhi-Stein, Lao, and Issagholian (2020). Pre-service teachers should be encouraged to approach the simulation experience as an approximation of reality and embrace the opportunity to engage with the avatars in a manner that promotes skill development and professional growth (Piro & O'Callaghan, 2020).

Emerging from the comparison of the quantitative and qualitative data we see a differing emphasis on the need to regulate emotion. The discussion of the need to monitor and manage one's own emotional state by the treatment group aligns with deep acting, which is attempting to modify one's own emotional state to bring it into agreement with an emotional state that is beneficial for the present situation (deCastro et al., 2004; Joseph & Newman, 2010). Teacher preparation programs should consider embedding reflective tools, such as the Mood Meter, for modifying one's emotional state into coursework as a regular practice for all pre-service teachers.

6. THREATS AND LIMITATIONS

A moderate history threat was addressed by the treatment and comparison groups being studied in consecutive semesters. As related to instrumentation, there was a moderate risk for this threat as students completed the same measures of adaptiveness in coping and empathy twice during the study. There was a low risk, however, of their first simulation performance impacting later simulation performances as the simulation scenario changed for each experience. Experimenter threat was low in this study, as the exercises were not based on direct, individualized intervention by the experimenters but rather the use of standardized forms for all participants in the treatment group. Triangulation, the convergence of multiple data sources, was the main means for establishing trustworthiness. Additionally, dense description was used in sharing information about the research methods used, the research context, and participant responses to provide an index of transferability and as well as information about the potential repeatability of the study (Krefting, 1991). Two data audits were conducted between the first two authors, with consideration to the research process and findings, and a particular focus on data reconstruction and synthesis products such as thematic categories (Krefting, 1991). Limitations of this study include its small sample size and minor differences between the composition and experience of the treatment and comparison group between two different semesters of data collection, although both groups came from the same university and education program with both groups taking the course at the same point in their programs.

7. CONCLUSION

Taken as a whole, the findings of this study lend support to the intentional integration of coursework relating to emotional awareness into teacher preparation programs, especially those featuring the use of a mixed reality simulator. Emotional awareness abilities have been linked to

potentially aiding teachers in promoting student engagement, enhancing mental flexibility, forming relationships, appraising the emotional context of the classroom, and buffering against burnout (Brackett & Baron, 2018; Castillo et al., 2013; Harvey et al., 2016; Tsouloupas et al., 2010; Valente, Lourenço et al., 2020; Valente, Veiga-Branco et al., 2020) in addition to having been shown to be positively related to self-efficacy beliefs (Alrajhi et al., 2017; Valente, Lourenço et al., 2020; Valente, Veiga-Branco et al., 2020).

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