The effect of Motivational Interviewing training on knowledge, attitude, self-efficacy, subjective norm, and intent to use by undergraduate nurses to support people with substance use: A comparison of two learning styles

by

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Author's declaration

I, Maryam Einshouka, hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required revisions, as suggested by my examiners.

I understand that my thesis may be made electronically available to the public.

Acknowledgments

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List of abbreviations

ANOVA Analysis of variance

CI Confidence interval

DSM-V Diagnostic and Statistical Manual of Mental Disorders – fifth edition

HCV Hepatitis C Virus

HIV Human Immunodeficiency Virus

MANCOVA Multivariable analysis of covariance

MHDs Mental health disorders

MI Motivational Interviewing

MIKAT Motivational Interviewing Knowledge and Attitude Test

PBC Perceived Behavioural Control

SBIRT Screening, Brief Intervention, and Referral to Treatment

SE Self Efficacy

SIM Simulation

SN Subjective Norm

SUDs Substance use disorders

TBDHU Thunder Bay district health unit

TPB Theory of Planned Behaviour

TRA Theory of Reasoned Action

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Chapter 1: Introduction

Mental health and well-being are a worldwide concern, especially in the last couple of years. From late 2020 to early 2022, high self-rated mental health decreased in Canadians aged 12 or older from 64% to 58% (Statistics Canada, 2022). Also, it was found that 25% of Canadians (18 or above) were found positive on at least one of depression, anxiety, or post-traumatic stress disorder in spring 2021, compared to 21% in fall 2020 (Statistics Canada, 2021). This indicates a serious problem and a need for immediate interventions. Moreover, the close relationship between MHD and substance use disorders (SUD) was highlighted during the COVID-19 pandemic. One in three Canadians with MHDs who also drink alcohol reported an increase of their drinking to problematic levels (Mental Health Commission of Canada & Canadian Centre on Substance Use, 2020). Similarly, the prevalence of problematic alcohol use in 2021 was found to be 21% among the general population and 39% among the low income population, compared to 38% and 52% of problematic cannabis use, respectively (Canadian Centre on Substance Use & Canadian Centre on Substance Use, 2021). SUDs have many harmful consequences on health and quality of life, like road traffic accidents, domestic violence, child abuse, and various health problems (McLellan, 2017). A SUD-related crisis is one of the most common issues managed in the emergency department; approximately 20% of emergency department cases involve substance use (Brubacher et al., 2008). Northwestern Ontario, including Thunder Bay, has a high proportion of SUD-related health problems, which puts a higher burden on the health care system (TBDHU, 2017). Consequently, SUDs are also commonly found in the psychiatric and critical care wards, in addition to the emergency department (personal communication with Thunder Bay Regional Hospital's nurses). This imposes higher stress levels on the hospital staff from departments other than Psychiatry, where the staff is specifically trained to address SUD concerns. Emergency and critical care departments personnel may not have received enough undergraduate training to

manage SUD cases effectively. Therefore, preparing nursing students (especially in Northwestern Ontario) to manage SUD patients is vital to increasing their competence range in their future practice.

Motivational Interviewing (MI) is an efficient counselling technique used for behavioural change, especially in people suffering from problematic substance use (Miller, 1983). Although MI skills may be familiar to psychiatric staff, they may not be known by many other specialties that may frequently encounter patients with SUD. Yet, MI skills were found to be well accepted and considered beneficial to other healthcare specialties, as well as other human services professions (Black et al., 2016; Chang et al., 2019; Fortune et al., 2019; Norris et al., 2019; Potocky & Guskovict, 2019). Similarly, MI skills were found to be effective to elicit behaviour change in a wide spectrum of clientele, other than SUD patients (Chen et al., 2012; Keeley et al., 2016; Meybodi et al., 2011). Therefore, introducing MI skills to the nursing staff at an early stage of their career (i.e., undergraduate) would positively affect their management of patients with challenging behaviour in whatever specialization they may pursue.

An effective way to teach clinical skills is through experiential learning, such as simulation. Simulation (SIM) methods are already mandatory in many aspects of nursing clinical training. Moreover, its use in mental health training is also proved to be beneficial (Albright et al., 2018b; Corrigan et al., 2018; Soccio, 2017). However, its use in teaching MI skills is not established in the undergraduate nursing student population, especially since MI skills are not regularly taught to this population. At Lakehead University, simulation is used in the mental health course for third-year nursing students. However, MI is not a part of the course lectures and is only part of the readings (Communication with Lakehead nursing instructors).

This study aims to assess the best learning method of MI skills by undergraduate nursing students, that will lead to future use of the skills. Research on MI learning to date shows that it involves long training sessions, as well as extensive evaluation methods (Barwick et al., 2012). However, a proxy for future use of MI was needed to accommodate the timeline of the study. Drawing on the theory of planned behaviour (TPB) (Ajzen, 1985), intent to use is used as a determinant of future use in this study, to assess the effectiveness of an introductory simulation-based MI training.

According to the TPB, to have the intent to use a new skill such as MI, learners (i.e., future nurses) need to have a positive attitude about it (i.e., MI attitude), be confident about their ability to use it (i.e., MI self-efficacy), and perceive that they are expected to use it (i.e., subjective norm). In this study, we evaluated the effectiveness of MI simulation training, compared to unidirectional e-learning, in two steps: First, by assessing the effect of learning type (SIM or e-learning) on MI knowledge, attitude, self-efficacy, and subjective norm of nursing students at Lakehead University; second, by confirming the association of MI attitude, subjective norm, and self-efficacy, with the intention to use (i.e., components of the TPB), then, exploring whether this association is different for each learning type.

References

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In Action control (pp. 11–39). Springer.

Albright, G., Bryan, C., Adam, C., McMillan, J., & Shockley, K. (2018). Using Virtual Patient Simulations to Prepare Primary Health Care Professionals to Conduct Substance Use and Mental Health Screening and Brief Intervention. Journal of the American Psychiatric Nurses Association, 24(3), 247–259. https://doi.org/10.1177/1078390317719321

Barwick, M. A., Bennett, L. M., Johnson, S. N., McGowan, J., & Moore, J. E. (2012). Training health and mental health professionals in motivational interviewing: A systematic review. Children and Youth Services Review, 34(9), 1786–1795. https://doi.org/10.1016/j.childyouth.2012.05.012

Black, B., Lucarelli, J., Ingman, M., & Briskey, C. (2016). Changes in physical therapist Students' self-efficacy for physical activity counseling following a motivational interviewing learning module. Journal of Physical Therapy Education, 30(3), 28–32.

Brubacher, J. R., Mabie, A., Ngo, M., Abu-Laban, R. B., Buchanan, J., Shenton, T., & Purssell, R. (2008). Substance-related problems in patients visiting an urban Canadian emergency department. In Canadian Journal of Emergency Medicine (Vol. 10, Issue 3, pp. 198–204). Canadian Medical Association. https://doi.org/10.1017/S1481803500010101

Canadian Centre on Substance Use, & Canadian Centre on Substance Use. (2021). Mental Health and Substance Use During COVID-19 SUMMARY REPORT 3: Spotlight On Income, Employment, Access. https://mentalhealthcommission.ca/wp-content/uploads/2021/09/leger_poll_spotlight_on_income_employment_access.pdf

Chang, Y., Cassalia, J., Warunek, M., & Scherer, Y. (2019). Motivational interviewing training

with standardized patient simulation for prescription opioid abuse among older adults.

Perspectives in Psychiatric Care, 55(4), 681–689. https://doi.org/10.1111/ppc.12402

Chen, S. M., Creedy, D., Lin, H. S., & Wollin, J. (2012). Effects of motivational interviewing

intervention on self-management, psychological and glycemic outcomes in type 2 diabetes:

A randomized controlled trial. International Journal of Nursing Studies, 49(6), 637–644.

https://doi.org/10.1016/j.ijnurstu.2011.11.011

Corrigan, D., Mix, R. L., Palmer, G. A., & Olson, S. A. (2018). Improving nursing confidence

and consistency in assessment of opioid withdrawal: Efficacy of simulation and debriefing.

Journal of Psychosocial Nursing and Mental Health Services, 56(10), 27–35.

https://doi.org/10.3928/02793695-20180503-05

District Health Unit, T. B. (2017). Opioid Use and Impacts in Thunder Bay District.

Fortune, J., Breckon, J., Norris, M., Eva, G., & Frater, T. (2019). Motivational interviewing

training for physiotherapy and occupational therapy students: effect on confidence,

knowledge and skills. Patient Education and Counseling, 102(4), 694–700.

Keeley, R. D., Brody, D. S., Engel, M., Burke, B. L., Nordstrom, K., Moralez, E., Dickinson, L.

M., & Emsermann, C. (2016). Motivational interviewing improves depression outcome in

primary care: A cluster randomized trial. Journal of Consulting and Clinical Psychology,

84(11), 993.

McLellan, A. T. (2017). Substance Misuse and Substance use Disorders: Why do they Matter in

Healthcare? Transactions of the American Clinical and Climatological Association, 128,

112–130. /pmc/articles/PMC5525418/?report=abstract

Mental Health Commission of Canada, & Canadian Centre on Substance Use. (2020). Mental

Health and Substance Use During COVID-19: First Summary Report.

https://mentalhealthcommission.ca/wp-

content/uploads/2021/09/mhcc_ccsa_covid_leger_poll_eng.pdf

Meybodi, F. A., Pourshrifi, H., Dastbaravarde, A., Rostami, R., & Saeedi, Z. (2011). The

effectiveness of motivational interview on weight reduction and self-efficacy in Iranian

overweight and obese women. Procedia-Social and Behavioral Sciences, 30, 1395–1398.

Miller, W. R. (1983). Motivational Interviewing with Problem Drinkers. Behavioural

Psychotherapy, 11(2), 147–172. https://doi.org/10.1017/S0141347300006583

Norris, M., Eva, G., Fortune, J., Frater, T., & Breckon, J. (2019). Educating undergraduate

occupational therapy and physiotherapy students in motivational interviewing: the student

perspective. BMC Medical Education, 19(1), 1–7.

Potocky, M., & Guskovict, K. L. (2019). Project MIRACLE: Increasing empathy among

psychosocial support staff working with refugees through brief training in motivational

interviewing. Intervention, 17(1), 59.

Soccio, D. A. (2017). Effectiveness of mental health simulation in replacing traditional clinical

hours in baccalaureate nursing education. Journal of Psychosocial Nursing and Mental

Health Services, 55(11), 36–43. https://doi.org/10.3928/02793695-20170905-03

Statistics Canada. (2021). The Daily — Survey on COVID-19 and Mental Health, February to

May 2021. https://www150.statcan.gc.ca/n1/daily-quotidien/210927/dq210927a-eng.htm

Statistics Canada. (2022). The Daily — Self-rated mental health decreases after another year of

the COVID-19 pandemic. https://www150.statcan.gc.ca/n1/daily-

quotidien/220607/dq220607e-eng.htm

Chapter 2: Literature review

2.1 Substance use disorders (SUDs)

According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) (American Psychiatric Association, 2013), SUD refers to the persistent use of alcohol or other drugs leading to significant impairment of the person's health and functions (Volkow et al., 2016). A "substance" can vary from alcohol and tobacco to stimulants and opioids (McLellan, 2017). SUDs are diagnosed when a person's substance use causes them social, work, or health disturbances (American Psychiatric Association, 2013; U.S. National Library of Medicine, 2016).

2.1.1 Epidemiology of Substance Use Disorders

Globally, approximately 240 million people suffered from alcohol use disorder in 2014, which constitutes 4.9% of the world's adult population (Gowing et al., 2015). As for other psychoactive drugs, the most commonly used is cannabis, with a rate of 3.5% worldwide (Gowing et al., 2015). In 2021, it was found that 25% of Canadians (18 or above) had at least one of depression, anxiety, or post-traumatic stress disorder, compared to 21% in fall 2020 (Statistics Canada, 2021). Moreover, the synergistic relationship between MHD and substance use disorders (SUD) was highlighted during the pandemic. One in three Canadians with MHDs and who drink alcohol reported increase of their drinking to problematic levels (Mental Health Commission of Canada & Canadian Centre on Substance Use, 2020). Similarly, the prevalence of problematic alcohol use in 2021 was found to be 21% among the general population and 39% among the low income population, compared to (Canadian Centre on Substance Use & Canadian Centre on Substance Use, 2021). My study took place in Thunder Bay, Ontario, Canada, which had double the Ontario rates of opioid-related emergency visits, from 2005 to 2016 (TBDHU, 2017). Therefore, the prevalence of SUD in Thunder Bay is expected to be among the highest ones in Ontario after the pandemic.

Country-wide, males have higher rates of substance use than females (Khan, 2017), as well as higher alcohol-related mortality rates (Roerecke & Rehm, 2013). According to the 2011 CADUMS (Canadian Alcohol and Drugs Use Monitoring Survey) data, cannabis use was double the rate among males compared to females (i.e., 12.2% vs. 6.2%) (Health Canada, 2011).

2.1.2 Negative Consequences of SUD

SUDs have many harmful consequences on health and quality of life, like road traffic accidents, domestic violence, child abuse, and various health problems (McLellan, 2017). Heavy drinking is associated with an increased risk of ischemic heart disease (Roerecke & Rehm, 2014), and decreasing alcohol consumption reduces mortality risk by 65% in case of abstinence (Roerecke et al., 2013). Likewise, various morbidities result from stimulant drug abuse, such as amphetamine and cocaine, including blood-borne infections (e.g. HIV and HCV) and mental health problems like psychosis, depression, and suicide (Farrell et al., 2019). Moreover, opioid-related deaths accounted for almost 22.2% of deaths in Canada in 2017, presenting an increase of 33% from 2016's rates (15.2%) (Health Canada, 2018).

2.1.3 Healthcare Provider Attitudes towards People with SUD

The attitude of health care providers towards SUD patients was found to be generally negative and to affect the quality and consistency of care delivery to these patients (Van Boekel et al., 2013). This attitude is sometimes affected by the lack of proper training in the field of SUD management. For instance, low levels of preparedness to manage SUD cases among primary healthcare providers were found and were associated with more negative attitudes toward SUD patients (Wakeman et al., 2016). A minority of providers felt well prepared to diagnose and intervene with SUD cases in an American national survey (The National Center on Addiction and Substance Abuse at Columbia University, 2000), while the majority of surveyed internal medicine

residents felt unprepared to manage SUD cases (Wakeman et al., 2013). This feeling of unpreparedness is the result of a lack of proper undergraduate training and is associated with providers' stigma toward SUD patients (Wakeman et al., 2016). The latter was explored among hospitalists and the results showed that 31% of participants believe that SUD are different from other chronic conditions because using a substance is a choice (Wakeman et al., 2016).

Nurses were found to be the most effective personnel out of many healthcare providers like psychiatrists, counsellors, general practitioners, psychologists, and social workers- in delivering alcohol-reducing interventions to SUDs patients (Platt et al., 2016). However, there is a lack of undergraduate programs for nursing students or interventions for nursing staff, to teach them how to identify and help SUD patients during their clinical practice (Rosenthal et al., 2018). Although training nurses to identify and help SUD patients to change is a much-needed service, it was found to be more effective when these skills are introduced to nursing students at the undergraduate level (i.e. versus postgraduate), regarding the future implementation of the acquired skills (Cook et al., 2018). Besides, upon receiving MI simulation training, post-licensure nurses wished that this type of training was received before having their license (Badowski et al., 2019).

2.2 Motivational Interviewing (MI)

Motivational interviewing (MI) was first introduced in 1983, by William Miller (Miller, 1983) to help people suffering from problematic drinking. It is a participative empathetic counselling method where the patients feel empowered and responsible for their decisions of change. It was defined by Miller and Rollnick in 1993 as a "… client-centred counselling style for eliciting behaviour change by helping clients to explore and resolve ambivalence" (Miller & Rollnick, 1993). MI depends on eliciting "change talk" - expressions of the patient's reasons, desire, and ability to change a behaviour -, rolling with the patient's resistance to change rather than

opposing it, with the ultimate goal of resolving ambivalence to change without directing the patient (Hettema et al., 2005). MI principles include, but are not limited to, helping the patients to identify and hear themselves expressing their own motives and goals, providing reflections that repeat the patients' statements (i.e. reflective listening) which reinforce the patients' beliefs in their abilities and inner strength, and finally documenting the commitment to change verbally by summarizing what was said without imposing solutions (Hettema et al., 2005).

2.2.1 MI Skills

MI has four basic skills: Open questions, Affirmations, Reflective listening, and Summary reflections (OARS) (Rollnick et al., 2008). Open questions give more room for the patients' responses. They allow the provider to know the context in which the patient is being interviewed. Moreover, open questions help to establish trust and rapport, as the patients feel welcome to talk and perceive the time given by the provider for their care. Open questions followed by careful listening to the patients' preferences and concerns are generally associated with more satisfaction with care and are particularly important to elicit "change talk" (Rollnick et al., 2008). Listening allows the provider to grasp the most concerning issues to their patients and construct the hypotheses to be later repeated back to the patient, to confirm or deny them. Reflections about the told story by the patients are then given by summarizing what the patients said and getting confirmation or disconfirmation from them about it, with the intent to focus on the patient's motives and reasons to change. This process of reflective listening is greatly connected to "Affirmations", where the provider should skillfully select the facts that they reflect intending to open the patient up to self-evaluation and create a state of inner dissonance inside the patient (Miller, 1983). Summary reflections are also part of the reflections, with an aim to summarize what has been said and encourage the patient to commit to the decisions that they have concluded.

Summary reflections also deliver a positive message about the provider's careful listening to the patient's responses and allow to catch any important details that were missed by the provider (Rollnick et al., 2008). These basic guiding skills, when correctly practiced, help the patient to independently see their need and ability for a certain behaviour change, and later result in their commitment for this change without direction from the provider.

2.2.2 MI uses

Over time, MI has been successfully implemented in various contexts of behaviour change, ranging from various SUDs to school education. Using MI effectively in problematic alcohol drinking and various substance-related disorders had shown positive results in people from a variety of backgrounds worldwide (d'Abbs et al., 2013; Komro et al., 2017; Venner et al., 2016). MI was also used to modify some of the consequences of drinking in adolescents, such as abusing their dating partners, with promising results regarding induced change talk and intention to seek help for dating abuse behaviours (Rothman & Wang, 2016). In addition to modifying SUD-related behaviour, MI has been widely used in mood disorder therapy, like major depression (Keeley et al., 2016), where using MI in association with the standard depression treatment was highly associated with better mood score results (Cohen's d = 0.41, 95% CI [0.11, 0.72]) and remission rate (Success Rate Difference = 14.53 [1.79, 27.26]), compared to standard treatment alone. MI was also tested as a pre-cognitive therapy intervention, compared to an active control condition, to increase anxiety and mood disorder patients' engagement with therapy, with significant results favouring the efficacy of MI (Dean et al., 2016). In the latter study, patients who received pre-treatment MI attended more therapy sessions (MD = 1.3, 95% CI [0.4-2.2]) and had a higher mean readiness for therapy after the pretreatment (MD = 0.5, 95% CI [0.1-0.9]), compared to those in the control condition (Dean et al., 2016). Besides psychiatry-related issues, MI is used in different

chronic health problems requiring a long commitment and adherence to therapy and behaviour modification. For instance, the use of MI in diabetic patients' care was proved to improve their diabetic self-management, psychological state, and glycemic control, compared to usual care (Chen et al., 2012). MI use for enhancing a healthier lifestyle was supported by strong evidence as well; including the promotion of weight loss in obese patients (Meybodi et al., 2011), as well as physical activity promotion with subsequent cardiometabolic health improvement in the study population (Lai et al., 2019). Lastly, the use of MI in education is also supported; where MI was used to address students' reluctance about certain cultural diversity topics in the curriculum and motivate them to change their perspectives and be more culturally competent (Venner & Verney, 2015).

Finally, MI skills have also been successfully taught to a range of learners. For instance, It was taught to physicians and nurses, as well as social workers and counsellors (Chang et al., 2019; Potocky & Guskovict, 2019; Seigart et al., 2018). It was also taught to physical and occupational therapy students to be able to motivate their future clients to physical activity and healthy lifestyles (Black et al., 2016; Fortune et al., 2019; Norris et al., 2019). MI skills were successfully learned and used by professionals outside the healthcare field, like teachers (Venner & Verney, 2015). Similarly, the successful use of MI skills is not limited to counsellors and psychologists, but extends to doctors, nurses, midwives, pharmacists, physiotherapists, occupational therapists, social workers, and teachers (Black et al., 2016; Cucciare et al., 2012; Fortune et al., 2019; Goggin et al., 2010; Meybodi et al., 2011; Norris et al., 2019; Potocky & Guskovict, 2019; Schoo et al., 2015).

The timing of learning MI skills is much appreciated at the undergraduate level. Learning MI skills, as undergraduates, is transformative for primary care nurses, as MI is a relational interpersonal skill that helps nurses engage with their patients and act as a team with one another

(Howard & Williams, 2016). This body of literature highlights the value of the implementation of MI training for undergraduate nurses; however, few studies investigate the delivery of MI educational content.

2.3 Simulation

2.3.1 Definition

The experiential learning theory was developed by David Kolb (Kolb, 1984), where experiential learning is described as a cycle with four parts: concrete experience, reflective observation, abstract conceptualization, and active experimentation. Simulation (SIM) is a form of experiential learning, which is learning through experience rather than unidirectional instructions, in which thinking and doing unite to fortify the learning experience (Gibbs, 1988). In SIM, imitation of real-life situations allows learners to actively acquire knowledge. Moreover, debriefing involves a subsequent analysis of the trainee's behaviour and reflection on the experience. Thus, sessions of simulation and debriefing allow learners to go through all the stages of experiential learning (Fanning & Gaba, 2007), as it puts the learner through the four stages described by Gibbs (1988): planning for action (e.g., when reading a scenario), carrying out the action (e.g., practicing the skills in a simulated environment), reflection on action (i.e., debriefing with an instructor), and relating what happens back to theory (e.g., discussing mistakes and areas for improvement).

2.3.2 Simulation uses

Simulation is a very powerful learning tool in many professions (e.g., medical, military, flight…etc.), particularly those that require interaction with the public. It is an important step before exposing students to training fields with real clients and cases, as it increases their self-awareness and confidence to interact with their clients, as well as their competence to use various

communication skills (Kourgiantakis et al., 2019). It was also found that simulation-based learning increases the knowledge, skills, and attitude of learners (Nestel et al., 2011). Using simulation in the nursing population, in particular, was found to improve the knowledge and skills of nurses in the various examined practices (Hegland et al., 2017). Moreover, health care providers were not the only population profiting from simulation techniques. Non-clinical hospital staff (e.g. administrative staff), community members, and teachers were the training subjects in studies evaluating simulation-based learning, where simulation was effective in teaching the participants various skills to identify and properly guide mental health patients (Bartgis & Albright, 2016; Williams et al., 2018), despite their lack of medical and psychological backgrounds.

Simulation has evolved through the years. In medical practice, it was first used by anesthesia specialists, then with technological advancement, it was used in various medical branches, such as internal medicine, emergency medicine, obstetrics/gynecology, pediatrics, and surgery (Chakravarthy, 2006; Passiment et al., 2013). Recently, simulation has been studied to teach non-physical clinical skills, such as communication skills, cultural competence, and mental health counselling skills like the SBIRT technique (i.e. Screening, Brief Intervention, and Referral to Treatment) with significantly positive results (Cook et al., 2018; Fioravanti et al., 2018; Kowalski & Sathanandan, 2015). These studies were in diverse learner populations ranging from undergraduate and graduate nursing students to psychiatry residents. Nonetheless, the reliability of simulation-based learning was also confirmed, where the adherence to acquired skills in simulation versus real clinical practice encounters was found comparable (Imel et al., 2014).

2.4 Teaching MI through Simulation

When teaching adult professionals, it was found that active participation, as in simulation-based trainings, induces longer retention of the learned materials, compared to didactic learning

ways (e.g., unidirectional lectures) (Fanning & Gaba, 2007). Especially, if these materials involve a set of skills (Fanning & Gaba, 2007), like Motivational Interviewing.

Some previous studies evaluated the use of simulation in teaching MI skills. Two studies in 2019 were directed toward post-graduate nurses. The first evaluated the perception of post-licensure nursing students of an MI telehealth simulation-based experience training, in which they practiced their skills online through a simulated clinical situation in small groups of students. MI skills introduction was positively received by the majority of the participants, however, they recommended introducing such skills before the nursing license (Badowski et al., 2019). Limitations of this study included the absence of any outcome that reflects retention of the training material or future use of the skills, a small sample size (n=22), and a lack of a control group. The study was also a pilot for evaluation of the nurses' perception of MI skills rather than an evaluation of the MI skills delivery method's effectiveness. The second study, which was a pre-post intervention design directed to doctorate nursing students, assessed their knowledge and confidence in MI skills before and after a three-stage MI training. The results showed a significant increase in MI skills after the simulation training. The intervention included a didactic lecture and peer roleplays, followed by simulation with standardized patients (Chang et al., 2019). This study's outcomes reflected the learning method's effectiveness and possibly the prediction of future use of the skills; however, the sample size was small (n=31), and the researchers didn't account for any possible confounders in their analysis of variance (ANOVA). Moreover, the three outcomes measured in this study, which were MI knowledge, confidence, and attitude, appeared to fit within the components of the theory of planned behaviour to predict future use of MI. However, MI use was not measured in the study, and neither was the intent to use MI skills in the future.

A third study was found in the nursing population, where MI was included in the undergraduate nursing curriculum through virtual and live simulations with actors (Seigart et al., 2018). The outcomes were the students' attitudes towards adolescents at risk of SUD or currently using, as well as the students' satisfaction with the training. Although the results were encouraging to introduce MI learning materials to undergraduate nurses, the study was a pilot and the authors' objective was not to evaluate the effectiveness of simulation in MI learning but to assess the satisfaction of the students with the simulation sessions. The design was pre- and post-experimental, but the statistical analysis only involved bivariate analysis (i.e. paired t-tests) to measure the change in attitudes towards SUD adolescent patients (Seigart et al., 2018).

Studies that evaluate MI simulation training for non-nursing students also exist. A randomized controlled trial compared three active learning styles to teach MI skills (written scenarios, peer roleplays, and standardized patient roleplays) to pharmacy students to elicit change in clients with substance use. This study assessed MI knowledge, confidence, competence, and attitude, with a significant difference in mean knowledge scores for the group that role-played with a mock patient, compared to the other tested methods of learning (Lupu et al., 2012). The lack of significant differences, between groups, in competence and confidence may be attributed to the fact that all three compared methods involved some form of active learning that exposes the student to an imaginary real-life situation, so differences in outcomes between the groups are logically non-existent. Another limitation in this study was the lack of follow-up to assess knowledge and confidence after a certain duration, which would further help to compare the different learning styles.

In summary, research on SIM for developing MI skills in nurses is at a preliminary stage. All previous studies found a general acceptance and satisfaction from the learners after receiving

MI by simulation. Additionally, knowledge, attitude, and confidence to use MI improved upon comparable simulation trainings. However, further research is still needed in the area to provide clearer evidence of the effectiveness of SIM in the delivery of MI skills and of the applicability of MI skills teaching to nurses at the undergraduate level.

2.5 The theory of planned behaviour (TPB)

According to the Theory of Planned Behaviour (TPB) (Ajzen, 1985), human behaviour is preceded and determined by the presence of intention. Moreover, any human behaviour is guided by a set of beliefs: behavioural, normative, and control beliefs (Ajzen, 2006). The behavioural beliefs consist of the perceived consequences and associated experiences with the behaviour. Normative beliefs are the person's thoughts about what is normally expected about the behaviour of their significant others and the community. Normative beliefs comprise two types: injunctive and descriptive (Martin Fishbein & Ajzen, 2011). Injunctive beliefs consist of the perceived approval and support of significant others (e.g., family, friends, coworkers) for a certain behaviour, while descriptive normative beliefs are beliefs that the person's significant others are performing the behaviour themselves. Finally, control beliefs are what a person perceives as facilitators or barriers to accomplishing the desired behaviour. The three sets of beliefs result in three forms of cognition, namely attitude, subjective norm, and perceived behavioural control (PBC), respectively (Ajzen, 2006). Behavioural beliefs result in a positive or negative attitude towards the behaviour. Normative beliefs result in the subjective norm, and control beliefs result in perceived behavioural control. The three cognitions in turn predict the human intention to do a certain behaviour, which is the primary predictor of actual behaviour, according to the theory (Ajzen, 1991). The TPB is the extension of the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1980), which introduced the role of intentions in determining human behaviour. However,

the TRA states that intentions are predicted by attitudes towards the behaviour and subjective

norm, without accounting for perceived behaviour control (PBC). PBC was found, according to

Bandura and Ajzen, to moderate the effect of attitude and subjective norms on intentions (Ajzen,

2020) and to influence the transformation of intention to action. Therefore, PBC was added as a

third factor for intention in the TPB. Furthermore, PBC is an extension of the Self Efficacy

Theory by Bandura (1977), which "is concerned with judgments of how well one can execute

courses of action required to deal with prospective situations" (Bandura, 1982). Thus, perceived

behavioural control and self-efficacy are conceptually the same (Ajzen, 1991). Also, self-

efficacy was used to reflect PBC in the integrative framework by Fishbein & Cappella (2006).
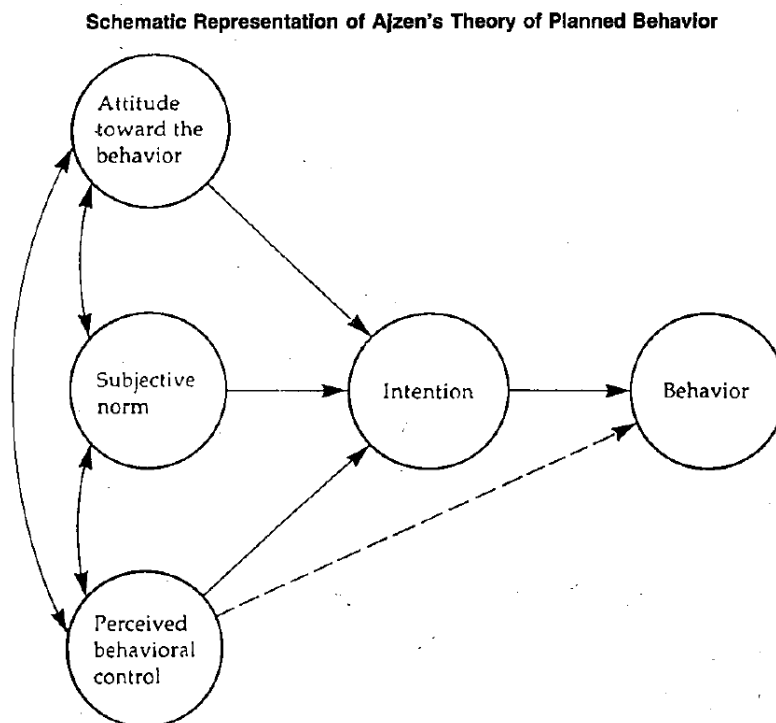
Figure 1-Theory of Planned Behaviour (Godin & Kok, 1996)

Many studies used the TPB to either predict behaviour or detect the beliefs associated

with a certain behaviour (Hardeman et al., 2002). Many of these studies were interventions for

health-related behaviours, like smoking, food choices, lifestyle, exercise, and sexual behaviour

(Albarracin et al., 2001; Conner et al., 2002; Godin & Kok, 1996; Huntington et al., 2020). For

instance, Conner et al. (2002) reported the use of the TPB on clients of nutritional clinics to find that intentions predicted healthy eating behaviours even after 6 years. On the other hand, some studies used the TPB in non-health related behavioural context like online purchasing (George, 2004), waste recycling (Nigbur et al., 2010), technology adoption behaviour (Chu & Chen, 2016), and using certain technology-based techniques in future teaching career (Siragusa & Dixon, 2009). Moreover, within the healthcare context, the TPB was used to know the factors affecting staff's intentions to use certain safety measures (Lapkin et al., 2015).

2.5.1 Application of TPB on MI skills use behaviour

Drawing on the TPB, intentions to use MI are determined by attitudes toward MI use, perceived self-efficacy to use MI skills, and perceived subjective norms about using MI skills. Quantitative measurements of these determinants of intention to use MI were found in the literature.

MI knowledge and attitude were effectively measured in doctorate nursing students using the Motivational Interviewing Knowledge and Attitude Scale (MIKAT) (Leffingwell, 2006). Similarly, MIKAT was used in physiotherapy and occupational therapy students (Chang et al., 2019; Fortune et al., 2019). The baseline mean score of occupational and physical therapy students was 71%, which was higher than that of doctorate nurses (60%). However, the occupational and physical therapy students' scores decreased by the end of the study to 68%. This scale will be used in the study within a population of undergraduate nurses and hypotheses will be guided by the results from the mentioned studies, particularly the doctorate nursing students' study.

Self-efficacy is considered to be the perceived confidence in one's self to accomplish a certain task (Bandura, 1977). A person must have a certain level of self-efficacy to attempt to pursue a challenging pathway. It can be considered as the motive behind the actions of the human

being (Bandura, 1977). Therefore, to intend to use a new skill (i.e., MI), which may be a challenge, learners (e.g., nursing students) should have confidence in their ability to succeed in this new step. Using simulation to learn new skills is found to enhance the self-efficacy of the learners, as they get exposed to an imitated real-life situation in a safe environment where mistakes are embraced and learned from (Hough et al., 2019; Labrague et al., 2019). Validated measurement tools for self-efficacy that were used in the nursing student population exist. However, the measured self-efficacy was particularly related to nursing psychomotor core competencies (Bulfone et al., 2016; Stump et al., 2012). Self-efficacy is situation-based and should be assessed in a certain context (Bandura, 1977); therefore, a self-efficacy scale in MI skills that was developed and used in a physiotherapy student population was found to be more compatible with this study (Black et al., 2016).

Subjective norm is described as a person's belief that significant others do a certain behaviour or expect him/her to do the same behaviour (Ajzen, 1985). Thus, all studies that intended to assess the perceived subjective norms of the participants used context-specific questions. Assessing the subjective norm for the nurses' population was conducted in two studies, discussing the behaviour of assessment of the patients' pain level and the behaviour of providing support to breastfeeding mothers (Bernaix, 2000; Nash et al., 1993). One qualitative study assessed registered dietitians' beliefs and behaviour toward counselling patients in physical activity and sedentary behaviour (Huntington et al., 2020). Although this latter study's focus was very similar to MI use, the questions were open-ended and had no scoring system. Therefore, two questions from the two quantitative studies that were found were adapted for the current study, combining the nursing normative and subjective norms.

Armitage and Conner argued that there are other variables predicting intention and behaviour besides the TPB components, such as self-identity and moral norms (Armitage & Conner, 2000). Therefore, it was believed that the demographic characteristics of the learners can impact the intention to use, directly or through the three determinants. In general, the age of the learner was found to be inversely proportional to retaining new knowledge, and that learning through experience (i.e. simulation) can be more beneficial for adult learners to promote knowledge acquirement (Fanning & Gaba, 2007). As for gender, studies show that simulation-based learning results in higher cognitive gains in females and males equally, but evidence from male-only studies is scarce (J. J. Vogel et al., 2006). On the other hand, males and females accept technology-based procedures differently (Gefen & Straub, 1997), which may affect their attitude and perceived self-efficacy toward the learned materials and, consequently, their intention to use them (Al-Azawei, 2019). Additionally, verbal communication quality and empathy towards patients were found to differ in male and female medical students (D. Vogel et al., 2018). This is evidence that proposes an effect of gender on the students' attitude towards MI, which is an empathy-based set of skills. Finally, there is some evidence suggesting a relationship between ethnicity and learning abilities, suggesting that certain ethnic groups have more learning difficulties than others (e.g., South Asian) (Mir et al., 2001). However, other scholars support the evidence that such learning difficulties are just the result of low socio-economic conditions (Emerson et al., 1997).

Although many studies used the TPB as a predictive model for behaviour, no studies could be found that used an etiological model to explain the association between the cognitions of the TPB and intention, while controlling for potential confounders. Moreover, assessing the

effectiveness of learning MI by SIM within the TPB framework, for undergraduate nurses is a

novel application for the TPB that will provide strong evidence for nursing education.

2.6 References

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In Action control (pp. 11–39). Springer.

Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179–211.

Ajzen, I. (2006). Constructing a theory of planned behavior questionnaire. Amherst, MA.

Ajzen, I. (2020). The theory of planned behavior: Frequently asked questions. Human Behavior and Emerging Technologies, 2(4), 314–324.

Al-Azawei, A. (2019). The moderating effect of gender differences on learning management systems (lmss) acceptance: a multi-group analysis. Italian Journal of Educational Technology, 27(3), 257–278.

Albarracin, D., Johnson, B. T., Fishbein, M., & Muellerleile, P. A. (2001). Theories of reasoned action and planned behavior as models of condom use: a meta-analysis. Psychological Bulletin, 127(1), 142.

American Psychiatric Association. (2013). Diagnostic and Statistical Manual of Mental Disorders (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Armitage, C. J., & Conner, M. (2000). Social cognition models and health behaviour: A structured review. Psychology and Health, 15(2), 173–189.

Association, A. P. (2013). Diagnostic and statistical manual of mental health disorders: DSM-5. Washington, DC: American Psychiatric Publishing.

Badowski, D. M., Rossler, K. L., & Gill-Gembala, L. T. (2019). Telehealth simulation with motivational interviewing: Impact on learning and practice. Journal of Nursing Education, 58(4), 221–224. https://doi.org/10.3928/01484834-20190321-06

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological

    Review, 84(2), 191–215. https://doi.org/10.1037/0033-295X.84.2.191

Bandura, A. (1982). Self-efficacy mechanism in human agency. American Psychologist, 37(2),

    122.

Bartgis, J., & Albright, G. (2016). Online role-play simulations with emotionally responsive

    avatars for the early detection of Native youth psychological distress, including depression

    and suicidal ideation. Am Indian Alsk Native Ment Health Res, 23(2), 1–27.

Bernaix, L. W. (2000). Nurses' Attitudes, Subjective Norms, and Behavioral Intentions Toward

    Support of Breastfeeding Mothers. In BernaixJ Hum Lact (Vol. 16, Issue 3).

Black, B., Lucarelli, J., Ingman, M., & Briskey, C. (2016). Changes in physical therapist

    Students' self-efficacy for physical activity counseling following a motivational

    interviewing learning module. Journal of Physical Therapy Education, 30(3), 28–32.

Bulfone, G., Fida, R., Ghezzi, V., Macale, L., Sili, A., Alvaro, R., & Palese, A. (2016). Nursing

    Student Self-efficacy in Psychomotor Skills: Findings from a Validation, Longitudinal, and

    Correlational Study. Nurse Educator, 41(6), E1–E6.

    https://doi.org/10.1097/NNE.0000000000000285

Canadian Centre on Substance Use, & Canadian Centre on Substance Use. (2021). Mental

    Health and Substance Use During COVID-19 SUMMARY REPORT 3: Spotlight On

    Income, Employment, Access. https://mentalhealthcommission.ca/wp-

    content/uploads/2021/09/leger_poll_spotlight_on_income_employment_access.pdf

CASA Columbia (The National Center on Addiction and Substance Abuse at Columbia

    University.). (2000). Missed Opportunity: National Survey of Primary Care Physicians and

    Patients on Substance Abuse.

Chakravarthy, B. (2006). Medical simulation in EM training and beyond. Newslett Soc Acad
Resid, 18(1), 18–19.

Chang, Y., Cassalia, J., Warunek, M., & Scherer, Y. (2019). Motivational interviewing training
with standardized patient simulation for prescription opioid abuse among older adults.
Perspectives in Psychiatric Care, 55(4), 681–689. https://doi.org/10.1111/ppc.12402

Chen, S. M., Creedy, D., Lin, H. S., & Wollin, J. (2012). Effects of motivational interviewing
intervention on self-management, psychological and glycemic outcomes in type 2 diabetes:
A randomized controlled trial. International Journal of Nursing Studies, 49(6), 637–644.
https://doi.org/10.1016/j.ijnurstu.2011.11.011

Chu, T.-H., & Chen, Y.-Y. (2016). With good we become good: Understanding e-learning
adoption by theory of planned behavior and group influences. Computers & Education, 92,
37–52.

Conner, M., Norman, P., & Bell, R. (2002). The theory of planned behavior and healthy eating.
Health Psychology, 21(2), 194.

Cook, P. F., Aagaard, L., Bowler, F., Rosenthal, L., Avery, L. K., & Weber, M. (2018).
Screening, brief intervention, and referral to treatment: Nurses helping colorado training
program. Journal of Nursing Education, 57(8), 476–482. https://doi.org/10.3928/01484834-
20180720-05

Cucciare, M. A., Ketroser, N., Wilbourne, P., Midboe, A. M., Cronkite, R., Berg-Smith, S. M., &
Chardos, J. (2012). Teaching motivational interviewing to primary care staff in the Veterans
Health Administration. Journal of General Internal Medicine, 27(8), 953–961.

d'Abbs, P., Togni, S., Rosewarne, C., & Boffa, J. (2013). The Grog Mob: lessons from an
evaluation of a multi-disciplinary alcohol intervention for Aboriginal clients. Australian and

New Zealand Journal of Public Health, 37(5), 450–456. https://doi.org/10.1111/1753-6405.12122

Dean, S., Britt, E., Bell, E., Stanley, J., & Collings, S. (2016). Motivational interviewing to enhance adolescent mental health treatment engagement: a randomized clinical trial. Psychological Medicine, 46(9), 1961–1969.

Emerson, E., Azmi, S., Hatton, C., Caine, A., Parrott, R., & Wolstenholme, J. (1997). Is there an increased prevalence of severe learning disabilities among British Asians? Ethnicity & Health, 2(4), 317–321.

Fanning, R. M., & Gaba, D. M. (2007). The Role of Debriefing in Simulation-Based Learning. Simulation in Healthcare: The Journal of the Society for Simulation in Healthcare, 2(2), 115–125. https://doi.org/10.1097/SIH.0b013e3180315539

Farrell, M., Martin, N. K., Stockings, E., Bórquez, A., Cepeda, J. A., Degenhardt, L., Ali, R., Tran, L. T., Rehm, J., & Torrens, M. (2019). Responding to global stimulant use: challenges and opportunities. The Lancet, 394(10209), 1652–1667.

Fioravanti, M. A., Hagle, H., Puskar, K., Knapp, E., Kane, I., Lindsay, D., Terhorst, L., & Mitchell, A. M. (2018). Creative Learning Through the Use of Simulation to Teach Nursing Students Screening, Brief Intervention, and Referral to Treatment for Alcohol and Other Drug Use in a Culturally Competent Manner. Journal of Transcultural Nursing, 29(4), 387–394. https://doi.org/10.1177/1043659617727832

Fishbein, M, & Ajzen, I. (1980). Understanding attitudes and predicting social behavior. Englewood Cliffs, NJ: Prentice-Hall. Inc.

Fishbein, Martin, & Ajzen, I. (2011). Predicting and changing behavior: The reasoned action approach. Psychology press.

Fortune, J., Breckon, J., Norris, M., Eva, G., & Frater, T. (2019). Motivational interviewing

    training for physiotherapy and occupational therapy students: effect on confidence,

    knowledge and skills. Patient Education and Counseling, 102(4), 694–700.

Gefen, D., & Straub, D. W. (1997). Gender differences in the perception and use of e-mail: An

    extension to the technology acceptance model. MIS Quarterly, 389–400.

George, J. F. (2004). The theory of planned behavior and Internet purchasing. Internet Research.

Gibbs, G. (1988). Learning by doing: A guide to teaching and learning methods. Further

    Education Unit.

Godin, G., & Kok, G. (1996). The theory of planned behavior: a review of its applications to

    health-related behaviors. American Journal of Health Promotion, 11(2), 87–98.

Goggin, K., Hawes, S. M., Duval, E. R., Spresser, C. D., Martinez, D. A., Lynam, I., Barnes, A.,

    Hinton-Dampf, A. M., Murphy, M. E., & Marken, P. A. (2010). A motivational

    interviewing course for pharmacy students. American Journal of Pharmaceutical Education,

    74(4).

Gowing, L. R., Ali, R. L., Allsop, S., Marsden, J., Turf, E. E., West, R., & Witton, J. (2015).

    Global statistics on addictive behaviours: 2014 status report. Addiction, 110(6), 904–919.

Hardeman, W., Johnston, M., Johnston, D., Bonetti, D., Wareham, N., & Kinmonth, A. L.

    (2002). Application of the theory of planned behaviour in behaviour change interventions:

    A systematic review. Psychology and Health, 17(2), 123–158.

Health Canada. (2011). Canadian alcohol and drug use monitoring survey. Author Ottawa,

    Ontario, Canada.

Health Canada. (2018). Synthetic Opioids / Novel Psychoactive Substances: Impact on Canada's

    Opioid Crisis.

Hegland, P. A., Aarlie, H., Strømme, H., & Jamtvedt, G. (2017). Simulation-based training for

    nurses: Systematic review and meta-analysis. Nurse Education Today, 54, 6–20.

Hettema, J., Steele, J., & Miller, W. R. (2005). Motivational interviewing. In Annual Review of

    Clinical Psychology (Vol. 1, pp. 91–111). Annual Reviews .

    https://doi.org/10.1146/annurev.clinpsy.1.102803.143833

Hough, J., Levan, D., Steele, M., Kelly, K., & Dalton, M. (2019). Simulation-based education

    improves student self-efficacy in physiotherapy assessment and management of paediatric

    patients. BMC Medical Education, 19(1), 463.

Howard, L. M., & Williams, B. A. (2016). A Focused Ethnography of Baccalaureate Nursing

    Students Who Are Using Motivational Interviewing. Journal of Nursing Scholarship, 48(5),

    472–481. https://doi.org/10.1111/jnu.12224

Huntington, J., Dwyer, J. J. M., Shama, S., & Brauer, P. (2020). Registered dietitians' beliefs and

    behaviours related to counselling patients on physical activity and sedentary behaviour from

    a theory of planned behaviour perspective. BMC Nutrition, 6(1).

    https://doi.org/10.1186/s40795-020-00392-1

Imel, Z. E., Baldwin, S. A., Baer, J. S., Hartzler, B., Dunn, C., Rosengren, D. B., & Atkins, D. C.

    (2014). Evaluating therapist adherence in motivational interviewing by comparing

    performance with standardized and real patients. Journal of Consulting and Clinical

    Psychology, 82(3), 472–481. https://doi.org/10.1037/a0036158

Keeley, R. D., Brody, D. S., Engel, M., Burke, B. L., Nordstrom, K., Moralez, E., Dickinson, L.

    M., & Emsermann, C. (2016). Motivational interviewing improves depression outcome in

    primary care: A cluster randomized trial. Journal of Consulting and Clinical Psychology,

    84(11), 993.

Khan, S. (2017). Concurrent mental and substance use disorders in Canada.

    https://www150.statcan.gc.ca/n1/pub/82-003-x/2017008/article/54853-eng.htm

Kolb, D. A. (1984). Experiential Learning: Experience as The Source of Learning and

    Development. Prentice Hall, Inc., 1984, 20–38. https://doi.org/10.1016/B978-0-7506-7223-

    8.50017-4

Komro, K. A., Livingston, M. D., Wagenaar, A. C., Kominsky, T. K., Pettigrew, D. W., Garrett,

    B. A., Boyd, B. J., Boyd, M. L., Livingston, B. J., Lynne, S. D., Molina, M. M., Merlo, L.

    J., & Tobler, A. L. (2017). Multilevel prevention trial of alcohol use among American

    Indian and white high school students in the Cherokee nation. In American Journal of

    Public Health (Vol. 107, Issue 3, pp. 453–459). American Public Health Association Inc.

    https://doi.org/10.2105/AJPH.2016.303603

Kourgiantakis, T., Sewell, K. M., & Bogo, M. (2019). The importance of feedback in preparing

    social work students for field education. Clinical Social Work Journal, 47(1), 124–133.

Kowalski, C., & Sathanandan, S. (2015). The use of simulation to develop advanced

    communication skills relevant to psychiatry. BMJ Simulation and Technology Enhanced

    Learning, 1(1), 29–32. https://doi.org/10.1136/bmjstel-2014-000006

Labrague, L. J., McEnroe‐Petitte, D. M., Bowling, A. M., Nwafor, C. E., & Tsaras, K. (2019).

    High‐fidelity simulation and nursing students' anxiety and self‐confidence: A

    systematic review. Nursing Forum, 54(3), 358–368.

Lai, H., Miles, R., Bredin, S., Kaufman, K., Chua, C., Hare, J., Norman, M., Rhodes, R., Oh, P.,

    & Warburton, D. (2019). "With Every Step, We Grow Stronger": The Cardiometabolic

    Benefits of an Indigenous-Led and Community-Based Healthy Lifestyle Intervention.

    Journal of Clinical Medicine, 8(4), 422. https://doi.org/10.3390/jcm8040422

Lapkin, S., Levett-Jones, T., & Gilligan, C. (2015). Using the Theory of Planned Behaviour to examine health professional students' behavioural intentions in relation to medication safety and collaborative practice. Nurse Education Today, 35(8), 935–940.

Leffingwell, T. R. (2006). Motivational Interviewing Knowledge and Attitudes Test (MIKAT) for evaluation of training outcomes. Minuet, 13, 10–11.

Lupu, A. M., Stewart, A. L., & O'Neil, C. (2012). Comparison of active-learning strategies for motivational interviewing skills, knowledge, and confidence in first-year pharmacy students. American Journal of Pharmaceutical Education, 76(2), 1–7. https://doi.org/10.5688/ajpe76228

McLellan, A. T. (2017). Substance Misuse and Substance use Disorders: Why do they Matter in Healthcare? Transactions of the American Clinical and Climatological Association, 128, 112–130. /pmc/articles/PMC5525418/?report=abstract

Mental Health Commission of Canada, & Canadian Centre on Substance Use. (2020). Mental Health and Substance Use During COVID-19: First Summary Report. https://mentalhealthcommission.ca/wp-content/uploads/2021/09/mhcc_ccsa_covid_leger_poll_eng.pdf

Meybodi, F. A., Pourshrifi, H., Dastbaravarde, A., Rostami, R., & Saeedi, Z. (2011). The effectiveness of motivational interview on weight reduction and self-efficacy in Iranian overweight and obese women. Procedia-Social and Behavioral Sciences, 30, 1395–1398.

Miller, W. R. (1983). Motivational Interviewing with Problem Drinkers. Behavioural Psychotherapy, 11(2), 147–172. https://doi.org/10.1017/S0141347300006583

Miller, W. R., & Rollnick, S. (1993). [BOOK REVIEW] Motivational interviewing, preparing people to change addictive behavior. Journal of Studies on Alcohol, 54, 507.

Mir, G., Nocon, A., Ahmad, W., & Jones, L. (2001). Learning difficulties and ethnicity. London: Department of Health, 1–84.

Nash, R., Edwards, H., & Nebauer, M. (1993). Effect of attitudes, subjective norms and perceived control on nurses' intention to assess patients' pain. Journal of Advanced Nursing, 18(6), 941–947. https://doi.org/10.1046/j.1365-2648.1993.18060941.x

Nestel, D., Groom, J., Eikeland-Husebø, S., & O'Donnell, J. M. (2011). Simulation for learning and teaching procedural skills: the state of the science. Simulation in Healthcare, 6(7), S10–S13.

Nigbur, D., Lyons, E., & Uzzell, D. (2010). Attitudes, norms, identity and environmental behaviour: Using an expanded theory of planned behaviour to predict participation in a kerbside recycling programme. British Journal of Social Psychology, 49(2), 259–284.

Norris, M., Eva, G., Fortune, J., Frater, T., & Breckon, J. (2019). Educating undergraduate occupational therapy and physiotherapy students in motivational interviewing: the student perspective. BMC Medical Education, 19(1), 1–7.

Passiment, M., Sacks, H., & Huang, G. (2013). Medical simulation in medical education: Results of an AAMC survey. 2011. Association of American Medical Colleges (AAMC).

Platt, L., Melendez-Torres, G. J., O'Donnell, A., Bradley, J., Newbury-Birch, D., Kaner, E., & Ashton, C. (2016). How effective are brief interventions in reducing alcohol consumption: do the setting, practitioner group and content matter? Findings from a systematic review and metaregression analysis. BMJ Open, 6(8), e011473. https://doi.org/10.1136/bmjopen-2016-011473

Potocky, M., & Guskovict, K. L. (2019). Project MIRACLE: Increasing empathy among psychosocial support staff working with refugees through brief training in motivational

interviewing. Intervention, 17(1), 59.

Roerecke, M., Gual, A., & Rehm, J. (2013). Reduction of alcohol consumption and subsequent

mortality in alcohol use disorders: systematic review and meta-analyses. The Journal of

Clinical Psychiatry, 74(12), e1181-9.

Roerecke, M., & Rehm, J. (2013). Alcohol use disorders and mortality: a systematic review and

meta‐analysis. Addiction, 108(9), 1562–1578.

Roerecke, M., & Rehm, J. (2014). Alcohol consumption, drinking patterns, and ischemic heart

disease: a narrative review of meta-analyses and a systematic review and meta-analysis of

the impact of heavy drinking occasions on risk for moderate drinkers. BMC Medicine,

12(1), 1–11.

Rollnick, S., Miller, W. R., & Butler, C. (2008). Motivational interviewing in health care:

helping patients change behavior. Guilford Press.

Rosenthal, L. D., Barnes, C., Aagaard, L., Cook, P., & Weber, M. (2018). Initiating SBIRT,

alcohol, and opioid training for nurses employed on an inpatient medical-surgical unit: a

quality improvement project. Medsurg Nursing, 27(4), 227–230.

Rothman, E. F., & Wang, N. (2016). A feasibility test of a brief motivational interview

intervention to reduce dating abuse perpetration in a hospital setting. Psychology of

Violence, 6(3), 433.

Schoo, A. M., Lawn, S., Rudnik, E., & Litt, J. C. (2015). Teaching health science students

foundation motivational interviewing skills: use of motivational interviewing treatment

integrity and self-reflection to approach transformative learning. BMC Medical Education,

15(1), 228.

Seigart, D., Veltman, M., Willhaus, J., & Letterle, C. (2018). Implementation of Motivational

Interviewing Training in an Undergraduate Nursing Curriculum: Identifying Adolescents at

Risk for Substance Use. International Journal of Environmental Research and Public

Health, 15(8), 1623. https://doi.org/10.3390/ijerph15081623

Siragusa, L., & Dixon, K. C. (2009). Theory of planned behaviour: Higher education students'

attitudes towards ICT-based learning interactions. Proceedings Ascilite Auckland, 2009,

969–980.

Statistics Canada. (2021). The Daily — Survey on COVID-19 and Mental Health, February to

May 2021. https://www150.statcan.gc.ca/n1/daily-quotidien/210927/dq210927a-eng.htm

Stump, G. S., Husman, J., & Brem, S. K. (2012). The nursing student self-efficacy scale:

Development using item response theory. Nursing Research, 61(3), 149–158.

https://doi.org/10.1097/NNR.0b013e318253a750

Thunder Bay District Health Unit. (2017). Opioid Use and Impacts in Thunder Bay District.

U.S. National library of Medicine. (2016). Substance use disorder: MedlinePlus Medical

Encyclopedia. MedlinePlus. https://medlineplus.gov/ency/article/001522.htm

Van Boekel, L. C., Brouwers, E. P. M., Van Weeghel, J., & Garretsen, H. F. L. (2013). Stigma

among health professionals towards patients with substance use disorders and its

consequences for healthcare delivery: systematic review. Drug and Alcohol Dependence,

131(1–2), 23–35.

Venner, K. L., Greenfield, B. L., Hagler, K. J., Simmons, J., Lupee, D., Homer, E., Yamutewa,

Y., & Smith, J. E. (2016). Pilot outcome results of culturally adapted evidence-based

substance use disorder treatment with a Southwest Tribe. Addictive Behaviors Reports, 3,

21–27. https://doi.org/10.1016/j.abrep.2015.11.002

Venner, K. L., & Verney, S. P. (2015). Motivational interviewing: Reduce student reluctance and

increase engagement in learning multicultural concepts. Professional Psychology: Research and Practice, 46(2), 116.

Vogel, D., Meyer, M., & Harendza, S. (2018). Verbal and non-verbal communication skills including empathy during history taking of undergraduate medical students. BMC Medical Education, 18(1), 1–7.

Vogel, J. J., Vogel, D. S., Cannon-Bowers, J., Bowers, C. A., Muse, K., & Wright, M. (2006). Computer gaming and interactive simulations for learning: A meta-analysis. Journal of Educational Computing Research, 34(3), 229–243.

Volkow, N. D., Koob, G. F., & McLellan, A. T. (2016). Neurobiologic advances from the brain disease model of addiction. New England Journal of Medicine, 374(4), 363–371.

Wakeman, S. E., Baggett, M. V, Pham-Kanter, G., & Campbell, E. G. (2013). Internal medicine residents' training in substance use disorders: a survey of the quality of instruction and residents' self-perceived preparedness to diagnose and treat addiction. Substance Abuse, 34(4), 363–370.

Wakeman, S. E., Pham-Kanter, G., & Donelan, K. (2016). Attitudes, practices, and preparedness to care for patients with substance use disorder: Results from a survey of general internists. Substance Abuse, 37(4), 635–641. https://doi.org/10.1080/08897077.2016.1187240

Williams, L., Mills, R., Parish, S., & Attoe, C. (2018). P3 Enhancing early intervention in mental health in primary care through simulation training. BMJ Specialist Journals.

Chapter 3: Overview of thesis structure

3.1 Summary of justification for the study

Research on SIM for learning MI skills in nurses is at a preliminary stage. All previous studies found a general acceptance and satisfaction from the learners following receiving MI by simulation. Additionally, knowledge, attitude, and confidence to use MI improved upon previous simulation trainings. However, limitations of the study design and statistical analysis were evident. For instance, only one of the studies conducted a randomized controlled trial to assess the effectiveness of simulation in MI delivery and used a sufficient sample size. Moreover, none of the studies performed a multivariable statistical analysis or accounted for possible confounders in their analyses. Nevertheless, the relationship between SIM and the outcomes of MI attitude, subjective norm, and self-efficacy were never used within a framework of the theory of planned behaviour. To address the limitations of the existing research, the purpose of my thesis is to evaluate MI simulation training for undergraduate nurses using a randomized controlled trial (RCT) design, with a comparison of the simulation style to a unidirectional e-learning style regarding outcomes of MI self-efficacy, knowledge, attitude, subjective norm, and intent to use.

3.2 Objectives

1. The first objective of this study was to determine the associations between the type of training, SIM or e-learning, and MI self-efficacy, knowledge, attitude, and subjective norm, in undergraduate nursing students, immediately after the training.

2. The second objective was to determine the associations of post-training MI attitude, subjective norm, and self-efficacy, with the intent to use MI skills after 3 months, while exploring the effect of the type of training on these associations.

MI knowledge was excluded from the second objective as it wasn't suggested as a determinant of intention in the TPB (Azjen, 1985). Moreover, Azjen explained that the three

suggested cognitions (i.e., attitude, subjective norm, and perceived behavioural control) are considered sufficient to predict intentions, regardless of the soundness and completeness of the knowledge about the behaviour in question

3.3 Hypotheses

Hypothesis 1: SIM training will be associated with higher post-training MI self-efficacy, attitude, knowledge, and subjective norm, compared to e-learning.

Hypothesis 2: Post-training MI attitude, subjective norm, and self-efficacy will be associated with intent to use MI skills at 3 months.

3.4 Approach to thesis

This thesis utilizes a quantitative approach supported by the TPB framework, with results presented in a manuscript style. We hope that the findings of this research can be disseminated in the form of journal publications and conference presentations. Therefore, we decided that it was most appropriate to organize this thesis into two separate manuscripts, as they would appear in an academic journal. Each manuscript is composed of an abstract, background, methods, results, discussion, and conclusion sections. A thesis comprehensive literature review was presented in Chapter 2, and a general discussion is presented in Chapter 6 to discuss the findings of both manuscripts, as well as the epidemiological implications of the thesis. The purpose of this thesis is to provide a thorough understanding of the topic of Motivational Interviewing skills learning through the use of SIM techniques in a sample of Canadian undergraduate nursing students. Although drafted as two separate manuscripts, this project was completed as a single multi-phased project to fulfil the Master of Health Sciences requirements at Lakehead University.

3.5 Overview of thesis content

The previous two chapters provide context and rationale for the study, as well as a thorough literature review for each of the topics involved in the study. The relationship between SIM learning and MI skills was summarized in the second chapter, in an attempt to highlight the strengths and gaps in the literature. The present chapter describes the purpose of the thesis, objectives, hypotheses, and layout. Following this, Chapter 4 presents the first of two manuscripts, titled "The Effect of Motivational Interviewing training on self-efficacy, knowledge, attitude, and subjective norm of undergraduate nurses: A comparison of two learning styles". Chapter 5 includes the second manuscript, which covers the follow-up phase of the study and the second objective, and is titled "The theory of planned behaviour in action: assessing the association of the components of the theory of planned behaviour with the 3-months intention to use Motivational Interviewing skills". Following the manuscripts, a discussion chapter discusses the main findings, epidemiological implications, limitations, and strengths of the study, as well as some ethical considerations in the study. Finally, Chapter 7 provides an overall conclusion to the thesis, where future research directions and the implications of the study are discussed. The appendix can be found at the end of the document after the conclusion chapter. Following each chapter, a reference list of the cited literature is provided.

3.6 References

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In Action control (pp.

11–39). Springer.

Ajzen, I. (2020). The theory of planned behavior: Frequently asked questions. Human Behavior

and Emerging Technologies, 2(4), 314–324.

Chapter 4: The effect of Motivational Interviewing training on self-efficacy, knowledge,

attitude, and subjective norm of undergraduate nurses: A comparison of two learning

styles

4.1 Abstract

Background: Substance use disorders and other behavioural problems constitute an increasing burden on the Canadian health system. A nurse in an outpatient or emergency setting sees around 20 patients per day, of whom between 10% and 20% may have substance use disorders, depending on the setting in which nurses work. If nurses were prepared with some basic counselling skills to improve substance use behaviours and outcomes, nurses could further reduce the SUD burden on the health system. Motivational Interviewing (MI) is a very effective counselling technique to elicit behavioural change, especially in people suffering from problematic substance use. Yet, it is not taught to undergraduate nurses in most Canadian nursing schools.

Objective: To evaluate the best learning method for Motivational Interviewing skills, whether it is by simulation or e-learning, for undergraduate nursing students. Evaluation is based on the association of learning style with four outcomes (self-efficacy, attitude, knowledge, and subjective norm), according to the Theory of Planned Behaviour.

Methods: This study used a randomized controlled trial design to compare two styles of learning. Undergraduate nurses from Lakehead University were recruited and then randomized to learn about MI skills by simulation or e-learning. Surveys were completed by participants before randomization (baseline, T1) and after the training sessions (post-training, T2). Paired t-tests and Multivariable analysis of covariance (MANCOVA) were used to assess the differences in the outcomes' scores between the two groups of the experiment.

Results: The total number of participants was 52, who were randomized into two groups of 26, receiving simulation or e-learning MI sessions. The SIM group included 96% females,

compared to 73% in the e-learning group. Fewer participants (11.5%) had prior training in MI in the SIM group, compared to 38% in the control group. The baseline mean self-efficacy score for the SIM group was 56.2 (+/- 15.4), compared to 65.9 (+/- 18.7) for the control group. As for baseline MI attitude, the mean baseline score for the SIM group was 8.4 (+/- 2.1), compared to 9.1 (+/- 1.6) for the control group. Paired t-test results showed significant increase in self-efficacy (mean difference (MD): 23, +/- 15), attitude (MD = 1.5, +/-2.1) , and subjective norm (MD = 1.8, +/- 2) for the simulation group (p-value < 0.05). On the other hand, the paired scores for the control group showed significant increases in self-efficacy (MD = 18, +/- 12.5), knowledge (MD = 0.5, +/- 1.1), and subjective norm (MD = 1.8, +/- 2). In the MANCOVA, the adjusted associations between the type of training and each of the post-training scores were not statistically significant.

Significance and implications: MI training was well-received by, and useful to participating nursing students in both the SIM and e-learning conditions. No significant differences were found in MI self-efficacy, attitude, knowledge, and subjective norm between the SIM and e-learning groups. The findings suggest that nursing schools can introduce MI skills in a variety of formats. The most convenient and cost-effective learning style will equally train undergraduate nursing students in MI.

4.2 Introduction

Mental health disorders (MHDs) represent a growing burden in Canada and worldwide (Xiong et al., 2020), constituting 25% of Canadians (18 or above) with at least one of depression, anxiety, or post-traumatic stress disorder in spring 2021, compared to 21% in fall 2020 (Statistics Canada, 2021). This indicates a serious problem during and after the pandemic of Covid-19. MHDs include a variety of disorders, like substance use disorders (SUDs), eating disorders, conduct disorders, and others (American Psychiatric Association, 2013). One in three Canadians with MHDs and who drink alcohol reported increase of their drinking to problematic levels (Mental Health Commission of Canada & Canadian Centre on Substance Use, 2020). Similarly, the prevalence of problematic alcohol use in 2021 was found to be 21% among the general population and 39% among the low income population (Canadian Centre on Substance Use & Canadian Centre on Substance Use, 2021). SUDs particularly lead to frequent emergency visits by the users, due to overdosing, withdrawal symptoms or other serious complications (Firestone et al., 2015). SUDs were found to present 9.4% of the emergency cases in an American study (Suen et al., 2021), and may constitute up to 20% of emergency department cases in an urban Canadian setting (Brubacher et al., 2008). This high rate increases the burden on the emergency health system and frequently deprives other cases of getting the help they need (TBDHU, 2017). Nonetheless, this high rate of SUD cases dramatically increases the stress level of the emergency staff.

Motivational interviewing (MI) is an empathic non-intrusive counselling technique that can be used to elicit behaviour change (Miller, 1983). It was first introduced to counsel alcohol users in the eighties, then its effectiveness extended its use to other behavioural disorders. MI helps behavioural patients to find their own motives to change, which is more empowering and

long-lasting than other counselling styles (Rollnick et al., 2008). MI depends on open-ended

questions, affirmations and reflective listening to explore the patients' potential motives to

change with minimal confrontation or labelling (Hettema et al., 2005). MI skills have been

successfully used with a diverse spectrum of clientele (e.g., SUDs, mood disorders,

diabetes,…etc.) (Chen et al., 2012; d'Abbs et al., 2013; Keeley et al., 2016; Venner & Verney,

2015) and by different types of care providers, like physicians, nurses, psychologists,

pharmacists, occupational therapists, physiotherapists, and social workers (Chang et al., 2019;

Cucciare et al., 2012; Fortune et al., 2019; Goggin et al., 2010; Meybodi et al., 2011; Potocky &

Guskovict, 2019).

In addition to the mental health professionals' role in the management of SUD, nurses

were found to be greatly effective in eliciting change in their patients (Platt et al., 2016).

Emergency nurses and nurse practitioners see approximately twenty patients or more per day.

Similarly, some people see nurse practitioners instead of doctors, with the same or better

efficiency (Laurant et al., 2018). This high level of contact between nurses and patients, as well

as the nurses' potential impact on many patients' health and behaviour, is particularly important.

As it draws attention to the importance of providing nurses with effective counselling skills like

MI, to help their patients change harmful behaviours. NursesSimilarly, some people see nurse

practitioners instead of doctors, with the same or better efficiency of care (Laurant et al., 2018).

This high level of contact between nurses and patients, as well as the nurses' potential impact on

many patients' health and behaviour, is particularly important. As it draws attention to the

importance of providing nurses with effective counselling skills like MI, to help their patients

change harmful behaviours. I believe that nurses learning and practicing MI skills in outpatient

settings may prevent emergency visits by using MI with chronic patients. Moreover, the use of

MI may lower the frequency of emergency visits, when used by emergency and critical care nurses with acute SUD patients. However, MI counselling skills are not part of the undergraduate nursing curricula by default (Rosenthal et al., 2018).

Nursing schools use simulation (SIM) to deliver many clinical skills to their students. SIM is a form of experiential learning, which is learning through experience rather than unidirectional instruction, in which thinking and doing unite to fortify the learning experience (Gibbs, 1988). In SIM, imitation of real-life situations allows learners to actively acquire knowledge. Moreover, debriefing involves a subsequent analysis of the trainee's behaviour and reflection on the experience (Fanning & Gaba, 2007). SIM and debriefing are important steps before exposing students to training fields with real clients and cases, as they increase their self-efficacy to interact with their patients, as well as their competence to use various skills (Hough et al., 2019; Labrague et al., 2019). It was also found that simulation-based learning increases the knowledge, skills, and attitude of learners as well (Hegland et al., 2017; Nestel et al., 2011).

Teaching through SIM is more widely used for clinical skills performed by hand, like surgical and interventional skills, than conversational clinical skills, like counselling (Chakravarthy, 2006; Passiment et al., 2013). Thus, MI counselling skills are less commonly taught through SIM in nursing schools, if at all (Rosenthal et al., 2018). For instance, Lakehead University nursing school includes MI skills in the readings but not in lectures and hands-on practice. This kind of exposure to MI skills may not be the best way to encourage students to use them in their future careers.

The Theory of Planned Behaviour (Ajzen, 1985) provides a theoretical framework for teaching students to adopt a new behaviour, namely using MI skills in their future practice.

According to the theory, the students should possess a certain degree of self-efficacy to use the skill, as well as a considerable positive attitude towards it. Additionally, the teaching style should be able to give the students a perception that this skill is subjectively needed in their practice (i.e., subjective norm).

Previous studies evaluated MI SIM training in the nursing population with promising results (Badowski et al., 2019; Chang et al., 2019; Seigart et al., 2018). Learning MI by SIM was well accepted by nurses (Badowski et al., 2019; Seigart et al., 2018) and improved their MI skills (Chang et al., 2019), compared to pre-training. However, there has not been a comparison between different approaches to learning in the same student population. Thus, the question about the more effective way to introduce MI counselling skills to nursing students remains unanswered. Therefore, the primary objective of this study is to assess which type of learning, SIM or unidirectional e-learning, is associated with nursing students' MI self-efficacy, knowledge, attitude, and subjective norm. We hypothesized that learning by SIM would increase the students' outcomes more than e-learning.

4.3 Methods

4.3.1 Study design

This study was reviewed and approved by the Lakehead University Research Ethics Board committee (Romeo file number 1468284). The study used a randomized controlled trial design, using data from baseline (T1) and post-training point of time (T2).

4.3.2 Participants

Recruitment of undergraduate nursing students for the study was promoted by their instructors and school as a voluntary extra-curricular activity. Recruitment occurred in two phases, first in the Spring of 2021 and the other in the Fall of 2021. Nursing instructors introduced the

project to their students by spreading the recruitment posters on their class website. Others agreed to host the researcher to give a short presentation about the study in class, either on Zoom (in the Spring) or in-person (in the Fall). Recruitment posters were developed with a brief introduction to the main purpose of the project, as being to assess the effectiveness of MI teaching methods (to ensure blinding of the participants). An incentive of a certificate of completion of MI training, as well as a $5 gift card from Starbucks, were provided (Appendix E: Recruitment poster).

Interested students could follow the link from the recruitment poster or contact the researcher for further information. The consent form was set up on the Qualtrics platform (Qualtrics, 2005), with the information letter and eligibility questions. Participants who gave their consent and passed the eligibility questions were immediately directed to the baseline survey. After completing the baseline survey, a randomization generator classified the participants into either intervention or control groups, by letting them choose from the respective session times available for each intervention arm. When a session registration was filled up or a session's date approached, an email was sent to the registered participants with the Zoom link and some MI introductory material (Appendix J: Introduction pre-reading material). After each session, a link to the post-training survey was sent to attendants and finished respondents received a certificate of completion.

Eligibility criteria: Different inclusion criteria were applied to the two data collection phases. In the spring, only third and fourth-year students were allowed to participate, while in the fall this inclusion criterion was amended to accept participants from all 4 undergraduate nursing years. This change was decided due to the extremely low response rate and the interest of some students from the first two years in the study. The other eligibility criterion was the same throughout the study, which was an age of at least 18 years. Previous MI training or use was not considered an exclusion criterion as a large portion of the students (i.e., year 3 and 4) were expected

to have read about MI in their Mental Health course readings. Therefore, excluding students who trained before would have significantly decreased the sampling pool, which was 300 students in total.

4.3.3 Randomization

Participants were randomized using Qualtrics software (Qualtrics, 2005) random generator into SIM (intervention group) or e-learning (control group). Randomization took place after consenting and answering the baseline survey and before choosing the session timing. The Qualtrics software allows for a blinded randomized redirection of respondents to one of two blocks of questions containing either the SIM or the control sessions timings, after finishing the baseline survey block. Participants were blinded from the intervention type (i.e., they were not informed about which arm is the intervention arm). Both groups received material related to the use of Motivational Interviewing (MI) in the management of patients with substance use disorders (SUD) for one hour: one group received this via SIM learning and the other group via e-learning. Evaluation and comparison of both training types were focused on four outcomes: MI self-efficacy, knowledge, attitude, and subjective norm. Evaluation of each method took place through completing assessments (created via Qualtrics software) by the participants at two points in time: immediately before randomization (i.e., baseline T1), and after the training (T2). Email reminders for completing the post-training surveys were sent, within a window of one month, after the training date.

4.3.4 Intervention

Ten SIM and ten e-learning sessions were held over two phases. Half of these sessions took place in May 2021, while the rest took place in October 2021. The SIM training consisted of a brief introduction about MI by a clinical psychology doctorate student (supervised by a registered

clinical and health psychologist with expertise in addiction treatment), followed by roleplays by the research participants to practice the basic skills. The roleplays consisted of common substance use clinical scenarios with a practice patient (i.e., acting patient). Each SIM session included 2-4 nursing student participants. Scenarios were developed by the clinical psychology facilitator and were reviewed by an MI expert before the intervention (Appendix H: SIM session power point). A different clinical psychology graduate student facilitated the fall SIM sessions using the same material developed by the original facilitator from the spring phase. The role of the patient was played by volunteer psychology students or by the investigator in some sessions. However, the scenarios were kept fairly similar across the SIM sessions. The clinical psychology facilitator started with a brief introduction about MI skills that could improve the clinician-patient interaction, performed a roleplay with the practice patient in front of the students, and facilitated discussions among the group about the roleplay ("How did that go?" "What did you think?" "Would you be able to try?"). This demonstration and discussion were followed by each of the participants taking a chance to roleplay the same skill with the practice patient and get feedback from the facilitator. This was repeated for each of the basic four MI skills: open questions, affirmation, reflective listening, and summarization. All the training sessions took part via Zoom due to the Covid-19 pandemic.

4.3.5 Control condition

Participants in the control condition were provided with a package of curated audios by MI experts and a demonstrating clinical situation video showing how to use MI with SUD patients (Appendix F: Control material (e-learning)). This e-material was shared in one of 10 zoom sessions, according to the participants convenience. Each zoom sessions had an average of 3 participants. However, the control group only watched the MI video and listened to several short audios, without

any further discussion with the researcher. The post-training survey (T2) links were sent during the Zoom sessions for both groups and by up to three email invites after the sessions, in case the participants missed the link.

4.3.6 Data collection

Evaluation of each learning method (SIM vs. e-learning) occurred through 10-minute-long surveys, administered through Qualtrics software (Qualtrics, 2005), at two points in time:

1) Baseline questionnaire (T1) (Appendix A: Baseline Survey) was taken by the students immediately before randomization. The questionnaire included assessments of baseline MI self-efficacy, knowledge, attitude, subjective norm, and intent to use with their patients. Participants were asked if they previously used MI or had any prior attempts to learn about MI skills. Questions about other possible confounders, like age, ethnicity, gender, year and attitude towards SUD patients (i.e., stigma) were assessed in this survey as well.

2) Post-training (T2) (Appendix B: Post-training Survey (SIM group) and Appendix C: Post-training Survey (E-materials group)) was taken by each group of students immediately after the SIM or e-learning sessions. This questionnaire included questions about satisfaction with the training, MI self-efficacy, knowledge, attitude, and subjective norm. MI's intent to use, previous use or training, and attitude towards SUD patients were also collected in this survey in case of the presence of missing data in the baseline survey's responses. However, this did not happen.

4.3.7 Measurements

Exposure measurements:

Participants were randomized to either the SIM training (trial group) or the e-material review (control group). The type of training (SIM or e-learning) is considered the exposure variable in this study, which is dichotomous.

Outcome measures:

Most of the studies evaluating similar outcomes to this study in a population of undergraduate nursing students using simulation as a learning method used scales designed specifically for their studies (Lavoie et al., 2018). Therefore, many of the tools that were used in this study were modified scales of non-validated tools that were found in the literature with similar outcomes.

Motivational interviewing (MI) knowledge and attitude: The Motivational Interviewing Knowledge and Attitude Test (MIKAT) (Leffingwell, 2006) was used to assess the MI knowledge and attitude of participants. The test consists of 14 true or false questions, including statements reflecting MI attitudes, and then the fifteenth and last question is a multiple-choice question reflecting the knowledge about counselling behaviours consistent with MI (Parrilla, 2016). Scores were calculated separately for attitude and knowledge in this study, by summing up the scores for each scale. The correct answers for the true or false were obtained from the attached model answer to previous work using the MIKAT scale (Parrilla, 2016). The resulting total attitude score was 14, out of the 14 "True or False" questions. The multiple-choice questions included 5 right answers, out of 15 choices, that are consistent with MI skills. So, the score for knowledge ranged from 0-5 depending on the number of right choices checked by the student. The internal consistency of the tool has been validated with a Cronbach's alpha of 0.84 (Doran et al., 2013).

Self-efficacy to use MI: Nursing students' self-efficacy to use MI skills was measured using 10 items expressing the various steps in an MI session, to be rated for students' confidence on an 11-points Likert scale, with a minimum of 0 and a maximum of 100. The scale was adapted from a study that measured the physiotherapy students' self-efficacy to use MI skills (Black et al., 2016). The reliability and validity of this scale were internally assessed by self-efficacy experts at

the university that hosted the study, but no reliability coefficients were documented for this scale (Black et al., 2016).

Subjective and normative norms for MI use: Subjective norm was measured using two questions adapted from two previous studies that measured subjective norm in nursing staff (Bernaix, 2000; Nash et al., 1993). The questions were "Other nurses think that I should use MI with people who have SUD" and "Most people who are important to me think that nurses should use MI with people who have SUD". The response to both questions was on a 7-points Likert scale ranging from "not at all likely" to "extremely likely". The used scales were not validated before but were successfully used in the nursing staff population (Bernaix, 2000; Nash et al., 1993).

Program satisfaction: Satisfaction with the training scale was added to the post-intervention survey for both groups. However, the questions that were only related to SIM were excluded from the control group's survey. Questions were developed by Dr. Willhaus and colleagues, to assess participants' satisfaction with an SBIRT (Screening, Brief Intervention, and Referral to Treatment) training for undergraduate nurses (Seigart et al., 2018). SBIRT is another strategy to support people with problematic SUD. Thirteen items on a 5-point Likert scale indicated satisfaction with the training program. An example question is "How satisfied are you with the quality of the simulations between the patient and practitioner?". The questions were modified to fit the nature of the adult population with problematic substance use. One question was added to this scale from the US Substance Abuse and Mental Health Services Administration, Center for Substance Abuse Treatment (SAMHSA, CSAT) program satisfaction questionnaire (*CSAT BASELINE TRAINING SATISFACTION SURVEY v2.0*). This question consists of a rating for the statement "I would recommend this training to a colleague".

Other covariates measures:

Attitude or Stigma towards SUD patients:

The attitude of care providers towards SUD patients was found to be measured by scales that are designed to be filled by the patients rather than the health care providers. Only one scale was found that explored the attitude of medical staff towards SUD patients and was designed to be filled by providers. It was specifically designed and used in a study (i.e. not previously validated) among a population of general internists to assess their attitudes and preparedness to manage SUD cases (Wakeman et al., 2016). The tool consists of measuring participants' agreement to six attitude statements on a four-point Likert scale. Scores were then calculated by dichotomizing each answer into 0 or 1, where zero represents low stigma and 1 represents high stigma. The total of the six questions was summed up to form a Stigma score for each participant, which ranged from 0 to 6.

Previous MI training: This potential confounder was measured with a single yes/no question "Did you receive any prior training in Motivational Interviewing?" at baseline and post-training. Answer choices included no, yes, and only as a part of the readings (i.e., recommended course reading by the school).

Previous MI use: A single question about the use of MI skills with patients was used to assess the previous usage. The question is: "Did you use MI skills with any patients before?". This question was adapted from a previous study that assessed the increase of MI use in primary health care professionals after virtual simulation training, with no measured validity or reliability (Albright et al., 2018a).

Demographics: Year of study, age, gender, and ethnicity of participants were measured through direct questions. Year of study choices varied from the first to fourth years. The age of participant questions provided multiple answer choices varying from 18 to 30 or older. The

gender choices were male, female, doesn't identify as male or female, and prefers not to answer. Ethnicity choices were white, black, south-Asian, indigenous, and other.

4.3.8 Analysis

All statistical analyses were performed using SPSS 27.0 (IBM corp, 2020). Data was exported from Qualtrics software to excel sheets, where duplicates were cleaned. Some respondents consented and did not continue for the baseline survey and were excluded. Some others proceeded to the baseline survey but stopped at a very early stage and were also excluded from the final dataset. The last group which completed the baseline survey but dropped out of the training was included and compared to the continuing participants. Data linkage between baseline and follow-up surveys was performed using the participants' email addresses as the unique identifier. Following the linking process, the data were de-identified and non-identifiable alphanumeric codes were assigned to each of the 52 participants. Scoring sheets for the MIKAT and stigma questions were used to calculate scores for attitude, knowledge, and stigma. Due to the sample size, some covariates were recoded into dichotomous variables. These included: year of study, ethnicity, and previous training. Univariate descriptive analysis was conducted to compare participants who completed the training and others who completed the baseline survey but didn't attend the training. Also, descriptive statistics by the type of training received were compared. Paired t-tests were used to compare the improvement in each of the outcomes' scores, for the whole sample, then for each arm separately. Independent samples t-tests were completed for the 4 outcome variables by each covariate category.

To test the first study hypothesis, which states "SIM training will be associated with higher post-training MI self-efficacy, attitude, knowledge, and subjective norm, compared to e-learning", two analyzing approaches were used; MANCOVA and change in score approach

(Vickers & Altman, 2001). MANCOVA was used to assess the adjusted effect of the training type on each of the outcome variables' post-training scores while controlling for baseline scores and potential confounders. The change-in-score approach assessed the adjusted effect of the training type on the change in outcome scores between baseline and post-training. The change-in-score approach was used to account for the significant variability in the baseline scores between intervention and control groups. However, since the baseline scores' variability is in favour of the control group, using the results from the change-in-score approach will overestimate the effect of training on the outcomes, as per Vickers & Altman:

> "If, by chance, baseline scores are worse in the treatment group, the treatment effect will be underestimated by a follow up score analysis and over-estimated by looking at change scores (because of regression to the mean). By contrast, analysis of covariance gives the same answer whether or not there is baseline imbalance." (Vickers & Altman, 2001)

Therefore, the results from both approaches are presented but only the MANCOVA results are interpreted. To identify important confounding variables for each outcome, we used a mean squared error-based modelling strategy, which helps to obtain the most accurate estimate while controlling for potential confounders in an etiological model rather than a predictor model (Greenland et al., 2016) (see Appendix I-1: Greenland method for confounders selection (Chapter 4), for confounders selection strategy details).

4.4 Results

4.4.1 Participants and demographics

Seventy-five students registered for participation in the study. Sixty-six of them took and finished the baseline survey, while the rest didn't return or were excluded due to their age. Of the

66 registered participants, 62 were scheduled for the sessions (31 in each arm), 52 attended the

training (26 in each arm) and a total of 14 were lost after T1; 4 of which did not schedule their

training and 10 did not show up to their scheduled sessions. The attrition after randomization

(i.e., scheduling) was 6 participants from the SIM and 4 participants from the control group.

Statistical comparison between those who completed their training (n=52) and those who

dropped out (n=14) yielded statistically significant differences in baseline MI knowledge scores

(p= 0.003) and ethnicity (p <0.001). Baseline MI mean knowledge score (2.3 +/-1.4) was

significantly lower in the dropouts, compared to those who completed the training (3.3 +/- 1)

(Table 2). As for ethnicity, the proportion of other-than-white ethnicities was 14% for the

dropouts, compared to 38% in the completed participants (Table 1).

Table 1- *Baseline characteristics by registration and type of training (categorical variables)*

Variables		Lost after registration		Registered and trained (total)		SIM		Control	
		Frequency	%	Frequency	%	Frequency	%	Frequency	%
Year	1 and 2	5	35.7	14	26.9	8	30.8	6	23.1
	3 and 4	8	57.1	38	73.1	18	69.2	20	76.9
	missing	1	7.2						
	Total	14	100	52	100	26	100	26	100
Gender	Male	2	14.3	7	13.5	1	3.8	6	23.1
	Female	12	85.7	44	84.6	25	96.2	19	73.1
	not male or female	0	0	1	1.9	0		1	3.8
	Total	14	100	52	100	26	100	26	100
Ethnicity	White	12	85.7	32	61.5	16	61.5	16	61.5
	Others	2	14.3	20	38.5	10	38.5	10	38.5
	Total	14*	100	52*	100	26	100	26	100
Prior training	No	10	71.4	39	75.0	23**	88.5	16**	61.5
	Yes, or reading	4	28.6	13	25.0	3**	11.5	10**	38.5
	Total	14	100	52	100	26	100	26	100
Prior use	No	10	71.4	44	84.6	23	88.5	21	80.8
	Yes	4	28.6	8	15.4	3	11.5	5	19.2
	Total	14	100	52	100	26	100	26	100
Time of training	Spring	6	42.9	25	48.1	12	46	13	50
	Fall	8	57.1	27	51.9	14	54	13	50
	Total	14	100	52	100	26	100	26	100

*represents statistically significant differences between dropouts and completed
**represents statistically significant differences between SIM and control

Univariate descriptive statistics were completed on 52 participants, 26 in each

intervention arm. Seventy-three percent of the participants were in the third or fourth year of

nursing school. There were few males in the sample (13.5%); moreover, the distribution of males was not even between the two intervention arms (i.e., one male in SIM and 6 males in control). The distribution of previous MI training or reading was significantly different across the two arms (p = 0.025). For instance, 11.5% of participants in the SIM group had previous training, compared to 38.5% in the control group (Table 1).

Table 2 - *Baseline characteristics by registration and type of training (scale variables)*

Variables	Lost after registration		Registered and trained (total)		SIM		Control	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age	24.5	4.27	24.27	3.89	23.92	3.65	24.64	4.17
Stigma	1.64	1.39	1.08	1.06	1.19	1.16	0.96	0.96
Baseline Self-efficacy	54.64	18.3	61.06	17.7	56.15**	15.41	65.96**	18.72
Baseline attitude	8.21	1.81	8.73	1.94	8.35	2.19	9.12	1.61
Baseline knowledge	2.29*	1.44	3.31*	1.00	3.42	0.98	3.19	1.02
Baseline subjective norm	10.29	2.27	10.04	2.43	9.69	2.11	10.38	2.69

*represents statistically significant differences between dropouts and completed
**represents statistically significant differences between SIM and control

As for the continuous variables (Table 2), the mean baseline stigma score was 0.96 (SD = 0.96) in the control group, compared to 1.19 (SD = 1.17) in the SIM group. Self-efficacy baseline scores were significantly lower (p = 0.04) in the SIM group (mean = 56,15, SD = 15.4), compared to the control group (mean = 65.96, SD = 18.73). On the other hand, the attitude, knowledge, and subjective norm baseline scores were not significantly different between the two

groups. It is worth noting that the baseline intent scores were negatively skewed compared to the rest of the scores (see Appendix K-1: Chapter 4 histograms for distributions).

4.4.2 Satisfaction scores

Both types of training were considered satisfactory for the participants, regarding covering the goals, enhancing the skills, relevancy to their careers, beneficence to substance users, and the ability of the applicant to apply the learned skills. The overall satisfaction scores ranged from 8 to 40. However, the mean overall satisfaction scores were slightly (not significant) higher for the control group (35.5), compared to the SIM group (mean 33.5). The likelihood score to recommend the training for another colleague was high, regardless of the training type (Table 3). Finally, the SIM group had three additional questions to assess their satisfaction with the quality of the simulated conversation with the practice patient. The scores ranged from 5 to 15, with a mean of 12.2. The three questions evaluated the participants' ability to identify SUD patients, the gain of conversation tactics, and the representativeness of reality during the SIM session. The most satisfying aspect among the three was gaining conversation tactics (mean score = 4.5 out of 5), while the least satisfaction score was with the ability to identify SUD patients (mean score = 3.5 out of 5).

Table 3 - *Satisfaction scores*

	Overall satisfaction		SIM Satisfaction		Recommendation of the training to a colleague	
	Mean	SD	Mean	SD	Mean	SD
Whole sample (N=52)	34.52	9.3	-	-	4.81	0.49
SIM (N=26)	33.58	10.27	12.15	1.9	4.77	0.59
Control (N=26)	35.46	8.32	-	-	4.85	0.37

4.4.3 Post-training outcome scores

No significant differences were found between the mean outcomes scores by training type, according to the independent t-tests. The post-training self-efficacy mean score was 84 in the control group, compared to 79 in the SIM group. The post-training attitude mean score was 9.8 in the SIM group, compared to 9.4 in the control. The post-training knowledge mean scores were 3.7 and 3.6 in the control and SIM groups, respectively. Finally, the post-training subjective norm mean scores were 12 for the control and 11.5 for the SIM groups (see figures 2-5)

4.4.4 Bivariate analysis

Paired t-test results: All four outcomes increased for the whole sample significantly from baseline to post-training (Table 4). However, some of the scores' improvements were attributed to one arm rather than the other. For instance, the SIM group attitude scores' mean difference was significantly higher in the post-training survey (p-value <0.001), compared to a non-significant increase in the control group. On the other hand, the control group's knowledge scores' mean increase after the training was significant (p-value = 0.03), compared to the SIM

group (p-value = 0.54). The mean scores of self-efficacy and subjective norm significantly

increased in both groups.

Although the post-training scores in the control group were higher, the increase in scores

for the SIM group was larger (Figures 1-4). For instance, for the self-efficacy score, the mean

difference was 23 (+/- 14.9) for the SIM arm compared to 18 (+/- 12.5) for the control arm. This

can be explained by the lower scores of the SIM group at baseline, which cannot be explained

except by chance.

Table 4 - Paired t-test results for the entire sample, intervention, and control groups

Variables paired	Sample		Paired differences					Paired t-test	Sig. (2-tailed)
		Mean difference	Std. Deviation	Std. Error Mean	95% CI of the Difference				
					Lower	Upper			
Baseline and Post-training **Self-efficacy**	Total sample (n=52)	20.65	13.83	1.92	16.81	24.50		10.77	0.00
	SIM (n=26)	23	14.93	2.93	16.97	29.03		7.85	0.00
	Control (n=26)	18.31	12.4	2.45	13.27	23.34		7.49	0.00
Baseline and Post-training **Attitude**	Total sample (n=52)	0.89	2.29	0.32	0.25	1.52		2.79	0.01
	SIM (n=26)	1.46	2.14	0.42	0.60	2.33		3.48	0.00
	Control (n=26)	0.31	2.33	0.46	-0.63	1.25		0.67	0.51
Baseline and post-training **Knowledge**	Total sample (n=52)	0.33	1.17	0.16	0.002	0.65		2.02	0.05
	SIM (n=26)	0.15	1.26	0.25	-0.35	0.66		0.63	0.54
	Control (n=26)	0.5	1.07	0.21	0.07	0.93		2.39	0.03
Baseline and post-training	Total sample (n=52)	1.73	2.52	0.35	1.03	2.43		4.95	0.00

Subjectiv e norm	SIM (n=26)	1.77	2.05	0.40	0.94	2.60	4.41	0.00
	Control (n=26)	1.69	2.96	0.58	0.50	2.89	2.91	0.01

The independent t-test comparison of post-training means didn't show any significant differences in the mean outcomes' scores between the two arms. However, the post-training self-efficacy mean score was significantly different by the year of study and the age of the participants (p-value 0.01). Additionally, the post-training knowledge mean score was significantly different between participants who identified as white and other ethnicities (p-value 0.02) (**Appendix L**: Independent t-test results (Chapter 4)).

Figure 2 - Increase in Self-efficacy mean scores by type of training
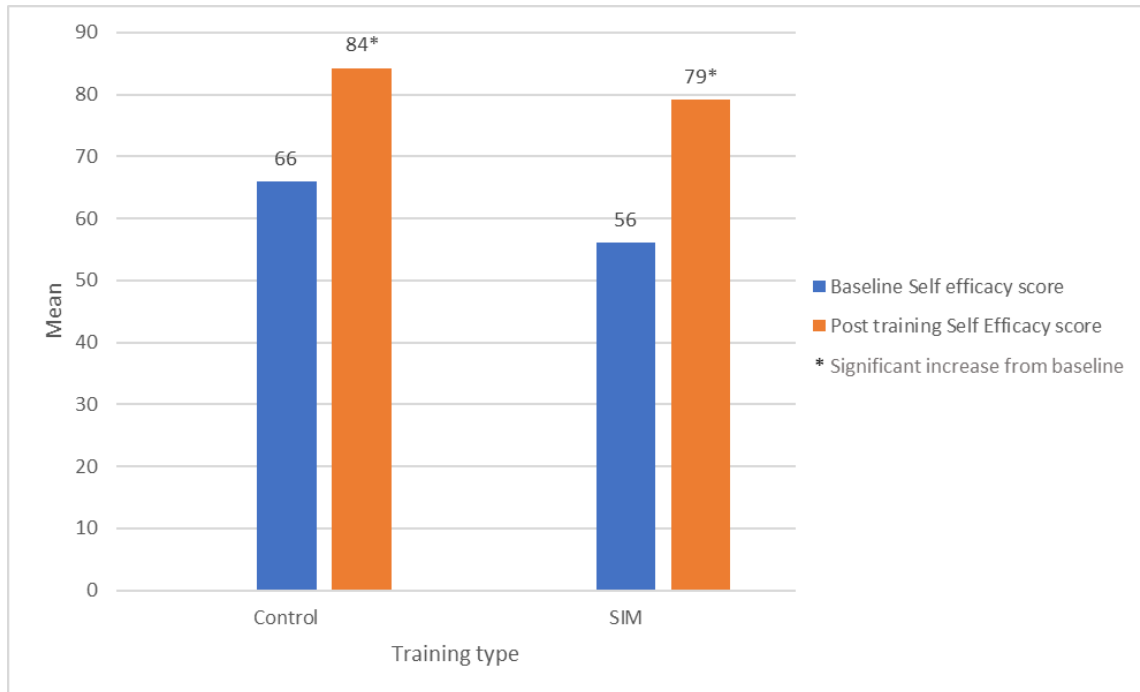
Figure 3 - Increase in Attitude mean scores by type of training
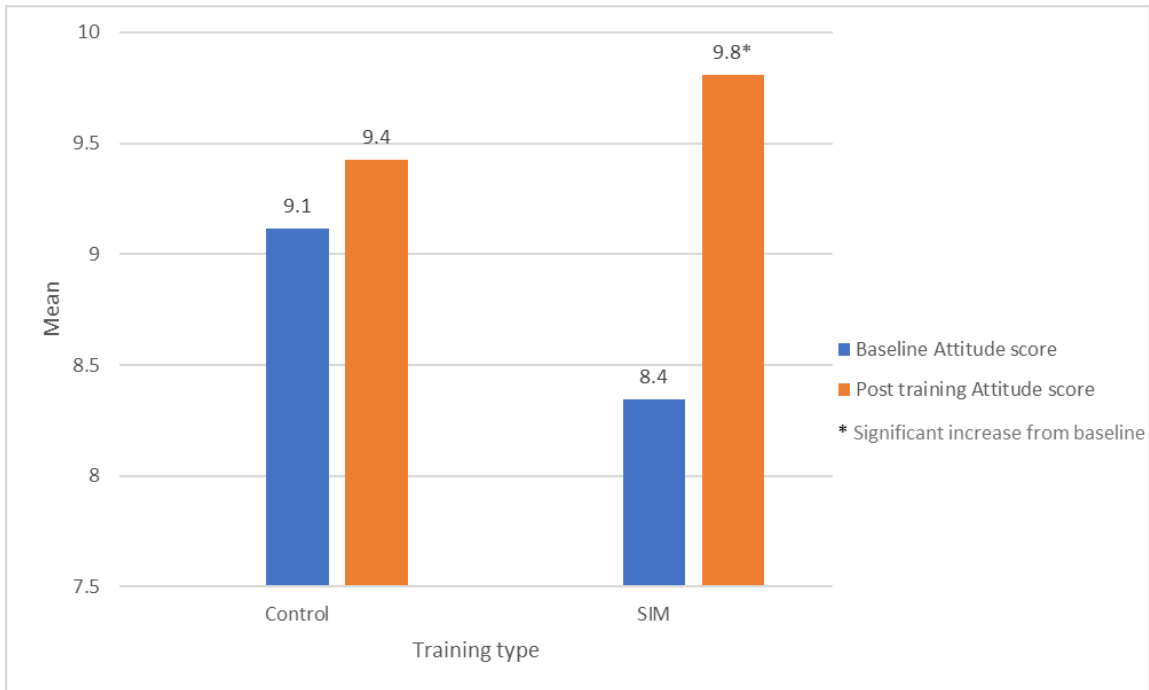
Figure 4 - Increase in Knowledge mean scores by type of training
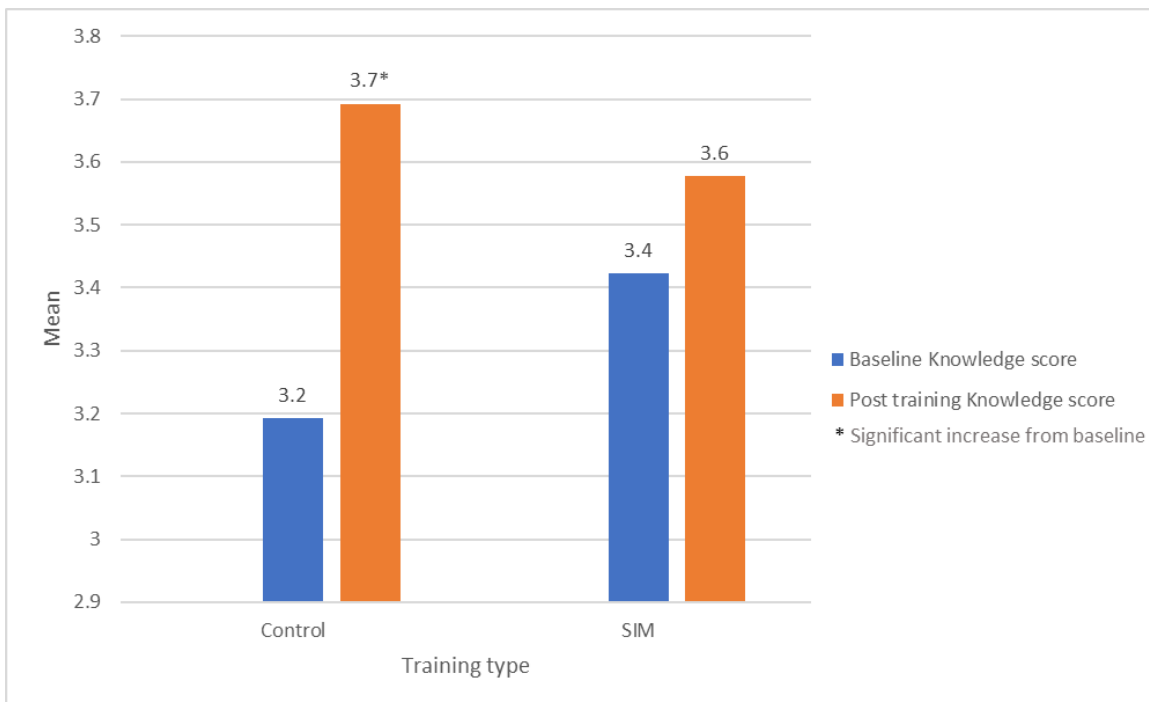
Figure 5 *- Increase in Subjective Norm mean scores by type of training*
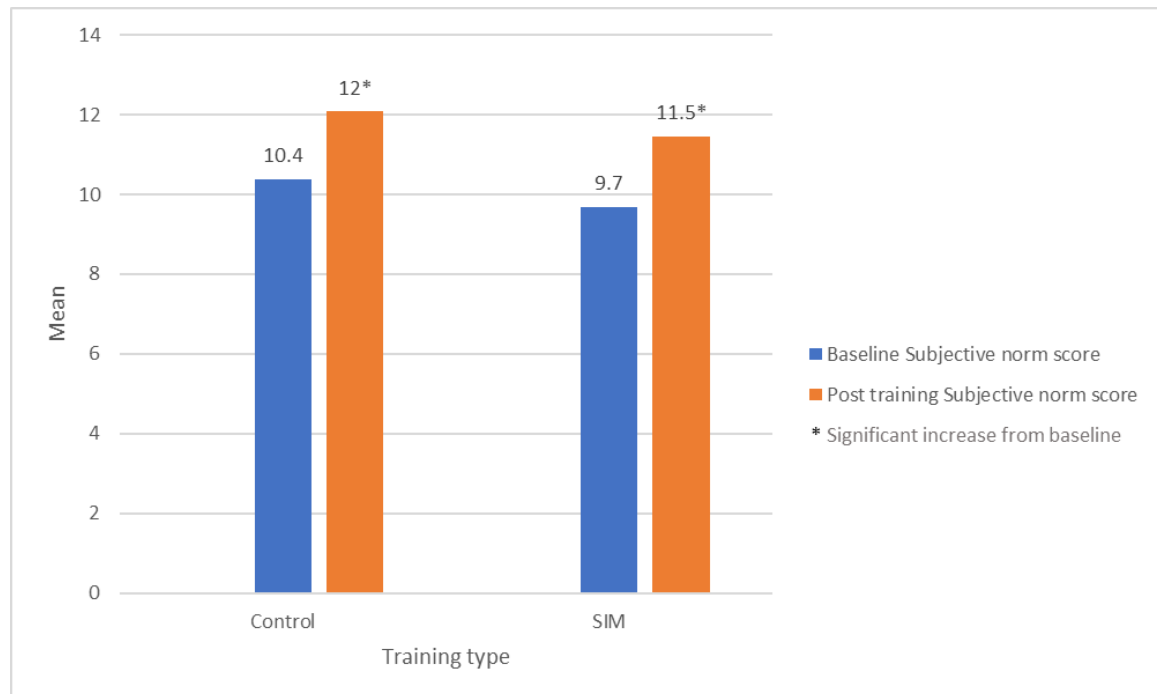
4.4.5 Multivariable analysis

Considering the differences in characteristics between the two intervention arms and the independent t-test results, a group of covariates was tested with each of the post-training scores outcomes. Greenland et al.'s (2016) method was used to select which confounders should stay in each of the models, to minimize the mean squared error. *(See* Appendix I-1: Greenland method for confounders selection (Chapter 4)*for detailed selection procedure)*.

Two approaches were used to assess the effect of the training type on the four outcomes of interest. In the first approach, the dependent variable used was the post-training score of each outcome. In this "post-training score approach", the baseline score was included as a confounder in the model. In the second approach, the dependent variable used was the change in each outcome score. In the "Change in score approach", baseline scores were not included in the model.

The resulting coefficients from both approaches were not statistically significant for any of the four outcomes (Tables 5 and 6). However, in the first approach, the regression models fitted the data well ($p<0.05$), unlike the models in the second approach (Appendix M: Models summary (Chapter 4)).

Approach 1 results: Participants who received the SIM training had lower post-training SE, knowledge, and SN scores by 1.5 (scores range 37 to 100), 0.29 (Range 1 to 5), and 1.12 (Range 4 to 14), respectively. However, participants trained by SIM were observed to have a higher post-training mean attitude score of 0.778 (Range 3 to 14), compared to control. No statistically significant association was found between any of the 4 post-training outcome scores and the training type.

Table 5 *– MANCOVA comparing the post-training outcome scores between intervention and control groups*

Outcome	Unstandardized β-coefficients	95% Confidence interval		Covariates included in the model (with Training Type)
		Lower bound	Upper bound	
Post-training Self-efficacy (SE)	-1.524	-7.834	4.786	Baseline SE, gender, stigma, year of study
Post-training Attitude	0.778	-0.388	1.945	Baseline Attitude
Post-training Knowledge	-0.295	-0.806	0.216	Baseline Knowledge, ethnicity, gender
Post-training Subjective norm (SN)	-1.122	-2.423	0.178	Baseline SN, gender, stigma, previous MI training

Approach 2 results: The change in score approach showed that those receiving the SIM, compared to control, were not significantly different, regarding the change in their scores after the training.

Table 6 *– Multivariable linear regression comparing the change in outcome scores between intervention and control groups*

Outcome	Unstandardized β-coefficients	95% Confidence interval	Covariates included in the model

		Lower bound	Upper bound	
Change in Self-efficacy (SE) score	2.637	-5.124	10.397	gender, stigma, year of study
Change in Attitude score	1.154	-0.092	2.400	-
Change in Knowledge score	-0.470	-1.158	0.217	ethnicity, gender
Change in Subjective norm (SN) score	-0.393	-2.030	1.243	gender, stigma, previous MI training

4.5 Discussion

4.5.1 Main findings

This randomized controlled trial, comparing SIM learning style to unidirectional e-learning in undergraduate nurses to learn about MI skills, showed an increase in overall MI self-efficacy, attitude, knowledge, and subjective norm, for nursing students in both arms. This study confirmed the findings from Seigart et al. (2018), Badowski et al. (2019), and Chang et al. (2019), regarding the satisfaction with SIM as a modality to learn MI skills, as well as the increase in MI self-efficacy, attitude, and knowledge, after receiving such training. This study compared four learning outcomes between two styles of learning, using a randomized controlled trial design. The randomization process was successful at creating two groups of participants who are fairly similar in many of the demographic characteristics and baseline scores. However,

due to the small sample size, a few significant exceptions to the randomization's effectiveness in creating equal comparison groups were seen in gender, previous MI training, and baseline MI knowledge. To account for the uneven distribution of gender and previous training, they were tested for confounding effects within the analysis of each of the four outcomes. Moreover, the randomization didn't result in comparable baseline outcomes scores, especially for MI self-efficacy and attitude, which was reflected in the post-training outcomes scores as well.

Both types of training were well received by the participants, as per the satisfaction scores. The overall training satisfaction was slightly higher for the control group, which was not expected. However, this could be explained by the nature of the questions for overall satisfaction, which included the ability to apply the learned skills, which is reflective of self-efficacy. Self-efficacy scores were higher for the control group, hence their overall satisfaction score. For the three questions about SIM satisfaction, in particular, the scores made sense to what was covered in the sessions. The lowest scores were seen for "identification of SUD patient", which was not covered in the sessions. On the other hand, the highest scores were seen with "gaining conversation tactics", which is the governing aspect of MI skills. The high satisfaction of participants with the MI training in this study confirms previous MI SIM training satisfaction in former studies, like Badowski et al. (2019) and Seigart et al. (2018). The satisfaction scale used was in fact adapted from the latter study.

The paired t-test results for self-efficacy scores showed a significant increase for both training types, SIM and control. However, the mean difference was higher for the SIM group, which echoes the results of Chang et al. (2019) about the increase in participants' self-efficacy after MI SIM training. A potential factor for the significant increase of SE in the control group is that students in the SIM group had a real sense of how difficult it is to implement MI skills in

practice, compared to the control e-learners who just heard examples of people who make MI sound easy. The paired attitude scores only showed a significant increase in the SIM group, which also is supported by the literature. On the other hand, the paired t-test for knowledge scores revealed a significant increase in the mean score in the control group, unlike the SIM group. This unexpected finding could be attributed to several factors. First, the curated audios offered in the control group contained some MI-consistent expressions (e.g., rolling with resistance) that were not thoroughly explored in the SIM sessions. The main focus of the SIM sessions was on practicing the four basic skills for each participant, which gave no time for deeper elaboration on the rest of the MI concepts. Also, many concepts covered in the SIM sessions, by chance, were not labelled in the same way as the MIKAT questionnaire. The second possible factor could be the disparity between the presenters in both training groups; in the SIM session, the facilitator was a clinical psychology graduate student, while in the control materials, the speakers were experienced clinicians with MI expertise. This may explain why knowledge scores increased significantly in the control group only. Finally, the paired t-test results for subjective norm (SN) scores showed a significant increase for both training groups. This could be attributed to the personal interaction component in the SIM group, and on the other hand, it can be explained by the diversity of successful examples for the use of MI in the e-learning audios.

The adjusted association between the training type and each of MI post-training SE, attitude, knowledge, and SN of participants was not statistically significant in both of the used approaches. This non-significance can be attributed to the small sample size (n=52). Similarly, the short duration of the SIM sessions being one hour can be a factor in the non-significance of the resulting changes in SE, attitude, knowledge, and subjective norm. The MANCOVA

modelling approach's results were surprising, as the models showed no significant differences in the post-training scores between SIM and control . This finding does not concur with the study hypothesis, previous literature or the paired t-test results. This contradiction with the hypothesis could be explained by the difference in baseline scores between the two groups, as well as other factors. For SE, in general, pre-training scores were lower in the SIM group so though there was a higher change, the post-training scores remained lower (Figure 1). Additionally, the small duration of the SIM training, as well as its experiential nature, might have contributed to the low post-training self-efficacy scores. Learning by SIM can be stressful for some students to improvise in front of other people and try to apply newly learned skills (within the past hour). For attitude, the baseline attitude scores in the SIM group were lower than the control group. Thus, although the post-training mean attitude scores were not different between the two groups, the increase in score was bigger for the SIM group.

4.5.2 Limitations and strengths

Limitations. The first recruitment timing in March 2021 was very challenging due to Covid-19 restrictions, in addition to the end of semesters examinations. The challenging virtual recruitment not only affected the sample size but also led to the second phase of recruitment and sessions in the fall of 2021. Across the two phases, some changes occurred to the protocol and the training. The inclusion criteria were changed to include all four nursing school years, while in the spring year 1 and 2 were excluded. Nursing students do not get exposed to mental health material until their third year. However, to account for the potential bias of the results, independent t-tests were used to compare the means of each of the outcomes by the study year variables (i.e., Year 1&2 or Year 3&4). Post-training SE scores were significantly different across the first two years and the third and fourth years. Therefore, the year of study was tested

as a potential confounder for SE and was controlled for in the final model. Furthermore, the SIM training's facilitator changed across the two phases. To overcome this limitation and to keep the material consistent for all participants, the same presentation and scenarios were used in the second phase.

Another limitation in the study is in the scoring accuracy of the knowledge question of the survey, where the question stated: "choose all that apply". So, participants could choose as many answers as they want, while only five choices were scored as correct. The lack of a limit on the number of choices made it possible for some participants to choose almost everything and get a maximum score, while others accurately chose four right answers and didn't get the maximum score. A possible misclassification bias in the knowledge scores may be present, although non-differential. Thus, the observed effect estimates between the type of training and MI knowledge scores may be inaccurate.

Finally, individual preferences in learning styles are a potential factor for the increase in SE, attitude, and knowledge. Asking about some individual learning preferences, like visual, auditory, or experiential learning, could be beneficial in understanding and interpreting the distribution of the outcomes. Another dimension to this is the way in which each individual perceives their performance in roleplays, and whether their self-efficacy gets heightened or reduced after roleplaying.

Strengths. This study was the first to add a control group to provide a comparison between two types of learning in the delivery of MI-related material. Conducting the study on the undergraduate nursing level was only previously done by Seigart et al., where the attitude toward SUD patients was assessed before and after the training. In my study, the attitude towards SUD

patients (i.e., stigma) is only considered as a confounder to the association between the learning modality and the four outcomes of interest.

Using a randomized controlled trial and multivariable regression analysis to evaluate SIM in MI skills learning was novel. Using a multivariable analysis in this study, although didn't provide significant results, contributed to the literature by identifying the potential significant confounders for each of MI self-efficacy, attitude, knowledge, and subjective norm. The statistically non-significant results from this study provide the possibility for nursing schools to introduce MI skills to their students in the most convenient way for their instructors. Since SIM can be expensive and time-consuming, the results allow enhancing MI skills through watching and listening to available e-material.

4.6 Conclusion

This study showed that the impact of training type was not significantly different between SIM and e-learning although there was an overall increase in the outcomes. These results may inform the nursing school stakeholders that both learning styles could be incorporated to introduce MI skills to undergraduate nurses. Especially, since MI skills were positively received by all undergraduate nursing participants. Moreover, the SIM training, although of short duration, was perceived as satisfactory for the SIM group and can be replicated.

Figure 6-Demonstration of scores increase by training type (by paired t-test)
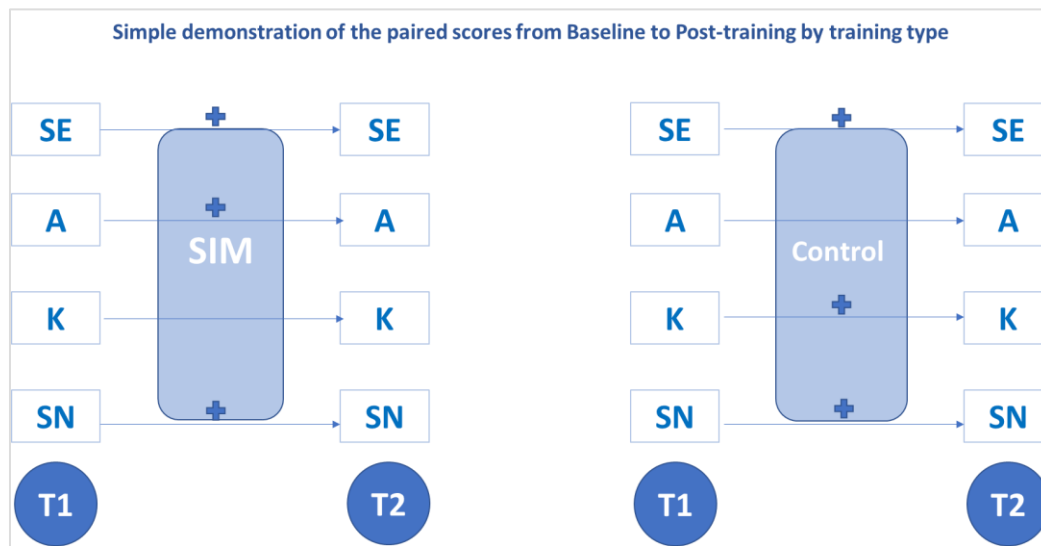
MI learning through SIM was not significantly associated with MI self-efficacy to use the skills, MI attitude, knowledge, or MI-related subjective norm. However, the paired outcomes' scores from baseline (T1) to post-training (T2) showed significant increases in mean scores of self-efficacy, attitude, and subjective norm, for the SIM learning group. On the other hand, the paired outcomes' scores showed significant increases in mean self-efficacy, knowledge, and subjective norm, for the e-learning group. Future research can build on the findings by testing a larger sample size and accounting for individual preferences in learning styles. Nonetheless, using more objective assessment tools of MI skills in future research will help to provide a more accurate comparison between the two learning styles.

4.7 References

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In *Action control* (pp. 11–39). Springer.

Albright, G., Bryan, C., Adam, C., McMillan, J., & Shockley, K. (2018). Using Virtual Patient Simulations to Prepare Primary Health Care Professionals to Conduct Substance Use and Mental Health Screening and Brief Intervention. *Journal of the American Psychiatric Nurses Association*, *24*(3), 247–259. https://doi.org/10.1177/1078390317719321

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.). https://doi.org/10.1176/appi.books.9780890425596

Badowski, D. M., Rossler, K. L., & Gill-Gembala, L. T. (2019). Telehealth simulation with motivational interviewing: Impact on learning and practice. *Journal of Nursing Education*, *58*(4), 221–224. https://doi.org/10.3928/01484834-20190321-06

Bernaix, L. W. (2000). Nurses' Attitudes, Subjective Norms, and Behavioral Intentions Toward Support of Breastfeeding Mothers. In *BernaixJ Hum Lact* (Vol. 16, Issue 3).

Black, B., Lucarelli, J., Ingman, M., & Briskey, C. (2016). Changes in physical therapist Students' self-efficacy for physical activity counseling following a motivational interviewing learning module. *Journal of Physical Therapy Education*, *30*(3), 28–32.

Brubacher, J. R., Mabie, A., Ngo, M., Abu-Laban, R. B., Buchanan, J., Shenton, T., & Purssell, R. (2008). Substance-related problems in patients visiting an urban Canadian emergency department. In *Canadian Journal of Emergency Medicine* (Vol. 10, Issue 3, pp. 198–204). Canadian Medical Association. https://doi.org/10.1017/S1481803500010101

Canadian Centre on Substance Use, & Canadian Centre on Substance Use. (2021). *Mental Health and Substance Use During COVID-19 SUMMARY REPORT 3: Spotlight On Income, Employment, Access*. https://mentalhealthcommission.ca/wp-content/uploads/2021/09/leger_poll_spotlight_on_income_employment_access.pdf

Chakravarthy, B. (2006). Medical simulation in EM training and beyond. *Newslett Soc Acad Resid*, *18*(1), 18–19.

Chang, Y., Cassalia, J., Warunek, M., & Scherer, Y. (2019). Motivational interviewing training with standardized patient simulation for prescription opioid abuse among older adults. *Perspectives in Psychiatric Care*, *55*(4), 681–689. https://doi.org/10.1111/ppc.12402

Chen, S. M., Creedy, D., Lin, H. S., & Wollin, J. (2012). Effects of motivational interviewing intervention on self-management, psychological and glycemic outcomes in type 2 diabetes: A randomized controlled trial. *International Journal of Nursing Studies*, *49*(6), 637–644. https://doi.org/10.1016/j.ijnurstu.2011.11.011

Cucciare, M. A., Ketroser, N., Wilbourne, P., Midboe, A. M., Cronkite, R., Berg-Smith, S. M., & Chardos, J. (2012). Teaching motivational interviewing to primary care staff in the Veterans Health Administration. *Journal of General Internal Medicine*, *27*(8), 953–961.

d'Abbs, P., Togni, S., Rosewarne, C., & Boffa, J. (2013). The Grog Mob: lessons from an evaluation of a multi-disciplinary alcohol intervention for Aboriginal clients. *Australian and New Zealand Journal of Public Health*, *37*(5), 450–456. https://doi.org/10.1111/1753-6405.12122

Doran, N., Hohman, M., & Koutsenok, I. (2013). Motivational interviewing training in juvenile corrections: A comparison of outside experts and internal trainers. *Legal and*

Criminological Psychology, *18*(2), 262–273. https://doi.org/10.1111/j.2044-8333.2011.02036.x

Fanning, R. M., & Gaba, D. M. (2007). The Role of Debriefing in Simulation-Based Learning. *Simulation in Healthcare: The Journal of the Society for Simulation in Healthcare*, *2*(2), 115–125. https://doi.org/10.1097/SIH.0b013e3180315539

Firestone, M., Tyndall, M., & Fischer, B. (2015). Substance use and related harms among Aboriginal people in Canada: a comprehensive review. *Journal of Health Care for the Poor and Underserved*, *26*(4), 1110–1131.

Fortune, J., Breckon, J., Norris, M., Eva, G., & Frater, T. (2019). Motivational interviewing training for physiotherapy and occupational therapy students: effect on confidence, knowledge and skills. *Patient Education and Counseling*, *102*(4), 694–700.

Gibbs, G. (1988). Learning by doing: A guide to teaching and learning methods. *Further Education Unit*.

Goggin, K., Hawes, S. M., Duval, E. R., Spresser, C. D., Martinez, D. A., Lynam, I., Barnes, A., Hinton-Dampf, A. M., Murphy, M. E., & Marken, P. A. (2010). A motivational interviewing course for pharmacy students. *American Journal of Pharmaceutical Education*, *74*(4).

Greenland, S., Daniel, R., & Pearce, N. (2016). Outcome modelling strategies in epidemiology: traditional methods and basic alternatives. *International Journal of Epidemiology*, *45*(2), 565–575.

Hegland, P. A., Aarlie, H., Strømme, H., & Jamtvedt, G. (2017). Simulation-based training for

nurses: Systematic review and meta-analysis. *Nurse Education Today*, *54*, 6–20.

Hettema, J., Steele, J., & Miller, W. R. (2005). Motivational interviewing. In *Annual Review of Clinical Psychology* (Vol. 1, pp. 91–111). Annual Reviews . https://doi.org/10.1146/annurev.clinpsy.1.102803.143833

Hough, J., Levan, D., Steele, M., Kelly, K., & Dalton, M. (2019). Simulation-based education improves student self-efficacy in physiotherapy assessment and management of paediatric patients. *BMC Medical Education*, *19*(1), 463.

IBM corp. (2020). *IBM SPSS Statistics for Windows* (27.0). IBM corp.

Keeley, R. D., Brody, D. S., Engel, M., Burke, B. L., Nordstrom, K., Moralez, E., Dickinson, L. M., & Emsermann, C. (2016). Motivational interviewing improves depression outcome in primary care: A cluster randomized trial. *Journal of Consulting and Clinical Psychology*, *84*(11), 993.

Labrague, L. J., McEnroe-Petitte, D. M., Bowling, A. M., Nwafor, C. E., & Tsaras, K. (2019). High-fidelity simulation and nursing students' anxiety and self-confidence: A systematic review. *Nursing Forum*, *54*(3), 358–368.

Laurant, M., van der Biezen, M., Wijers, N., Watananirun, K., Kontopantelis, E., & van Vught, A. J. A. H. (2018). Nurses as substitutes for doctors in primary care. *Cochrane Database of Systematic Reviews*, *7*.

Lavoie, P., Michaud, C., Bélisle, M., Boyer, L., Gosselin, E., Grondin, M., Larue, C., Lavoie, S., & Pepin, J. (2018). Learning theories and tools for the assessment of core nursing competencies in simulation: A theoretical review. *Journal of Advanced Nursing*, *74*(2),

239–250.

Leffingwell, T. R. (2006). Motivational Interviewing Knowledge and Attitudes Test (MIKAT)

for evaluation of training outcomes. *Minuet*, *13*, 10–11.

Mental Health Commission of Canada, & Canadian Centre on Substance Use. (2020). *Mental*

Health and Substance Use During COVID-19: First Summary Report.

https://mentalhealthcommission.ca/wp-

content/uploads/2021/09/mhcc_ccsa_covid_leger_poll_eng.pdf

Meybodi, F. A., Pourshrifi, H., Dastbaravarde, A., Rostami, R., & Saeedi, Z. (2011). The

effectiveness of motivational interview on weight reduction and self-efficacy in Iranian

overweight and obese women. *Procedia-Social and Behavioral Sciences*, *30*, 1395–1398.

Miller, W. R. (1983). Motivational Interviewing with Problem Drinkers. *Behavioural*

Psychotherapy, *11*(2), 147–172. https://doi.org/10.1017/S0141347300006583

Nash, R., Edwards, H., & Nebauer, M. (1993). Effect of attitudes, subjective norms and

perceived control on nurses' intention to assess patients' pain. *Journal of Advanced*

Nursing, *18*(6), 941–947. https://doi.org/10.1046/j.1365-2648.1993.18060941.x

Nestel, D., Groom, J., Eikeland-Husebø, S., & O'Donnell, J. M. (2011). Simulation for learning

and teaching procedural skills: the state of the science. *Simulation in Healthcare*, *6*(7), S10–

S13.

Parrilla, S. J. (2016). *Measuring knowledge and attitudes of clinicians about motivational*

interviewing with troubled adolescents.

Passiment, M., Sacks, H., & Huang, G. (2013). Medical simulation in medical education: Results

of an AAMC survey. 2011. *Association of American Medical Colleges (AAMC)*.

Platt, L., Melendez-Torres, G. J., O'Donnell, A., Bradley, J., Newbury-Birch, D., Kaner, E., & Ashton, C. (2016). How effective are brief interventions in reducing alcohol consumption: do the setting, practitioner group and content matter? Findings from a systematic review and metaregression analysis. *BMJ Open*, *6*(8), e011473. https://doi.org/10.1136/bmjopen-2016-011473

Potocky, M., & Guskovict, K. L. (2019). Project MIRACLE: Increasing empathy among psychosocial support staff working with refugees through brief training in motivational interviewing. *Intervention*, *17*(1), 59.

Qualtrics. (2005). *Qualtrics XM* (March, 2022).

Rollnick, S., Miller, W. R., & Butler, C. (2008). *Motivational interviewing in health care: helping patients change behavior*. Guilford Press.

Rosenthal, L. D., Barnes, C., Aagaard, L., Cook, P., & Weber, M. (2018). Initiating SBIRT, alcohol, and opioid training for nurses employed on an inpatient medical-surgical unit: a quality improvement project. *Medsurg Nursing*, *27*(4), 227–230.

Seigart, D., Veltman, M., Willhaus, J., & Letterle, C. (2018). Implementation of Motivational Interviewing Training in an Undergraduate Nursing Curriculum: Identifying Adolescents at Risk for Substance Use. *International Journal of Environmental Research and Public Health*, *15*(8), 1623. https://doi.org/10.3390/ijerph15081623

Statistics Canada. (2021). *The Daily — Survey on COVID-19 and Mental Health, February to May 2021*. https://www150.statcan.gc.ca/n1/daily-quotidien/210927/dq210927a-eng.htm

Suen, L. W., Makam, A. N., Snyder, H. R., Repplinger, D., Kushel, M. B., Martin, M., &

    Nguyen, O. K. (2021). National prevalence of alcohol and other substance use disorders

    among emergency department visits and hospitalizations: NHAMCS 2014–2018. *Journal of*

    General Internal Medicine, 1–9.

Thunder Bay District Health Unit. (2017). *Opioid Use and Impacts in Thunder Bay District*.

Venner, K. L., & Verney, S. P. (2015). Motivational interviewing: Reduce student reluctance and

    increase engagement in learning multicultural concepts. *Professional Psychology: Research*

    and Practice, *46*(2), 116.

Vickers, A. J., & Altman, D. G. (2001). Analysing controlled trials with baseline and follow up

    measurements. *Bmj*, *323*(7321), 1123–1124.

Wakeman, S. E., Pham-Kanter, G., & Donelan, K. (2016). Attitudes, practices, and preparedness

    to care for patients with substance use disorder: Results from a survey of general internists.

    Substance Abuse, *37*(4), 635–641. https://doi.org/10.1080/08897077.2016.1187240

Xiong, J., Lipsitz, O., Nasri, F., Lui, L. M. W., Gill, H., Phan, L., Chen-Li, D., Iacobucci, M.,

    Ho, R., Majeed, A., & McIntyre, R. S. (2020). Impact of COVID-19 pandemic on mental

    health in the general population: A systematic review. *Journal of Affective Disorders*, *277*,

    55–64. https://doi.org/10.1016/J.JAD.2020.08.001

Chapter 5: The theory of planned behaviour in action: assessing the association of MI attitude, subjective norm, and self-efficacy, with the 3-months intention to use Motivational Interviewing skills

5.1 Abstract

Background: Preparing nursing students with Motivational Interviewing (MI) skills to intervene with patients suffering from problematic substance use is widely needed in Canada. The way in which MI skills are learned and its impact on the future use of the skills are still not fully established. According to the Theory of Planned Behaviour (TPB), adopting a new behaviour, like using MI skills, is determined by the intention, and intention is predicted by three cognitions, namely self-efficacy, attitude towards the behaviour, and subjective norm (Ajzen, 1991). The TPB framework has been applied in various contexts to predict or moderate health behaviours. However, an etiological approach to the TPB in the context of counselling skills learning by nursing students is unexplored.

Objective: To assess the association of each of the three cognitions of the TPB, namely attitude, subjective norm, and self-efficacy, with the intent to use MI skills by the participants. The effect of the type of training, simulation (SIM) or e-learning, on these associations is also explored.

Methods: This study used a randomized controlled trial to deliver MI skills to undergraduate nursing participants by either SIM or e-learning. Surveys were completed by the participants at three points in time: baseline (T1), post-training (T2), and 3-months later (T3). The components of the TPB (MI attitude, subjective norm, and self-efficacy) were measured at T2 and the intention to use the MI skills was evaluated at T1, T2, and T3. Repeated measures analysis of variance (ANOVA) and multivariable linear regression modelling were used to assess the change in intention scores and the association of the TPB components with the 3-months intent, respectively, for the whole sample and for each training type.

Results: Forty participants, out of the trained 52, completed the 3-month follow-up survey (T3). Statistically significant differences, between completed participants and those who were lost after the post-training survey (T2), were found in baseline previous MI use and post-training mean MI attitude scores. The post-training survey results were compared for SIM (n=20) and control (n=20) groups with no statistically significant differences.

Repeated measures ANOVA for the intent scores between baseline (T1), post-training (T2), and 3-months follow-up (T3) showed a significant change in intent scores over time (p= 0.049). However, post-hoc analysis of this finding showed that the significant change is only found from T2 to T3. The split repeated measures ANOVA by training type showed a non-significant change in intent scores, while the post-hoc Bonferroni analysis indicated a significant change from T2 to T3, only in the SIM group.

Multivariable regression analysis revealed no association between post-training self-efficacy, attitude, or subjective norm, and 3-month intent to use, for the whole sample. On a stratified level, a significant positive association (β coefficient = 0.236, 95% CI [0.023-0.45]) was found between the post-training subjective norm and the 3-months intent to use, for the SIM group, while controlling for post-training knowledge and self-efficacy. Similarly, a statistically significant association (β coefficient = 0.037, 95% CI [0.014-0.061]) was found between post-training self-efficacy and 3-months intent to use, in the control group, while controlling for year of study, post-training knowledge, and subjective norm.

Significance and implications: This study demonstrates the applicability of the TPB in the context of learning MI skills by nursing students. Finding significant results in each stratum should be interpreted with caution due to the small sample size. However, the stratified results suggest that the association between the TPB components and intentions can be found with any

learning type; SIM or e-learning. Future research with larger samples and different nursing

populations is recommended.

5.2 Introduction

Substance use disorders (SUDs) are a growing public health concern in Canada and worldwide (Khan, 2017). Nurses in an emergency setting encounter many people with SUDs, which they were not well prepared to treat (Firestone et al., 2015). Motivational Interviewing (MI) is a set of skills that efficiently helps health care providers to elicit change in people suffering from SUDs (Rollnick & Miller, 1995). However, very few nursing schools teach undergraduate nurses MI skills and instead most focus on the clinical signs and symptoms of SUDs in their curricula. The best way to deliver MI skills to nursing students is still not documented. Moreover, the factors associated with the future use of the skills are largely unexplored. To evaluate the determinants of future use of MI skills by nurses, while exploring the impact of the learning modality of MI, a theoretical framework was used to guide the assessed outcomes.

The Theory of Planned Behaviour (TPB) (Ajzen, 1985) states that human behaviour is preceded and determined by the presence of intention. Additionally, any human behaviour is guided by a set of beliefs: behavioural, normative, and control beliefs (Ajzen, 2006). The behavioural beliefs consist of the perceived consequences and associated experiences with the behaviour. Normative beliefs are the person's thoughts about what is normally expected about a behaviour of their significant others and the community. Normative beliefs comprise two types: injunctive and descriptive (Fishbein & Ajzen, 2011). Injunctive beliefs consist of the perceived approval and support of a significant other (e.g., family, friends, coworkers) for a certain behaviour, while descriptive normative beliefs are beliefs that the person's significant others are performing the behaviour themselves. Finally, control beliefs are what a person perceives as facilitators or barriers to accomplishing the desired behaviour. The three sets of beliefs result in

three forms of cognition, namely attitude, subjective norm, and perceived behavioural control

(PBC), respectively (Ajzen, 2006). The three cognitions in turn predict the human intention to do

a certain behaviour, which is the primary predictor of actual behaviour, according to the theory

(Ajzen, 1991). PBC is an extension of the Self Efficacy Theory (SET) by Bandura (1977). Thus,

perceived behavioural control and self-efficacy are conceptually the same; however, they are not

assessed in the same way (Ajzen, 2020). In other words, self-efficacy can be used to reflect PBC

but has to be measured with its corresponding scales.

Schematic Representation of Ajzen's Theory of Planned Behavior
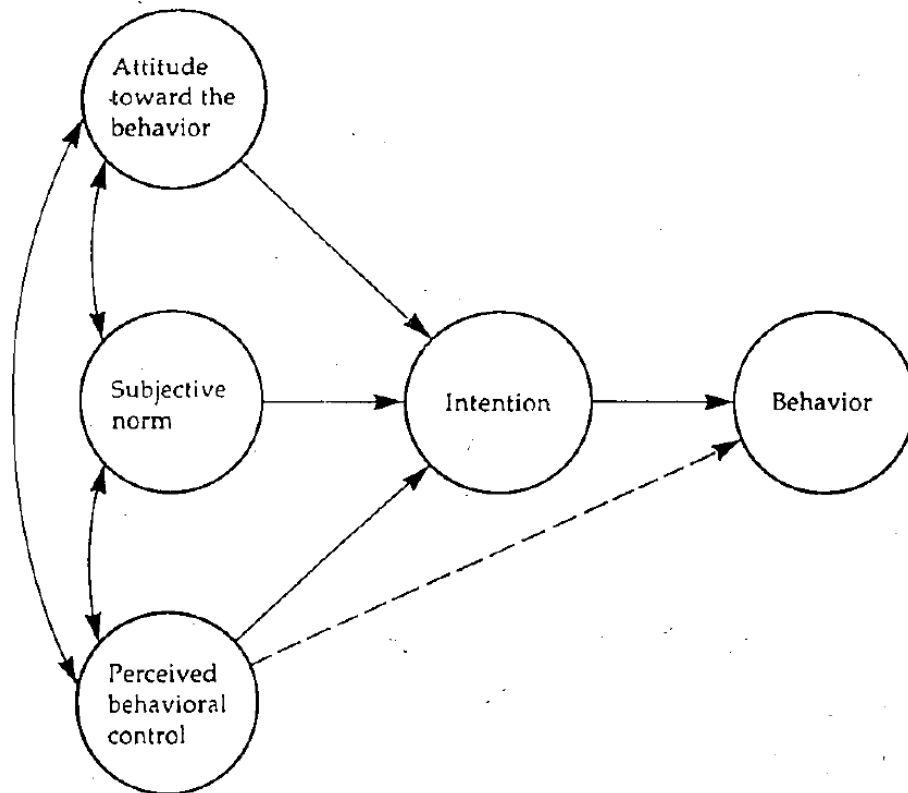
Figure 7 – Theory of Planned Behaviour (Godin & Kok, 1996)

Many studies used the TPB to either predict behaviour or detect the beliefs associated

with a certain behaviour (Hardeman et al., 2002). Many of which aimed to build interventions for

health-related behaviours, like smoking, food choices, lifestyle, exercise, and sexual behaviour (Albarracin et al., 2001; Conner et al., 2002; Godin & Kok, 1996; Huntington et al., 2020).On the other hand, some studies used the TPB framework in non-health-related behaviours like online purchasing, waste recycling, and technology adoption behaviour (Chu & Chen, 2016; George, 2004; Nigbur et al., 2010).

Despite the substantial body of literature that validated and applied the TPB, most previous studies used a predictive approach to the modelling of the theory's components. Moreover, the style of learning a new behaviour was not extensively explored before as to its effect within the framework of the TPB. Therefore, this RCT, in which MI skills were delivered to undergraduate nurses by one of two learning styles, used the TPB to guide the choice of the evaluating outcomes of the training effectiveness. The evaluating post-training survey (for the second objective) assessed the participants' MI attitudes, the perceived subjective norm by the participants, as well as their self-efficacy in using the learnt skills. Each of these three components (i.e., TPB cognitions) will be assessed for its association with the participants' intent to use MI skills after 3-months (i.e., the follow-up survey). Additionally, the training type's effect on these associations will be explored.

5.3 Methods

5.3.1 Study design

This study was reviewed and approved by the Lakehead University Research Ethics Board committee (Romeo file number 1468284). This study was a cohort study within a randomized controlled trial design, using the intent to use data from all points in time (T1. T2, and T3), as well as outcomes scores from post-training (T2), and covariates data from baseline (T1).

5.3.2 Participants

Participants were undergraduate Lakehead nursing students who were at least 18 years of age. Recruitment of participants occurred after the researcher contacted the director of the nursing school, followed by some of the instructors. Recruitment occurred by either sharing the recruitment poster electronically with the students by the instructors (Appendix E: Recruitment poster) or by hosting the researcher in class to give a 5-minute presentation about the study. Two incentives were declared at recruitment: a certificate of completion upon completing the post-training survey (T2) and a $5 Starbucks gift card upon completion of the 3-months follow-up survey (T3)

Interested students could follow the link from the recruitment poster or contact the researcher for further information. The consent form was set up on the Qualtrics platform (Qualtrics, 2005), with the information letter and eligibility questions. Participants who gave their consent and passed the eligibility questions were directed to a baseline survey, followed by a randomization generator to classify the participants into intervention or control groups.

Eligibility criteria: different inclusion criteria were applied to the two data collection phases. Wherein the spring, only third and fourth-year students were eligible, while in the fall this inclusion criterion was amended to accept participants from all 4 undergraduate nursing years. The other eligibility criterion was the same throughout the study, which was an age of at least 18 years. Previous MI training or use was not considered an exclusion criterion as a large portion of the students (i.e., year 3 and 4) were expected to have read about MI in their Mental Health course readings. Therefore, excluding students who trained before would have significantly decreased the sampling pool, which was 300 students in total.

5.3.3 Randomization

Participants were randomized using Qualtrics random generator into SIM (intervention group) or e-learning (control group). Participants were blinded from the intervention type, which means that they knew that they will receive MI training but without further details about the two arms. Both groups received material related to the use of Motivational Interviewing (MI) in the management of patients with SUDs for one hour. Drawing upon the TPB, three outcomes were assessed at the end of each training session (T2); MI attitude, self-efficacy, and subjective norm. Intent to use MI skills was assessed at the three points of data collection (T1, T2, and T3). The assessments were through Qualtrics-created surveys that were shared electronically. Up to three email reminders for completing the post-training and the 3- months follow-up surveys were sent to participants.

5.3.4 Intervention

Ten SIM and ten e-learning sessions were held over two phases. Half of these sessions took place in May 2021, while the rest took place in October 2021. The SIM training consisted of a brief introduction about MI, by a clinical psychology doctorate student, followed by roleplays by the research participants to practice the basic skills. The roleplays consisted of common substance use clinical scenarios with a practice patient (i.e., acting patient). The first session was supervised by a clinical psychologist with SUD and MI expertise. Each SIM session included 2-4 nursing student participants. Scenarios were developed by the Clinical Psychology facilitator and were reviewed by an MI expert before the intervention (Appendix H: SIM session power point). A different clinical psychology graduate student facilitated the fall SIM session using the same material developed by the original facilitator from the spring phase. The role of the patient was played by volunteer psychology students or by the investigator in some sessions.

However, the scenarios were kept fairly similar across the SIM sessions. The clinical psychology facilitator started with a brief introduction about MI skills that could improve the clinician-patient interaction, performed a roleplay with the practice patient in front of the students, and facilitated discussions among the group about the roleplay ("How did that go?" "What did you think?" "Would you be able to try?"). This demonstration and discussion were followed by each of the participants taking a chance to roleplay the same skill with the practice patient and get feedback from the facilitator. This was repeated for each of the basic four MI skills: open questions, affirmation, reflective listening, and summarization. All the training sessions took part via Zoom due to the Covid-19 pandemic.

5.3.5 Control condition

Participants in the control condition were provided with a package of curated audios by MI experts and a demonstrating clinical situation video showing how to use MI with SUD patients (Appendix F: Control material (e-learning)). This e-material was shared in one of 10 zoom sessions, according to the participants convenience. Each zoom sessions had an average of 3 participants. However, the control group only watched the MI video and listened to several short audios, without any further discussion with the researcher. The post-training survey (T2) links were sent during the Zoom sessions for both groups and by up to three email invites after the sessions, in case the participants missed the link.

5.3.6 Data collection

The baseline questionnaire (T1) mainly was used to assess the participants' demographic characteristics and potential confounders, such as age, year of study, ethnicity, gender, stigma towards SUDs, and prior MI training or use. It also measured other main outcomes like MI self-

efficacy, knowledge, attitude, subjective norms, and intent to use. These baseline measures served to detect the change in these scores after the intervention.

Evaluation of the TPB variables in each intervention arm (SIM vs. e-learning) occurred through two 10-minute-long surveys that were administered through Qualtrics (Qualtrics, 2005):

1. Post-training (Appendix B: Post-training Survey (SIM group) and Appendix C: Post-training Survey (E-materials group)), was taken by the students immediately after the intervention or control e-learning. This survey was mainly used to assess MI attitude, self-efficacy, and subjective norms, to reflect the determinant of intention as per the TPB. This questionnaire also included questions about satisfaction with the training, MI knowledge, MI's intent to use, previous use or training, and attitude towards SUD patients.

2. Follow-up (Appendix D: Follow-up Survey) was taken by the students three months after the intervention. The follow-up duration was determined according to the range of durations adopted by previous studies involving MI training for health professionals (Barwick, Bennett, Johnson, McGowan, & Moore, 2012). This survey assessed whether the participants intended to implement any of the skills/knowledge from the training with their future patients. The outcomes from the first two surveys were also re-assessed, as well as attitudes towards the SUD patients and extra attempts to learn MI skills by the participants.

5.3.7 Measurements

Most of the studies evaluating similar outcomes to this study in a population of undergraduate nursing students, using simulation as a learning method, used scales designed specifically for their studies (Lavoie et al., 2018). Therefore, many of the tools that were used in this study were modified scales of non-validated tools that were used in previous studies with similar outcomes.

Exposure measurements:

Motivational interviewing (MI) attitude: MI attitudes from the post-training surveys (T2) were assessed, using the Motivational Interviewing Knowledge and Attitude Test (MIKAT) (Leffingwell, 2006). The test consists of 14 true or false questions, including statements reflecting MI attitudes, and then the 15th and last question is a multiple-choice question reflecting the knowledge about MI (Parrilla, 2016). Attitude scores were calculated by summing up the scores of the first 14 questions (i.e., the maximum score is 14). The internal consistency of the tool has been validated with a Cronbach's alpha of 0.84 (Doran et al., 2013).

Self-efficacy to use MI: Nursing students' post-training (T2) self-efficacy to use MI skills was measured using 10 items expressing the various steps in an MI session, to be rated for students' confidence on an 11-points Likert scale, with a minimum score of 0 and a maximum of 100. The scale was adapted from a study that measured the physiotherapy students' self-efficacy to use MI skills (Black et al., 2016). The reliability and validity of this scale were internally assessed by self-efficacy experts at the university that hosted the study, but no reliability coefficients were documented for this scale (Black et al., 2016).

Subjective and normative norms for MI use: MI-related subjective norms perceived by the participants after the training (T2) was measured using two questions adapted from previous studies that measured subjective norm in nursing staff (Bernaix, 2000; Nash et al., 1993). The questions were "Other nurses think that I should use MI with people who have SUD" and "Most people who are important to me think that nurses should use MI with people who have SUD". The response to both questions was on a 7-point Likert scale ranging from not at all likely to extremely likely. The total score for the subjective norm was 14, which was obtained by summing up the

maximum of both questions. The scales were not previously validated but were successfully used in the nursing staff population in the mentioned studies.

Outcome measures:

Intent to use MI: Intent to use MI is considered a direct predictor of future use of MI skills (Ajzen, 1985; Martin Fishbein & Cappella, 2006). Although it was measured in all surveys, the outcome of interest for this study is the intent to use MI from the 3-month follow-up survey (T3) only. Guided by previous studies that measured intentions to use certain skills with patients (Bernaix, 2000), this direct question was adapted to measure the students' intentions to use MI skills with SUD patients; "I would rate my intention to use MI skills with SUD patients as". The response ranged from "very weak because it will not make any difference" to "very strong because it will definitely help" on a 7-point Likert scale. The Cronbach's alpha for this scale was reported to be 0.93 when it was successfully used in a population of nurses in the study by Bernaix (2000). An indirect question was added to measure intention and to detect possible desirability bias that may affect the direct question responses (Fisher, 1993). The indirect question was: "I think that nursing staff should use MI skills with SUD patients" with an agreement 7-point Likert scale ranging from "strongly agree" to "strongly disagree". The total score for each of the intent questions was summed to a total of 7. Comparing the mean scores of both questions led to the decision of which scale to use in the final analysis.

Other covariates measures:

Training type: Participants were randomized to either the SIM training (trial group) or the e-material review (control group). The type of training (SIM or e-learning) is considered a categorical variable in this study, where "1" refers to SIM training and "0" refers to e-learning.

Stigma towards SUD patients: Baseline (T1) attitude of participants toward SUDs patients was measured with an adapted scale, which was created to explore the attitude of medical staff toward SUDs patients. It was specifically designed and used in a study (i.e. not previously validated) among a population of general internists to assess their attitudes and preparedness to manage SUD cases (Wakeman et al., 2016). The tool consists of measuring participants' agreement to six attitude statements on a four-point Likert scale. Scores were then calculated by dichotomizing each answer into 0 or 1, where zero represents low stigma and 1 represents high stigma, which is the scoring system used by the original paper (Wakeman et al., 2016). The total of the six questions was summed up to form a Stigma score for each participant, which ranged from 0 to 6.

Previous MI training: This potential confounder was measured with a single yes/no question "Did you receive any prior training in Motivational Interviewing?" at baseline before randomization. Answer choices included no, yes, and only as a part of the readings.

Previous MI use: A single question about the use of MI skills with patients was used to assess the previous usage. The question is: "Did you use MI skills with any patients before?". This question was adapted from a previous study that assessed the increase of MI use in primary health care professionals after virtual simulation training, with no measured validity or reliability (Albright et al., 2018a).

MI knowledge: The Motivational Interviewing Knowledge and Attitude Test (MIKAT) (Leffingwell, 2006) was used to assess the MI knowledge of the participants. The part of the test that assesses knowledge consists of a multiple-choice question reflecting the knowledge about counselling behaviours consistent with MI (Parrilla, 2016). Scores were calculated by summing

up the correct choices. The total knowledge score was out of 5. The internal consistency of the tool

has been validated with a Cronbach's alpha of 0.84 (Doran et al., 2013).

Demographics: Year of study, age, gender, and ethnicity of participants were measured

through direct questions. Year of study choices varied from the first to fourth years. The age of

participant questions provided multiple answer choices varying from 18 to 30 or older. The

gender choices were male, female, doesn't identify as male or female, and prefers not to answer.

Ethnicity choices were white, black, south Asian, indigenous, and other.

5.3.8 Analysis

All statistical analyses were performed using SPSS 27.0 (IBM corp, 2020). Data from the

post-training (T2) and 3-months follow-up (T3) surveys were exported from Qualtrics software to

excel sheets. The data was linked with the participants' email addresses and the assigned ID

numbers as the unique identifiers. The MIKAT's scoring manual (Leffingwell, 2006; Parrilla,

2016) was used to calculate scores for attitude and knowledge. Self-efficacy, subjective norm, and

intent scores were created. Covariates and demographics were used from the baseline survey data

(T1), such as year of study, age, gender, ethnicity, stigma, previous MI use, and previous MI

training. After comparing the score distribution of the indirect (or subjective) intent and personal

intent (Appendix K-2), we decided to use personal intent as the dependent variable to test the

hypothesis, because personal intent scores were normally distributed, while subjective intent

scores were heavily negatively skewed. Univariate descriptive analysis was used to explore the

baseline and post-training data from participants who followed up at 3 months (n=40) and those

who were lost to follow-up (n=12), and outcomes were compared by Chi-square and independent

t-tests. Also, descriptive statistics by the type of training received were compared, for those who

completed the follow-up survey. Repeated measures ANOVA, with post-hoc Bonferroni analysis, were used to compare the intent scores across the three points of time, for the whole sample, then for each arm separately. Independent t-tests were used to compare intent scores at 3 months follow-ups by training type and by confounders' categories.

To test the second hypothesis, which states "Post-training MI attitude, subjective norm, and self-efficacy will be associated with intent to use MI skills at 3 months", 3-months intention to use MI was modelled with post-training self-efficacy, attitude and subjective norm, using multivariable linear regression. Multivariable linear regression was used to assess the crude and adjusted associations (i.e., separate models) between the total sample's post-training self-efficacy, attitude, and subjective norm, with intent to use after 3-months (dependent variable). Then, to explore whether the impact of exposure variables on intent differed by the training type, interaction terms with training type were tested for each of the SE, Attitude, and SN models, and stratified analyses by the type of training were done to assess the crude and adjusted associations. Given the considerably low sample size, few confounders were tested for inclusion in the final model, such as MI knowledge, attitude, self-efficacy, and subjective norm. The year of study was tested as a confounder only in the self-efficacy model because the exposure variable (i.e., post-training SE) was significantly different by the year of study.

5.4 Results

5.4.1 Participants and demographics

Out of the 52 participants who completed the training, 52 completed the post-training survey (T2) and only 40 completed the 3-months follow-up survey (T3). Comparison of baseline characteristics and post-training scores between those who completed their 3-month follow-up (n=40) and those who were lost to follow-up (n=12) resulted in statistically significant

differences in previous MI use (p= 0.049) and post-training MI attitude scores (p= 0.03). Tables

7 and 8 show the frequencies and means for those you completed the study and those who were

lost before the 3-month follow-up.

Table 7 – *Participants' characteristics by loss to follow-up (categorical variables)*

Variable	Category	Followed up at 3 months (n=40)						Lost to follow-up at 3 months (n=12)					
		Total N=40 (100%)		SIM (N=20)		Control (N=20)		Total N=12 (100%)		SIM (N=6)		Control (N=6)	
		N	%	N	%	N	%	N	%	N	%	N	%
Year	1 and 2	11	27.5	6	30.0	5	25.0	3	25.0	2	33.3	1	16.7
	3 and 4	29	72.5	14	70.0	15	75.0	9	75.0	4	66.7	5	83.0
Gender	Male	6	15	0	0.0	6	30.0	1	8.3	1	16.7	0	0.0
	Female	33	82.5	20	100	13	65.0	11	91.7	5	83.3	6	100
	Doesn't identify as male or female	1	2.5	-	-	1	5.0	-	-	-	-	-	-
Ethnicity	White	26	65.0	13	65.0	13	65.0	6	50.0	3	50.0	3	50.0
	Other	14	35.0	7	35.0	7	35.0	6	50.0	3	50.	3	50.0
Prior training	No	32	80.0	18	90.0	14	70.	7	58.0	5	83.3	2	33.3
	Yes, or reading	8	20.0	2	10.0	6	30.0	5	41.7	1	16.7	4	66.7
Prior use*	No	36*	90.0	18	90.0	18	90.0	8*	66.7	5	83.3	3	50.0
	Yes	4*	10.0	2	10.0	2	10.0	4*	33.3	1	16.7	3	50.0
Time of training	Spring	19	47.5	10	50.0	9	45.0	6	50.0	2	33.3	4	66.7
	Fall	21	52.5	10	50.0	11	55.0	6	50.0	4	66.7	2	33.3

*Statistically significant Chi-square test for this variable – comparing completed vs. lost to Follow-up

The only participant who identified as male in the SIM group was lost at the 3-month follow-up. Participants with previous MI training accounted for 20% of the completing participants compared to 41% of the lost to follow-up participants. Similarly, only 10% of completing participants previously used MI, compared to 33% of the lost to follow-up participants (Table 7).

Table 8 – Participants' characteristics by loss to follow-up (Scale variables)

| | Followed up at 3 months (n=40) | | | | | | Lost to follow-up at 3 months (n=12) | | | | | |
| | Total N=40 | | SIM N=20 | | Control N=20 | | Total N=12 | | SIM N=6 | | Control N=6 | |
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age	24.05	3.9	23.40	3.32	24.74	4.43	25	3.9	25.67	4.50	24.33	3.56
Baseline stigma	1.05	1.1	1.15	1.09	0.95	1.10	1.7	1.0	1.33	1.51	1.00	0.00
Post-training Self-efficacy	81.95	14.9	80.25	11.65	83.65	17.69	80.92	12.7	75.50	14.69	86.33	8.14
Post-training Attitude*	9.98*	2.1	10.15	1.98	9.80	2.19	8.42*	2.5	8.67	3.33	8.17	1.47
Post-training Knowledge	3.6	0.8	3.55	0.89	3.65	0.88	3.75	1.1	3.67	1.51	3.83	0.75
Post-training Subjective norm	11.78	2.1	11.75	1.62	11.80	2.63	11.75	2.8	10.50	3.45	13.00	1.27
3-months Subjective intent	6.42	1.36	6.3	1.38	6.55	1.36	none	-	-	-	-	-
3-months Personal intent	5.95	0.78	5.8	0.77	6.1	0.79	none	-	-	-	-	-

*Statistically significant independent t-test – comparing mean scores of completed vs. lost to follow-up

For the continuous variables, the mean post-training attitude score was significantly higher in the completing participants (mean = 9.98), compared to those lost to follow-up (mean = 8.42). The rest of the variables were not significantly different between those who completed the study and those who dropped out (table 8).

Participants who completed the follow-up survey at the 3-month mark were (40 in total) evenly distributed between both intervention arms. The mean post-training self-efficacy score was 83.65 in the control group, compared to 80.25 in the SIM group. The mean scores for post-training attitude and subjective norm were not statistically different in both groups. The

subjective (indirect) and personal (direct) intent to use MI at 3-months after the training slightly

(Non significantly) varied between both intervention arms as well; the SIM group's subjective

and personal intent mean scores were 6.3 and 5.8, compared to 6.55 and 6.1 in the control group,

respectively. However, the total sample's direct intent average score was significantly higher

than the average subjective intent score.

5.4.2 Bivariate analysis

Repeated measures ANOVA for the total sample's intent scores revealed a significant

change in intent to use MI scores over time (p-value = 0.049). The post-hoc Bonferroni's

analysis for this test showed that the change in scores was only significant between times 2 and 3

with a p-value = 0.004 (Table 9).

The results showed that the intent scores increased after the training (T1 and T2) and then

decreased again after the 3 months (T2-T3) for both groups (Figure 8).

Figure 8 – *Mean intent score by training type over time*
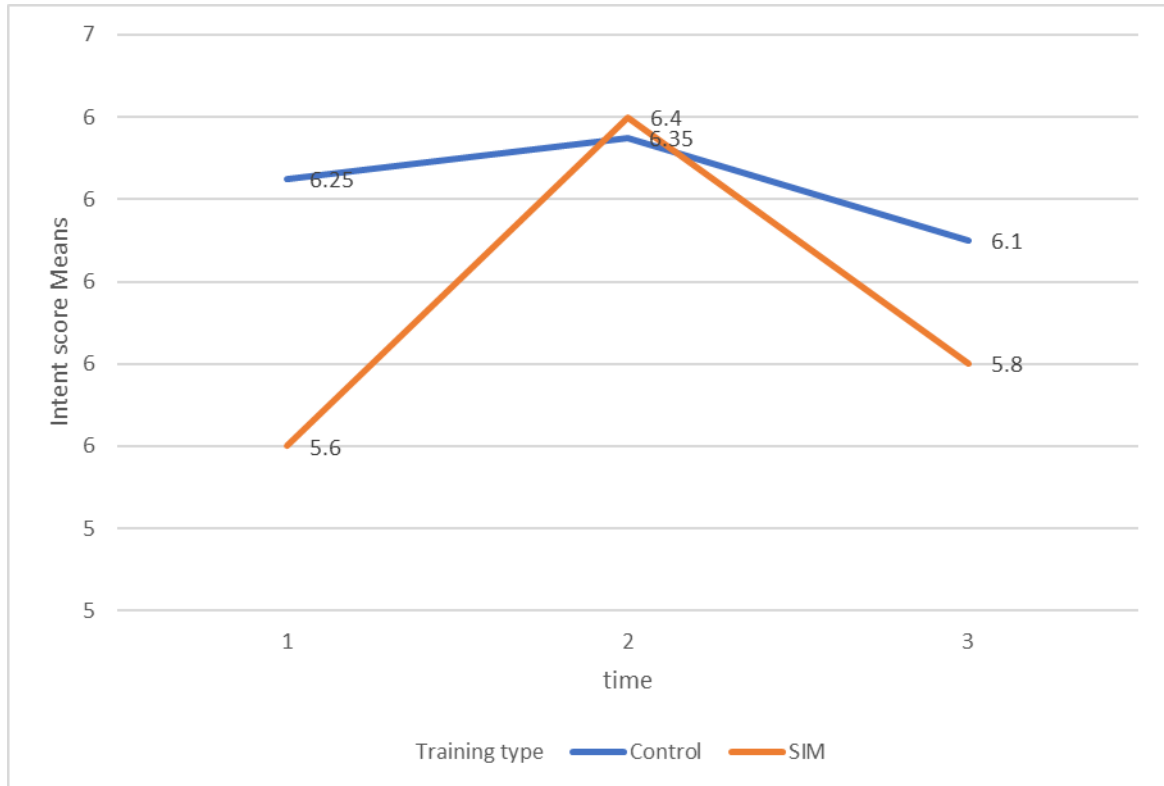
Table 9 – *Posthoc analysis (Bonferroni test) for INTENT scores' repeated measures ANOVA (total sample (N=40))*

Times compared	Mean difference	95% Confidence Interval of the difference		P-value
		Lower	**Upper**	
T1 – T2	-0.450	-1.002	0.102	0.144
T1 – T3	-0.025	-0.559	0.509	1.000
T2 – T3	.425*	0.116	0.734	0.004

* Represents a significant mean difference

Running repeated measures ANOVA by the training type revealed that change in intent scores was not significant in either group. However, the p-value for the SIM group was 0.055,

which suggests a more significant change compared to the control group (p-value = 0.55).

Moreover, the post-hoc Bonferroni analysis revealed a significant change in the mean intent

score from T2 to T3 (p-value = 0.001), only in the SIM group (Table 10).

Table 10 – *Posthoc analysis (Bonferroni test) for INTENT scores' repeated measures*
ANOVA for each training type (N=20)

Times compared	Training type	Mean difference	95% Confidence Interval of the Difference		P-value
			Paired Differences		
			Lower	Upper	
T1 – T2	SIM	-0.800	-1.705	0.105	0.095
	Control	-0.100	-0.784	0.584	1.000
T1 – T3	SIM	-0.200	-1.164	0.764	1.000
	Control	0.150	-0.430	0.730	1.000
T2 – T3	SIM	0.600*	0.249	0.951	0.001
	Control	0.250	-0.284	0.784	0.703

5.4.3 Multivariable analysis

Multivariable linear regression modelling was used to test the association between each

of the components of the TPB and the intent to use the skills while controlling for potential

confounders. The regression model was computed for the whole sample (N=40) and then for

each training type. Stratification of the models by training type was done to explore the TPB

accuracy in an MI learning method context. Moreover, the training type interaction term with SN

was found to be statistically significant ($\beta = 0.26$ +/-0.12, 95% CI [0.009-0.51]). However, the

training type interaction terms for SE and attitude were not statistically significant, but the

exploration of stratified analyses for the three models was done.

Based on the literature and bivariate analyses, a limited number of confounders was

tested for inclusion in each model using the Greenland et al. (2016) method of reduced mean

squared error (see Appendix I-2). For each model, the confounders included the other two

determinants of intention, according to the TPB, as well as MI knowledge. For the self-efficacy

model with intent, the year of study was added as a potential confounder, due to the significantly

different mean post-training self-efficacy by the year of study. The crude and adjusted estimates

of the association between each independent variable and 3-month intent were calculated for the

whole sample and each intervention arm (Tables 11, 12, and 13) in separate models.

Table 11- Crude and adjusted estimate for the association of post-training SE, Attitude, and SN
with the 3-months intent for the total sample (N=40)

Independent variable	Model	Unstandardized coefficient		95% confidence interval		Included covariates
		Beta	Std. error	lower bound	upper bound	
Post-training self-efficacy	Crude	0.017*	0.008	0.00	0.033	_
	Adjusted	0.013	0.008	-0.004	0.03	Study year, knowledge, subjective norm
Post-training attitude	Crude	-0.03	0.061	-0.154	0.094	_
	Adjusted	-0.05	0.058	-0.169	0.068	Self-efficacy, knowledge
Post-training subjective norm	Crude	0.053	0.058	-0.065	0.171	_
	Adjusted	0.055	0.055	-0.056	0.167	Self-efficacy, knowledge

* Represents a significant coefficient.

For the total sample, post-training self-efficacy was positively associated with 3-months

intent to use, without controlling for confounders ((β = 0.017 +/- 0.008, 95% CI [0.00-0.033]).

Adjusting for potential confounders made the effect estimates non-significant. Also, the crude

and adjusted estimates of post-training attitude and subjective norm with the 3-months intent were not statistically significant, for the total sample.

Stratified model results

Post-training subjective norm was significantly associated ($\beta = 0.24$ +/- 0.1, 95% CI [0.023-0.45]) with intent to use the MI skills after 3-months, only in the SIM group. This result was found before and after adjusting for post-training knowledge and self-efficacy scores. A significant association between post-training self-efficacy and 3-months intent was found in the control group ($\beta = 0.037$ +/- 0.011, 95% CI [0.014-0.061]), while adjusting for study, post-training knowledge, and subjective norm. The crude and adjusted associations of post-training attitude with 3-month intent were not statistically significant in both intervention arms.

Table 12- *Crude estimates for the associations of post-training SE, Attitude, and SN with the 3-months intent by training type (N=20)*

Independent variable	SIM				Control			
	unstandardized coefficient		95% confidence interval		unstandardized coefficient		95% confidence interval	
	Beta	Std. error	lower bound	upper bound	Beta	Std. error	lower bound	upper bound
Post-training self-efficacy	0.008	0.015	-0.025	0.040	0.019	0.009	-0.001	0.039
Post-training attitude	-0.059	0.09	-0.249	0.131	0.004	0.085	-0.174	0.182
Post-training subjective norm	0.24*	0.096	0.039	0.444	-0.02	0.071	-0.168	0.128

* Represents a significant coefficient.

Table 13 – *Adjusted estimates for the association of post-training SE, Attitude, and SN, with the 3-months intent by training type (N=20)*

Independent variable	SIM unstandardized coefficient		95% confidence interval		Control unstandardized coefficient		95% confidence interval		Included covariates
	Beta	Std. error	lower bound	upper bound	Beta	Std. error	lower bound	upper bound	
Post-training self-efficacy	0.002	0.013	-0.026	0.030	0.037*	0.011	0.014	0.061	Study year, knowledge, subjective norm
Post-training attitude	-0.065	0.094	-0.264	0.135	-0.049	0.076	-0.210	0.112	Self-efficacy, knowledge
Post-training subjective norm	0.236*	0.1	0.023	0.450	-0.005	0.06	-0.133	0.123	Self-efficacy, knowledge

* Represents a significant coefficient.

5.5 Discussion

5.5.1 Main findings

The study found no association between post-training self-efficacy, attitude, or subjective norm, and intent to use MI skills after 3-months. The only significant association was between post-training self-efficacy and 3-month intent before adjusting for SN, knowledge, and year of study. Although this crude association is in line with the TPB (Ajzen, 1991), the effect estimate cannot be attributed to the post-training self-efficacy, since the beta coefficient became non-significant when confounders were adjusted for. This change in significance suggests a confounding effect of these covariates and makes the interpretation of the crude estimate not accurate.

For the stratified analyses, the study results showed a statistically significant association between the subjective norm perceived by the participants after the SIM training and their intent to use the skills after three months. However, this finding was evident only for participants who

learned the skills via SIM. Likewise, this association was significant with and without adjusting for self-efficacy and knowledge as confounders. Given that the SN*training type interaction term was statistically significant, it can be considered that training type was an effect modifier of the association between post-training SN and 3-month intent. This finding goes with the TPB (Ajzen, 1991), and the stratified analysis results confirmed our expectations of the SIM learning style, being more effective in increasing intent through the increased subjective norm. This difference between SIM and control groups in subjective norm may be due to the personal interaction that happened during the group setting of the SIM sessions, between the facilitator, the researcher, and the participants. This claim is supported by the literature, which found a positive relationship between experiential learning (SIM) and the subjective norm (Baden & Parkes, 2013).

The second finding from the stratified analyses in this study is the statistically significant association between the self-efficacy after the control group session and their intent to use the skills after 3 months, while adjusting for study year, MI knowledge, and perceived MI subjective norm. This finding also confirms the TPB, as well as many studies that implemented the theory (Hardeman et al., 2002). However, this finding doesn't match the study hypothesis about SIM learning and how SE can be increased more with experiential learning. This more significant association between SE and intent, in the control group, can be explained by the differences in the post-training SE scores across SIM and control groups. The latter can be explained by what Ajzen discussed about feedback on certain behaviour, such as what happened in the SIM, that it may negatively affect the cognitions (i.e., attitude, SN, SE) and consequently lead to a decreased intention to act (Ajzen, 2020). Moreover, listening to and watching experts performing a certain skill (i.e., in the e-material) sometimes makes it easier to believe that you can do it, compared to

when you actually try to perform the skills by yourself (i.e., SIM). This belief that you can do it is translated to self-efficacy, which is a strong determinant of intent, according to the literature (Ajzen, 1991; Bandura, 1977; Hardeman et al., 2002).

No association was found between MI attitude and intent to use MI after 3 months, for all participants. This finding contradicts the TPB and the findings from the literature, which showed strong associations between attitude and intent, even stronger than the associations of SE and SN with intent (Albarracin et al., 2001). However, the way used to assess MI attitude in this study can be considered different from the one used in the literature. Although the MIKAT is designed to assess MI attitudes and knowledge, the attitudes questions are measuring whether the participants are knowing the right attitudes consistent with MI principles. The questions didn't include how strong the students' behavioural beliefs were about using MI skills on a personal level, which is how the attitude was measured in the literature applying TPB (Ajzen, 2006).

Another controversial finding in this study was the decrease in intent scores after three months, compared to immediately after the training. As per the Transtheoretical Model of Change (Prochaska et al., 2015), people need time which varies from zero to six months to move from the pre-contemplation to the contemplation stage of behaviour change. To parallel this, students with low intention scores should have the same or higher intentions scores after 3 months. However, the significant increase in intent happened between baseline and post-training, which involved an average of ten days, then intent scores significantly decreased at the 3-months follow-up. Another important point to bring here is that participants who were lost to the 3-month follow-up were more frequently with prior MI practice experience, which may have lowered the 3-months intent scores and caused a selection bias.

5.5.2 Limitations and strengths

Limitations. The sample size for this study was very small, especially after the loss to follow-up and the stratification of the analyses by training type. Although some of the results achieved statistical significance despite the small sample size, they have to be interpreted with caution. In the stratified analyses, the significant associations may have been the result of a random finding in the presence of small sample size (N=20). On another note, the small sample size didn't allow enough power to include all identified potential confounders. For instance, an analysis of the loss to follow-up showed potential selection bias, due to some statistically significant differences between the completing participants and those lost to follow-up. However, there was no statistical power to include these potential confounders in the final models.

Contamination of the results is another possible limitation. Discussing the content of the training sessions or sharing beliefs about MI skills and the training may have occurred and affected some of the results. This is a potential limitation, especially as the nursing students were back to in-person learning from fall 2021, and because of the three-months duration between the training and follow-up. Such contamination usually leads to non-differential misclassification bias. However, this type of misclassification probably biased the results towards the null, thus lowering the measured associations towards a more conservative estimate.

MI knowledge was included as a confounder in the three models in this study, although Ajzen challenged the role of knowledge in the prediction of intentions to adopt a certain behaviour (Ajzen et al., 2011), and it was not significant as expected. However, the intervention from this study didn't focus on persuasion but rather on learning a new skill, thus knowledge is logically related to the development of intent (i.e., a confounder), as well as to SE, attitude, and SN.

Strengths. This study provides an etiological relationship between each of the components of the TPB and intention. This means that the associations between self-efficacy, attitude, and subjective norm, with the intention to use MI, were separately measured, while controlling for significant confounders for each of the three associations. This etiological modelling approach is novel compared to the predictive approaches frequently used to apply the TPB in various contexts. Moreover, comparing the impact of learning style on these associations was not previously addressed.

The study combined epidemiological design within a psychological framework, in a nursing learning environment. The randomization of the sample provided robustness to the study design, compared to a pre- and post- experimental design. Moreover, the robustness of the study design allows it to be replicated for various domains of learning. Nonetheless, the results from this study can be used as a guide for instructors to focus on the subjective norm and self-efficacy in new skills' teaching, to increase the intent and future use by the students.

5.5.3 Significance

Motivational interviewing is the future of behaviour change in health care (Rollnick et al., 2008). This study can result in the implementation of a training program in MI for future nurses, which will positively affect the nursing staff's competence, patient outcomes, staff burnout, and turnover rates (Bakhamis et al., 2019; Hayes et al., 2012). MI is used to motivate change in lifestyle, dietary habits, and unhealthy attitudes, in addition to addiction. This will help nursing students in their future careers regardless of their specialization. Moreover, the finding that the use of simulation improved the association between subjective norm and intent to use is a valuable input for various mental health counselling skills' learning, besides MI.

The study design can be replicated in other nursing populations to assess the effectiveness of SIM to learn various skills. Future research is encouraged to assess attitudes differently and to recruit a larger sample.

5.6 Conclusion

This study found that nursing students' self-efficacy, attitudes, and subjective norms about using MI skills after a short training were not associated with intent to use the skills after 3 months. However, it was found in participants who learned by SIM, in a one-hour session template, that they had increased intentions to use the skills in their practice, through the increased subjective norms about MI. On the other hand, participants who learned by watching videos and listening to audio recordings about MI, showed an increase in 3-month intent to use the skills through the increased self-efficacy of the participants to use MI skills, while controlling for MI knowledge and subjective norm.

Although the changes in intentions scores were not big across the data collection points, the intention to use the skills was associated with the subjective norm for the SIM group and with self-efficacy for the control group, which confirms the TPB. Moreover, the TPB suggests that the intention directly predicts future behaviour, which translates into the use of MI skills by the nurses with their future patients.

This combination between theory and epidemiology benefits the literature by building strong evidence of the MI skills teaching styles and their impact on future practice. Moreover, this can inform the teaching of other conversational skills to nursing students. Future research may replicate this study in a different nursing population with a larger sample size and longer follow-up period to detect the actual use of the skills and further confirm the applicability of the TPB in the context of nursing counselling education.

5.7 References

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In Action control (pp. 11–39). Springer.

Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179–211.

Ajzen, I. (2006). Constructing a theory of planned behavior questionnaire. Amherst, MA.

Ajzen, I. (2020). The theory of planned behavior: Frequently asked questions. Human Behavior and Emerging Technologies, 2(4), 314–324.

Ajzen, I., Joyce, N., Sheikh, S., & Cote, N. G. (2011). Knowledge and the prediction of behavior: The role of information accuracy in the theory of planned behavior. Basic and Applied Social Psychology, 33(2), 101–117.

Albarracin, D., Johnson, B. T., Fishbein, M., & Muellerleile, P. A. (2001). Theories of reasoned action and planned behavior as models of condom use: a meta-analysis. Psychological Bulletin, 127(1), 142.

Albright, G., Bryan, C., Adam, C., McMillan, J., & Shockley, K. (2018). Using Virtual Patient Simulations to Prepare Primary Health Care Professionals to Conduct Substance Use and Mental Health Screening and Brief Intervention. Journal of the American Psychiatric Nurses Association, 24(3), 247–259. https://doi.org/10.1177/1078390317719321

Baden, D., & Parkes, C. (2013). Experiential learning: Inspiring the business leaders of tomorrow. Journal of Management Development.

Bakhamis, L., Paul, D. P., Smith, H., & Coustasse, A. (2019). Still an Epidemic: The Burnout Syndrome in Hospital Registered Nurses. Health Care Manager, 38(1), 3–10. https://doi.org/10.1097/HCM.0000000000000243

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological

Review, 84(2), 191–215. https://doi.org/10.1037/0033-295X.84.2.191

Bernaix, L. W. (2000). Nurses' Attitudes, Subjective Norms, and Behavioral Intentions Toward

Support of Breastfeeding Mothers. In BernaixJ Hum Lact (Vol. 16, Issue 3).

Black, B., Lucarelli, J., Ingman, M., & Briskey, C. (2016). Changes in physical therapist

Students' self-efficacy for physical activity counseling following a motivational

interviewing learning module. Journal of Physical Therapy Education, 30(3), 28–32.

Chu, T.-H., & Chen, Y.-Y. (2016). With good we become good: Understanding e-learning

adoption by theory of planned behavior and group influences. Computers & Education, 92,

37–52.

Conner, M., Norman, P., & Bell, R. (2002). The theory of planned behavior and healthy eating.

Health Psychology, 21(2), 194.

Doran, N., Hohman, M., & Koutsenok, I. (2013). Motivational interviewing training in juvenile

corrections: A comparison of outside experts and internal trainers. Legal and Criminological

Psychology, 18(2), 262–273. https://doi.org/10.1111/j.2044-8333.2011.02036.x

Firestone, M., Tyndall, M., & Fischer, B. (2015). Substance use and related harms among

Aboriginal people in Canada: a comprehensive review. Journal of Health Care for the Poor

and Underserved, 26(4), 1110–1131.

Fishbein, M., & Ajzen, I. (2011). Predicting and changing behavior: The reasoned action

approach. Psychology press.

Fishbein, M., & Cappella, J. N. (2006). The Role of Theory in Developing Effective Health

Communications. Journal of Communication, 56. https://doi.org/10.1111/j.1460-

2466.2006.00280.x

Fisher, R. J. (1993). Social desirability bias and the validity of indirect questioning. Journal of

Consumer Research, 20(2), 303–315.

George, J. F. (2004). The theory of planned behavior and Internet purchasing. Internet Research.

Godin, G., & Kok, G. (1996). The theory of planned behavior: a review of its applications to

health-related behaviors. American Journal of Health Promotion, 11(2), 87–98.

Hardeman, W., Johnston, M., Johnston, D., Bonetti, D., Wareham, N., & Kinmonth, A. L.

(2002). Application of the theory of planned behaviour in behaviour change interventions:

A systematic review. Psychology and Health, 17(2), 123–158.

Hayes, L. J., O'Brien-Pallas, L., Duffield, C., Shamian, J., Buchan, J., Hughes, F., Laschinger,

H. K. S., & North, N. (2012). Nurse turnover: A literature review - An update. In

International Journal of Nursing Studies (Vol. 49, Issue 7, pp. 887–905).

https://doi.org/10.1016/j.ijnurstu.2011.10.001

Huntington, J., Dwyer, J. J. M., Shama, S., & Brauer, P. (2020). Registered dietitians' beliefs and

behaviours related to counselling patients on physical activity and sedentary behaviour from

a theory of planned behaviour perspective. BMC Nutrition, 6(1).

https://doi.org/10.1186/s40795-020-00392-1

IBM corp. (2020). IBM SPSS Statistics for Windows (27.0). IBM corp.

Khan, S. (2017). Concurrent mental and substance use disorders in Canada.

https://www150.statcan.gc.ca/n1/pub/82-003-x/2017008/article/54853-eng.htm

Lavoie, P., Michaud, C., Bélisle, M., Boyer, L., Gosselin, E., Grondin, M., Larue, C., Lavoie, S.,

& Pepin, J. (2018). Learning theories and tools for the assessment of core nursing

competencies in simulation: A theoretical review. Journal of Advanced Nursing, 74(2),

239–250.

Leffingwell, T. R. (2006). Motivational Interviewing Knowledge and Attitudes Test (MIKAT) for evaluation of training outcomes. Minuet, 13, 10–11.

Nash, R., Edwards, H., & Nebauer, M. (1993). Effect of attitudes, subjective norms and perceived control on nurses' intention to assess patients' pain. Journal of Advanced Nursing, 18(6), 941–947. https://doi.org/10.1046/j.1365-2648.1993.18060941.x

Nigbur, D., Lyons, E., & Uzzell, D. (2010). Attitudes, norms, identity and environmental behaviour: Using an expanded theory of planned behaviour to predict participation in a kerbside recycling programme. British Journal of Social Psychology, 49(2), 259–284.

Parrilla, S. J. (2016). Measuring knowledge and attitudes of clinicians about motivational interviewing with troubled adolescents.

Prochaska, J. O., Redding, C. A., & Evers, K. E. (2015). The transtheoretical model and stages of change. Health Behavior: Theory, Research, and Practice, 97.

Qualtrics. (2005). Qualtrics XM (March, 2022).

Rollnick, S., & Miller, W. R. (1995). What is Motivational Interviewing? Behavioural and Cognitive Psychotherapy, 23(4), 325–334. https://doi.org/10.1017/S135246580001643X

Rollnick, S., Miller, W. R., & Butler, C. (2008). Motivational interviewing in health care: helping patients change behavior. Guilford Press.

Wakeman, S. E., Pham-Kanter, G., & Donelan, K. (2016). Attitudes, practices, and preparedness to care for patients with substance use disorder: Results from a survey of general internists. Substance Abuse, 37(4), 635–641. https://doi.org/10.1080/08897077.2016.1187240

Chapter 6: Discussion

6.1 Overview of findings

This thesis had two objectives: (1) to determine the association between the type of training, SIM or e-learning, and MI self-efficacy, knowledge, attitude, and subjective norm, in undergraduate nursing students, immediately after the training, and (2) to determine the associations of post-training MI attitude, self-efficacy, and subjective norm, with intent to use of MI skills after 3 months, while exploring the effect of the type of training on these associations.

According to the conducted literature review, this is the first study to adopt a randomized controlled trial design to assess the effectiveness of SIM to deliver MI skills to undergraduate nurses. Moreover, this is the first time to have this learning style comparison assessed according to the Theory of Planned Behaviour's framework. Multivariable linear regression modelling showed no significant associations between training type and the four post-training outcomes: MI self-efficacy, attitude, knowledge, and subjective norm while adjusting for potential confounders. However, all outcomes significantly increased in both learning groups, according to paired analyses. Regarding the second objective, post-training self-efficacy, attitude, and subjective norms were not found to be associated with 3-months intent for the whole sample. On the other hand, only the post-training subjective norm was found to be significantly associated with 3-months intent to use MI, for the SIM training group, with and without adjusting for post-training knowledge and self-efficacy. Post-training self-efficacy was found to be associated with 3-month intent to use MI, in the control group only, after adjusting for year of study, MI knowledge, and subjective norm.

6.2 Main findings

6.2.1 SIM and MI self-efficacy

The MI self-efficacy results were surprising on two levels. At the descriptive statistics level, post-training MI self-efficacy scores were higher for the control group, compared to the SIM group (84 vs. 79). At the multivariable analysis level, training by SIM was not found to be associated with post-training self-efficacy. The resulting coefficient suggested that those who trained by SIM had a lower post-training mean SE score of 1.5. This finding can be explained by the differences in baseline self-efficacy scores between both groups, where they were lower for the SIM group. Consequently, the amount of increase in self-efficacy scores was higher for the SIM group, although the mean post-training score was lower than the control group. Another point to consider, when looking at the post-training self-efficacy scores, is the type of learner and the level of confidence of each individual in their abilities in general. Learning by SIM can be stressful for some students to improvise in front of other people and try to apply newly learned skills (within the past hour). Therefore, the small duration of the SIM training, as well as its experiential nature, might have contributed to the low post-training self-efficacy scores. The significant increase in self-efficacy scores after the SIM training, according to the paired t-test results, was consistent with the findings of Chang et al. (2019), who reported a significant increase in MI skills confidence after MI SIM training. It is also worth noticing that their findings were on the bivariate level of analysis, using ANOVA.

6.2.2 SIM and MI attitude

The bivariable and multivariable analysis results for the MI attitude outcome were in line with the direction of our hypothesis. In bivariable analysis, mean attitude scores significantly increased from baseline to post-training, only in the SIM group (mean difference 1.5, 95% CI

[0.6-2.3]). This finding differed from the statistically non-significant increase found by Chang et al., using the same MIKAT scale (Chang et al., 2019). Multivariable analysis showed that those who learned by SIM had a higher post-training attitude score by 0.8 (out of 14); however, no association was found between training type and post-training MI attitude score. This finding may be explained by the variability in baseline attitude scores between the two arms, where MI attitude scores were lower in the SIM group at baseline (8.35 compared to 9.12). So, although they showed a larger positive change after the training, there was no association between learning by SIM and post-training attitude.

6.2.3 SIM and MI knowledge

The relationship between learning by SIM and MI knowledge was a bit surprising. Bivariable analyses revealed a significant increase in MI knowledge for the control group only. Moreover, although statistically non-significant, the multivariable results suggest that participants trained by SIM achieved lower post-training MI knowledge scores while adjusting for ethnicity, gender, and baseline knowledge score. These findings contradict the findings from Lupu et al. (2012), who found the highest increase in MI knowledge in the SIM learning group by roleplaying. Also, the results do not corroborate the findings of Chang et al., where a significant increase in MI knowledge was seen after MI SIM training, assessed by the MIKAT tool (Chang et al., 2019). These contradicting findings may have several explanations. First, the curated audios offered in the control group contained some MI-consistent expressions (e.g., rolling with resistance) that were not mentioned in the SIM sessions. The main focus of the SIM sessions was on practicing the four basic skills for each participant, which gave no time for deeper elaborations on the rest of the MI concepts. Also, many of the covered concepts in the SIM sessions, unfortunately, were not labelled in the same way as the questionnaire. The second

possible explanation could be the disparity between the presenters in both training groups; in the SIM session, the facilitator was a clinical psychology graduate student, while for the control group, the speakers were more experienced clinicians with MI expertise. Therefore, knowledge scores increased significantly in the control group only.

6.2.4 SIM and MI subjective norm (SN)

Post-training subjective norm scores were not found to be associated with the type of training, SIM or e-learning. Also, the paired increase in the subjective norm's mean scores was statistically significant for both groups. Surprisingly, the findings suggest that the SN scores would decrease by 1.12 in the SIM group while controlling for baseline SN, gender, stigma, and previous MI training. Although the results do not support the study hypothesis, they can be explained. Subjective norm is the cognition arising from the normative beliefs of an individual. Normative beliefs are the person's thoughts about what is normally expected about the behaviour of their significant others and the community (Ajzen, 2006; Fishbein & Ajzen, 2011). Since the control group heard the opinion of more than 15 experts about the importance and usefulness of MI, their normative beliefs about using the skills grew higher than their learning-by-SIM colleagues. Especially, when the only MI expert in the SIM sessions was the facilitator and the total attendants of one session were 4-6 individuals, including the researcher.

6.2.5 Intention to use MI scores

The intention to use MI skills by the participants was measured at all points of data collection (baseline T1, post-training T2, 3-month follow-up T3), and significantly changed for the total sample. The results showed an initial increase in intent scores from T1 to T2, followed by a significant decrease at T3, for the whole sample. The change in the intent scores was wider and statistically significant only for the SIM group, from T2 to T3. However, the initial increase

in the intent to use scores for the SIM group was not significant and could not be maintained

after 3-months. This may be explained by how the human interaction in the SIM group

significantly encouraged them to decide to use these new skills; however, the training was not

long or detailed enough to maintain their intentions. Future research is encouraged to explore

factors that may maintain the high intentions to use MI skills in nursing students.

6.2.6 MI self-efficacy and intent to use

Post-training MI self-efficacy was not found to be associated with 3-month intent to use,

for the total sample. A significant effect estimate was found on the crude level but could not be

interpreted as it became non-significant when confounders were controlled for. After splitting the

sample and adjusting for potential confounders, such as year of study, post-training MI

knowledge, and subjective norm, a statistically significant positive association was seen, for the

control group only. Although this association should be interpreted with caution due to the small

sample size, it confirms the TPB framework (Ajzen, 1991). Every 10 units increase on the scale

of self-efficacy (out of 100) would increase the intent to use score by 0.37 (out of 7), while

adjusting for confounders. This significant association slightly contradicts the paired t-test results

for the intent scores, which were only significant for the SIM group. However, the multivariable

analysis was conducted between T2 (for independent variable) and T3 (for dependent variable),

where a significant decrease in intent scores was evident for the SIM group. Furthermore, the

difference between the post-training mean self-efficacy scores was in favour of the control

group, which can explain its significant association with the 3-month intent, for the control group

only.

6.2.7 MI attitude and intent to use

Surprisingly, no association was found between post-training MI attitude and 3-month intent to use, for the total sample or by training type. Moreover, the beta coefficient of MI attitude was negative in the total and stratified models, suggesting a decrease in intent scores with increasing MI attitude. This negative direction contradicts the TPB and the evidence from the literature, which showed strong associations between attitude and intent, even stronger than the associations of SE and SN with intent (Albarracin et al., 2001). A possible explanation for this contradiction can be the MIKAT scale questions, which measured MI-consistent attitudes, rather than attitudes towards MI use. The way used to assess MI attitude in this study can be considered different from how the attitude towards a behaviour is assessed in the literature. The questions didn't include how strong were the students' behavioural beliefs about MI skills on a personal level, which is how the attitude was measured in the literature applying TPB (Ajzen, 2006). Capturing the students' attitude towards using MI can be a bit challenging, as such a scale was not found in the literature and needs to be created. Moreover, the attitude toward using MI skills can be strongly determined by the attitude towards behavioural patients in general. Despite the potential inaccuracy of the used attitude scale, stigma scores (i.e., attitude toward SUD patients) were found to be negatively correlated to post-training attitude scores. This negative correlation is reassuring that the measured attitudes are not completely out of context.

6.2.8 MI subjective norm and intent to use

For the total sample, no significant association was found between subjective norm and 3-months intent. However, the post-training subjective norm was significantly associated with 3-month intent to use, exclusively in the SIM group, with and without adjustment for post-training self-efficacy and knowledge. Each 1-point increase on the subjective norm scale (out of 14)

increases the intent score by 0.24 (out of 7) while adjusting for MI self-efficacy and knowledge. This finding goes with the TPB (Ajzen, 1991) and supports our expectations that the association between subjective norm and intention, as per the TPB, would be stronger in the SIM group. This difference in the results, by the type of training, can be justified by the human interaction factor in the SIM sessions. Since subjective norm is based on normative beliefs received from significant people in the person's community, its effect on intent was more significant for the SIM group. This explanation is also supported by the experiential learning literature, which found a positive relationship between SIM and the subjective norm (Baden & Parkes, 2013).

6.3 Epidemiological implications

Internal validity. Internal validity refers to the "validity of the comparisons made within the study" (Celentano & Szklo, 2018). In other words, internal validity represents the soundness of the process and interpretations within the study. The more selection, misclassification, and confounding biases are kept to a minimum, the more internal validity is achieved. In this section, three potential sources of bias are discussed in relation to this study.

Selection bias. Selection bias is defined as the way of selecting exposed and non-exposed participants that may lead to certain observations that are not necessarily true, like the presence of association in the absence of one, or the absence of association in the presence of one (Celentano & Szklo, 2018). Three potential sources of selection bias can be identified in this study. First, is the low response rate, which drove this study to be conducted in two phases (Spring and fall of 2021). Nursing students who were interested to participate in our study may have different perceptions of counselling skills or SUD-related chronic problems in general, compared to the non-interested students (who were approached by the researcher in class and didn't register). Attempts to prevent this were through promoting MI skills as a useful skill set to

manage all chronic patients needing behaviour change, rather than solely for SUD management. Moreover, non-participants can be less interested in extra-curricular activities or more focusing on grades. This was addressed by promoting MI skills as a clinically must-know strategy for their upcoming career. Nonetheless, the Covid-19 pandemic can be a great contributor to the low response rate, given that this study was another e-learning experience for both intervention arms (Mosleh et al., 2022; Nikou & Maslov, 2021).

Another potential source of selection bias was the high dropout rate after initial registration. The initial registration stage included the informed consent form, the baseline survey, and the available dates for training. Seventy-five nursing students showed interest in this study and consented to participate. Sixty-six of which (88%) completed the baseline survey, then only 52 (79%) showed up for their training and completed the post-training survey. To account for the potential bias, we compared the baseline characteristics of the trained participants (n=52) and the lost-after-baseline participants (n=14). This comparison showed a statistically significant difference only in ethnicity and baseline MI knowledge. The rate of dropping out after the baseline survey was higher for white participants, compared to other ethnicities. Similarly, the mean baseline MI knowledge score was 2.29 for the dropped-out participants, compared to 3.31 for the continuing participants. Thus, nursing students with higher MI knowledge scores were more likely to continue the study and show for the training, which may have inflated the knowledge outcome scores. However, since this inflation affected both the SIM and control groups equally, according to the results of the independent t-test, thus no bias in the association of interest was expected. Several attempts to reach out to registered participants to accommodate their scheduling needs were done to lower attrition; however, coordinating the schedules of four

years nursing students', the facilitator, the acting patient, and the researcher was not possible for all participants.

    Misclassification bias. Is defined as *"*a systematic error that can occur at any stage in the research process. It occurs when an individual is assigned to a different category than the one to which they should be assigned" (Szklo & Nieto, 2014). Potential sources of misclassification can be the unvalidated questions used to assess some of the variables, such as stigma scores, prior training, and prior use of MI. Fortunately, the questions used to assess the main exposures and outcomes were validated in previous studies. However, for the first objective, a potential nondifferential misclassification bias is suspected, regarding the association between the type of training and MI knowledge. The scoring accuracy of the knowledge part of the questionnaire is questioned, where the question stated: "choose all that apply". So, participants could choose as many answers as they want, while only five answers were scored as correct. The lack of a limit on the number of choices made it possible for some participants to choose almost everything and get a maximum score, while others accurately chose four right answers and didn't get the maximum score. This may have caused an error in the outcome measurement (i.e. MI knowledge) in both groups, thus, resulting in a bias towards the null. If this was true, the negative association between SIM training and MI knowledge would be an area of re-exploration.

    For the second objective, the measurement of the outcome (i.e., intent to use) was challenging due to potential social desirability bias, which may falsely inflate the scores. This was prevented by adding a subjective intent question, which explores the opinion of participants about whether the skills should be used by other nurses. The mean scores for both scales were compared using paired t-tests and the results showed that subjective intent scores were

significantly higher than personal intent scores (MD = 0.48, p = 0.03). This suggested that the personal intent scores were not affected by social desirability bias, since they were generally lower than subjective intent scores. Therefore, the analysis for objective 2 was conducted using the scores from the personal intent question, as the outcome.

On the other hand, the surprisingly negative association between MI attitude and intention in the second paper raised a question about the accuracy of the MIKAT in the assessment of attitude towards MI use. When reviewed, the attitude questions of the MIKAT, which were 14 true or false questions, intend to capture MI-consistent attitudes rather than attitudes towards MI (Leffingwell, 2006). The latter differs in that attitudes toward MI arise from the behavioural belief about MI, which translates into the believed benefit and consequences of using MI (Ajzen, 2006). However, this misclassification is non-differential across the SIM and control group and would bias the results towards the null. To further explore this possible misclassification, the correlation between MI attitude scores and stigma was assessed and found to be significantly negative (r = -0.41, p-value < 0.01). This indicates that the more MI attitude scores increased, the lower the stigma scores were. On the other hand, Wakeman et al. (2016) found that having less stigma toward SUD patients was associated with a higher likelihood of providing the appropriate clinical practice, such as screening, giving medical advice, assessing readiness to change, and offering help and referral. These described clinical practices are very close to MI practices. Therefore, according to this association between stigma and providing appropriate clinical practice in the literature, MI attitude scores can still be considered to represent a determinant for intention to use the skills in this study. In conclusion, the MIKAT scale is a reliable instrument but was not the optimal tool to measure attitude towards MI skills in this study.

Confounding bias. This type of bias results when a variable is associated with the exposure of interest and is a risk factor for the outcome, at the same time (Celentano & Szklo, 2018). To overcome this kind of bias, blind randomization of all participants took place at the beginning of the study, after the completion of the baseline survey (T1). Randomization allows for an even distribution of the study variables between the two intervention arms, thus, omitting their confounding effect, as long as the sample size is sufficient (Celentano & Szklo, 2018). The second step to avoid confounding bias was through reviewing the literature for potential confounders. This step resulted in the inclusion of prior training and stigma as potential confounders for objective 1, as well as the inclusion of the TPB components as confounders for each other in objective 2 (i.e., MI attitude, subjective norm, and self-efficacy). Moreover, a descriptive comparison of the different variables across the two intervention arms was done, which showed that gender and prior training were not evenly distributed across the groups, even after randomization. Thus, they were assessed for potential residual confounding for all the models in paper 1. To add to this comparison, the post-training outcomes' means (i.e., post-training SE, attitude, knowledge, and SN) were tested for significant differences by each of the covariates' categories in paper 1 (i.e., using an independent t-test and ANOVA test with Bonferroni correction). This step yielded a significant difference in the MI self-efficacy outcome by the year of study. Similarly, a significant difference was found in MI knowledge across different ethnicities.

For the second objective, the training type was explored as a potential effect modifier by stratification. Performing the stratified analysis by the type of training showed a wide difference in the estimate's values between SIM and control groups in each of the 3 models. However, the tested training type interaction terms were not significant, except for with post-training

subjective norm. Therefore, the training type wasn't considered an effect modifier, stratification was only done for exploration and the results were presented in the overall and stratified forms. On another note, the sample size was very small, being 40 in total and 20 for each stratum, which limited the inclusion of confounders to a great extent. For each TPB component, the other components were included as potential confounders in the least mean squared error method (Greenland et al., 2016). This was decided based on previous intervention studies, which always included the three components as predictors in the same model (Hardeman et al., 2002). Moreover, the TPB framework by Ajzen shows that the three components are related to each other and are factors for intention (Ajzen, 2006). Furthermore, the year of study was added to the self-efficacy model according to the statistically significant difference between years 1&2 and years 3&4's post-training self-efficacy scores. Nonetheless, MI knowledge was included in all the models as a potential confounder, although not based on the literature or statistical significance. Knowledge was included due to its logical association with attitude, subjective norm, and self-efficacy, as well as its importance to develop intention. Having the intention for a behaviour would make no sense in the absence of knowledge about it.

External validity. This study assessed the effectiveness of simulation in delivering MI skills to undergraduate nursing students at Lakehead University. The participants included undergraduate nurses from all four study years with an age range from 18 to above 30. The ethnic diversity within the sample was acceptable to some extent, unlike the gender representation, which was mostly female. The generalizability of this study's results cannot be extended to undergraduate nursing students in Northwestern Ontario, because of the small sample size. Its generalizability to the rest of the Canadian nursing undergraduates also has its limitations, due to the difference in the student population composition in more urban parts of

Canada and Ontario, in addition to the small sample size. However, the study findings give an idea about the acceptance of MI skills by undergraduate nursing students. Additionally, it provides a comparison of two learning styles for conversational skills, regarding the acquired self-efficacy, knowledge, attitude, and subjective norm, as well as the intention to use the skills. Further research in larger and multiple Canadian universities will be needed to confirm the study findings and build generalized conclusions.

Causality. The first and most important guideline to judge an observed association as being causal is temporality (Celentano & Szklo, 2018). Prospective studies, which follow a sample of the population over a period of time, address the issue of temporality. Therefore, the significant associations found in this study realize the conditions of temporality. Moreover, the results of the study are considered plausible since they follow and confirm the body of knowledge around the Theory of Planned Behaviour (Ajzen, 1991). The association between self-efficacy and intention to use MI skills after 3-months possesses temporality and consistency with previous knowledge (Celentano & Szklo, 2018), although observed only for the control group. Likewise, the association between subjective norm and intention to use the skills after 3-months is consistent with the body of TPB literature and shows temporality. On the other hand, the rest of the associations assessed in the study were not statistically significant, probably due to the small sample size. However, some of the findings suggest plausible associations and are in the expected direction. For instance, the beta coefficients of the SIM training in the MI attitude and subjective norm regression models were positive.

6.4 Ethical considerations

This study was reviewed and accepted by the Lakehead University Research Ethics Board (REB). Several amendments were requested and accepted according to the recruitment

needs, such as adding a recruitment email and including the first- and second-year students in the study.

Informed consent: Interested nursing students were directed to a link that took them to the information letter and consent form, followed by a brief study screening questionnaire via Qualtrics to verify that they were age 18 or above. Eligible students were then directed to the baseline line survey, and finally to self-schedule for a range of MI training session dates. The cover letter included the purpose of the study, statements about the data collection procedure, the right to withdraw at any time, the potential risks and benefits, procedures to ensure confidentiality, and data storage and dissemination details. The consent form included a checkbox if the participant wished to receive a copy of the results.

Potential risks and benefits: SIM training generally may carry a potential psychological risk of feeling embarrassed to participate in roleplaying in front of other colleagues. To reduce this risk, students were informed that roleplay may be required during the study, then the facilitator explained that this was a new skill and that no participant was expected to do it very well during the first try. Mistakes and nervousness were normalized.

Participants' total time in the study was approximately 90 minutes, including an hour for the session and 30 minutes for the three surveys. The acquired benefits from participation are learning about motivational interviewing, which will help the students in their future careers and make it easier for them as care providers to manage patients who need behavioural change. Additionally, improving future nurses' capacity to manage patients suffering from problematic substance use would positively impact society, by lowering the rates of substance use and its consequences. Nonetheless, upon participation and finishing the post-training survey, students received a certificate of completion to demonstrate their introductory learning of MI skills.

Finally, upon the completion of the follow-up survey, participants received a $5 Starbucks gift card.

Confidentiality: The researcher was aware of the participants' names and contact information to arrange a time for the training, as well as to send reminders and answer questions. This information was kept confidential. That is, the names were coded into participants' IDs and saved into separate files, then cross-linking of the follow-up data occurred via participant emails. This linkage document was only accessible by the PI and the graduate student investigator leading the data collection. The research team will not share the names or other identifying information with anyone outside the study without the participant's explicit consent.

6.5 Limitations

Low response rates and small sample sizes were the main limitations facing this study. The Covid-19 pandemic and the busy nature of nursing studies made participation challenging for many interested students. Moreover, virtual recruitment is not believed to have reached all of the targeted population. Research-related electronic invitations can be easily ignored due to busy schedules. The low response rate caused the study to be conducted in two phases with some inconsistencies between the two, such as the inclusion of years one and two in the second phase and the change of the sessions' facilitator. The impact of such inconsistencies was kept to a minimum through diverse strategies. For instance, the same PowerPoint presentation was used from phase one by the new facilitator. Also, the year of study was tested as a potential confounder for self-efficacy outcomes, due to the significant difference between the first and last two years' self-efficacy scores. Similarly, the small sample size is a barrier to the interpretation of the stratified analysis results, although they showed significant associations.

Potential misclassification bias is present in the study, although likely nondifferential in nature. The way that MI knowledge was assessed as an outcome for the first objective may not have been completely accurate, due to the unlimited answer choices. This means that students may have responded inaccurately by checking as many as apply and still get a score as high as those who accurately chose five right answers. This limitation may have biased the findings, such that we observed no association between SIM training and MI knowledge.

Another potential misclassification is suspected for the second objective, where the MI attitude scale doesn't optimally reflect the attitude of the students towards using MI. The MIKAT measured the MI-consistent attitudes through true or false questions, which are not the same as the attitudes arising from behavioural beliefs and expectations. This misclassification, being nondifferential, is thought to have biased the results towards the null. In other words, this misclassification led to a negative and non-significant association between MI attitude and intent to use the skills, which is not supported by the TPB or the literature.

Finally, there is a potential confounder that was revealed by reflecting on the results, which is the preferred learning style of each student. Personal preferences exist for learning styles, such as active experimentation versus reflective observations (Kolb, 1984). So, if most of the SIM group consisted of reflective observers, that would bias the results towards the null, and if they mostly consisted of active experimenters, that would bias the results away from the null.

6.6 Strengths

This study used a randomized controlled trial design and multivariable regression analysis to evaluate SIM use in MI skills learning, which was novel. This study was the first to add a control group to provide a comparison between two types of learning in the delivery of MI-related material. The randomization of the sample gave more confidence to the findings,

compared to pre-and post- experimental design adopted by comparable previous studies (Badowski et al., 2019; Chang et al., 2019; Seigart et al., 2018). Using a multivariable analysis in this study, although didn't provide significant results, contributed to the literature by identifying possible confounders for each MI self-efficacy, attitude, knowledge, and subjective norm. Moreover, the robustness of the study design allows it to be replicated for various domains of learning. On the other hand, the findings from this study, although likely to change with a larger sample, provide the possibility for nursing schools to introduce MI skills to their students in the most convenient way for their instructors. Since SIM can be expensive and time-consuming, the results allow the instructors to introduce MI skills by providing e-material.

The study combined an epidemiological design within a psychological framework, in a nursing learning environment. This combination between epidemiology and psychology opens up new avenues of research that combines theory with science in this study area. Nonetheless, this study used an etiological approach to assess the relationship between each of the cognitions of the TPB and intention. This means that the associations between self-efficacy, attitude, and subjective norm, with the intention to use MI, were separately measured, while controlling for important confounders for each of the three determinants. This etiological modelling approach is novel compared to the predictive approaches frequently used to apply the TPB in various contexts. Moreover, comparing the impact of learning style on these associations adds a different exploration lens.

6.7 References

Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision

    Processes, 50(2), 179–211.

Ajzen, I. (2006). Constructing a theory of planned behavior questionnaire. Amherst, MA.

Albarracin, D., Johnson, B. T., Fishbein, M., & Muellerleile, P. A. (2001). Theories of reasoned

    action and planned behavior as models of condom use: a meta-analysis. Psychological

    Bulletin, 127(1), 142.

Baden, D., & Parkes, C. (2013). Experiential learning: Inspiring the business leaders of

    tomorrow. Journal of Management Development.

Badowski, D. M., Rossler, K. L., & Gill-Gembala, L. T. (2019). Telehealth simulation with

    motivational interviewing: Impact on learning and practice. Journal of Nursing Education,

    58(4), 221–224. https://doi.org/10.3928/01484834-20190321-06

Celentano, D. D., & Szklo, M. (2018). Gordis Epidemiology (sixth edit). Elservier Canada.

Chang, Y., Cassalia, J., Warunek, M., & Scherer, Y. (2019). Motivational interviewing training

    with standardized patient simulation for prescription opioid abuse among older adults.

    Perspectives in Psychiatric Care, 55(4), 681–689. https://doi.org/10.1111/ppc.12402

Fishbein, M., & Ajzen, I. (2011). Predicting and changing behavior: The reasoned action

    approach. Psychology press.

Greenland, S., Daniel, R., & Pearce, N. (2016). Outcome modelling strategies in epidemiology:

    traditional methods and basic alternatives. International Journal of Epidemiology, 45(2),

    565–575.

Hardeman, W., Johnston, M., Johnston, D., Bonetti, D., Wareham, N., & Kinmonth, A. L.

    (2002). Application of the theory of planned behaviour in behaviour change interventions:

A systematic review. Psychology and Health, 17(2), 123–158.

Kolb, D. A. (1984). Experiential Learning: Experience as The Source of Learning and

Development. Prentice Hall, Inc., 1984, 20–38. https://doi.org/10.1016/B978-0-7506-7223-

8.50017-4

Leffingwell, T. R. (2006). Motivational Interviewing Knowledge and Attitudes Test (MIKAT)

for evaluation of training outcomes. Minuet, 13, 10–11.

Lupu, A. M., Stewart, A. L., & O'Neil, C. (2012). Comparison of active-learning strategies for

motivational interviewing skills, knowledge, and confidence in first-year pharmacy

students. American Journal of Pharmaceutical Education, 76(2), 1–7.

https://doi.org/10.5688/ajpe76228

Mosleh, S. M., Shudifat, R. M., Dalky, H. F., Almalik, M. M., & Alnajar, M. K. (2022). Mental

health, learning behaviour and perceived fatigue among university students during the

COVID-19 outbreak: a cross-sectional multicentric study in the UAE. BMC Psychology,

10(1), 1–11.

Nikou, S., & Maslov, I. (2021). An analysis of students' perspectives on e-learning

participation–the case of COVID-19 pandemic. The International Journal of Information

and Learning Technology.

Seigart, D., Veltman, M., Willhaus, J., & Letterle, C. (2018). Implementation of Motivational

Interviewing Training in an Undergraduate Nursing Curriculum: Identifying Adolescents at

Risk for Substance Use. International Journal of Environmental Research and Public

Health, 15(8), 1623. https://doi.org/10.3390/ijerph15081623

Szklo, M., & Nieto, F. J. (2014). Epidemiology: beyond the basics. Jones & Bartlett Publishers.

Wakeman, S. E., Pham-Kanter, G., & Donelan, K. (2016). Attitudes, practices, and preparedness

to care for patients with substance use disorder: Results from a survey of general internists.

Substance Abuse, 37(4), 635–641. https://doi.org/10.1080/08897077.2016.1187240

Chapter 7: Conclusions

This study confirmed the effectiveness of the SIM learning style to improve nursing students' MI self-efficacy, attitudes, knowledge, and subjective norm, immediately after a one-hour training. However, this improvement was also found in the control group, which received MI-related information through e-learning. While this non-significant difference did not support the study hypothesis, it provides more diversity to the possible ways of learning MI skills in nursing schools. Future research is encouraged to replicate the study with a larger sample size to explore whether the training type is not an important factor in the MI skills inquiry.

Moreover, a significant association between the students' intentions to use the skills in their future practice and the subjective norm was found in the SIM group. This emphasizes that the aspect of SIM learning, that elicits an intention to use the skills, is mostly related to the interactive learning environments and the altered normative beliefs about the learnt skills. The finding that self-efficacy was not significantly higher or significantly associated with intent in the SIM group was particularly interesting, as learning through experience is expected to boost the students' self-efficacy. Future research is encouraged to include the type of learner, being observational or experiential, as a potential confounding variable for self-efficacy increase.

Another important implication of the findings is the ability of the learning style to maintain its effects for longer. An initial significant increase in intention to use MI skills was observed immediately after the training, then it significantly declined at follow-up. This area needs further exploration to find the best learning method that can maintain intentions to use new skills until graduation and practice, with minimum time costs.

The study also provided a practical application of the Theory of Planned Behaviour (TPB) by combining its theoretical framework with an etiological analytical approach. This combination provides a beneficial body of evidence about MI teaching styles and their impact on

future use by nurses. Furthermore, the study can be replicated in other healthcare personnel

contexts or for other conversational skills learning, after validating the applicability of the TPB

in this context.

      Nonetheless, the study noted the satisfaction and acceptance of nursing students for MI

skills learning, even at this early stage of their careers. Although a descriptive finding, this

should encourage the nursing education stakeholders to think about regularly introducing MI

skills at the undergraduate nursing level. This can be an impactful step in the long term to

decrease the SUD burden on the mental health departments, as well as to lower its negative

impact on the Canadian economy.

Appendix

Appendix A: Baseline Survey

1. Which year of nursing school are you in?

   ☐third

   ☐fourth

   ☐other

2. How old are you?

3. What is your gender?

   ☐Male

   ☐Female

   ☐ I don't identify as either Male or Female

   ☐ Prefer not to say

4. What is your ethnicity?

   ☐White

   ☐Black

   ☐Indigenous

   ☐South Asian

   ☐other

5. Did you receive any prior training in Motivational Interviewing (MI)?

   ☐Yes

   ☐No

6. Did you use MI skills with any patients before?

☐yes

☐no

7. Please indicate your agreement with these statements:

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
Substance use disorders (SUD) is different from other chronic diseases because drug and alcohol use is a choice				
SUD is a treatable disease				
Treatment with opioid agonist medications is "simply replacing one addiction with another"				
Caring for patients with SUD is as satisfying as other clinical activities				
Patients with SUD are more challenging than the average patient				
People who use drugs are committing a crime and deserve to be punished.				

8. Please rate on a scale from 0 to 10 how confident are you to:

											0
To provide a brief intervention to motivate your patients to lower their substance use levels											
Ask open-ended 156raining during the counseling sessions with the patient											
Repeat back to the patient their thoughts and feelings regarding their substance use without judgement											
Ask about											

then repeat back to the patient their own arguments **against** abstinence											
Ask about then repeat back to the patient their own arguments **for** abstinence											
Assess the patient's stage of change for decreasing their substance use											
Assess the patient's self-efficacy for decreasing their substance use											

Assess the importance the patient places on decreasing their substance use										
Convey your belief that they can successfully change their level of substance use										
Refrain from giving advice unless you are asked or given permission by the patient										

9. The following statements are either factually true or false, or consistent with ("true") or inconsistent with ("false") a motivational interviewing approach. Indicate your response by circling the appropriate item to the right.

    K. Substance users must accept their problem (for example: "I am an

alcoholic/addict.") before they can get help. ☐True ☐ False

2. Denial is a characteristic of the disease of addiction. ☐True ☐False

3. Therapists' expectancies for their client's abilities to change have no effect upon whether change occurs. ☐True ☐False

4. Research has failed to find support the existence of an "addictive personality." ☐True ☐False

5. Substance users need to "hit bottom" before they can change. ☐True ☐False

6. If clients are resistant to talk about changing substance use, direct confrontation and persuasion are required to help the person change. ☐True ☐False

7. Resistance to talking about substance use is the direct result of denial, a symptom of the disease of addiction. ☐True ☐False

8. Counselors should emphasize personal choice over clients' behavior, including substance use. ☐True ☐False

9. Substance abusers are generally incapable of making sound decisions in their current state of addiction. ☐True ☐False

10. Resistance is best thought of as a product of the interpersonal context in which it is observed. ☒True ☐False

11. Addicts and alcoholics are not capable of exerting control over their substance use behavior. ☐True ☐False

12. Readiness to make change is the client's responsibility – no one can help them until they decide they are ready. ☐True ☐False

13. The best way to motivate substance users is to help them resolve their ambivalence about change. ☐True ☐False

14. External pressure and consequences is the only way to make substance abusers change.

☐True ☐False

10. Which of the following are principles of a Motivational Interviewing approach to dealing with substance use? (select all that apply):

☐ Breakdown denial ☐ Develop discrepancies ☐ Confront resistance

☐ Express empathy ☐ Acceptance of label("alcoholic/addict") is required ☐ Educate about risks

☐ Maximize external pressure ☐ Use subtle coercion ☐ Support self-efficacy

☐ Roll with resistance ☐ Give direct advice ☐ Give clear consequences

☐ Require abstinence as only acceptable goal ☐ Encourage submission to disease

☐ Avoid argumentation

11. I would rate my intent to use MI skills with SUD patients as: (very weak – very strong)

1	2	3	4	5	6	7
Very weak because it won't make any difference						Very strong because it will definitely help

12. I think that nursing staff should use MI skills with SUD patients:

Stron gly agree	Agr ee	Somew hat agree	Neit her agree nor disagree	Somew hat disagree	Disag ree	Stron gly disagree

13. Indicate the likeliness of the following statements (not at all likely – extremely likely):

	1 not at all likely	2	3	4	5	6	7 – extreme ly likely
Oth er nurses think that I should use MI with people who have SUD							
Mo st people who are important to me think that nurses should use MI with people who have SUD							

Appendix B: Post-training Survey (SIM group)

1. Please indicate your agreement with these statements about the MI training:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The overall purpose/goal for this MI training was met.					
The education enhanced my skills in this topic area.					
The education was relevant to my career.					
The education will enhance my knowledge and skills as a practitioner.					
I expect to use the information gained from this education.					
I found this education useful for my professional practice in the future.					
I expect this education to benefit the substance users I may work with in the future.					
I was able to implement MI skills in my clinical practice					

2. To what extent have you found the simulated conversation with the virtual patients/clients to be:

	Not at all or to very little extent	To a little extent	To some extent	To a great extent	To a very great extent
Helpful in learning how to identify people with substance use issues					

Helpful in learning effective conversation tactics to increase substance users engagement in a brief intervention					
Realistic representation of conversations you might have with substance users as a practitioner					

3. Satisfaction with the Standardized Patients simulation training provided:

	Very Dissatisfied	Dissatisfied	Neutral	Satisfied	Very Satisfied
How satisfied are you with the quality of the simulations between the patient and practitioner?					
Overall, how satisfied are you with your educational experience after completing the simulation program?					

4. Please rate your agreement with this statement on a scale from 1 to 5:

	1	2	3	4	5
I would recommend this training to a colleague					

5. Please rate on a scale from 0 to 10 how confident are you to:

										0
To provide a brief intervention to motivate your 163rai										

nin to lower their substance use levels											
Ask open-ended questions during the counseling sessions with the patient											
Repeat back to the patient their 164rainin and 164rainin regarding their substance use without judgement											
Ask about then repeat back to the patient their own											

arguments **against** abstinence											
Ask about then repeat back to the patient their own arguments **for** abstinence											
Assess the patient's stage of change for decreasing their substance use											
Assess the patient's self-efficacy for decreasing their substance use											
Assess the											

importance the patient places on decreasing their substance use											
Convey your belief that they can successfully change their level of substance use											
Refrain from giving advice unless you are asked or given permission by the patient											

6. The following statements are either factually true or false, or consistent with ("true") or inconsistent with ("false") a motivational interviewing approach. Indicate your response by circling the appropriate item to the right.

   K. Substance users must accept their problem (for example: "I am an

alcoholic/addict.") before they can get help. ☐True ☐ False

2. Denial is a characteristic of the disease of addiction. ☐True ☐False

3. Therapists' expectancies for their client's abilities to change have no effect upon whether change occurs. ☐True ☐False

4. Research has failed to find support the existence of an "addictive personality." ☐True ☐False

5. Substance users need to "hit bottom" before they can change. ☐True ☐False

6. If clients are resistant to talk about changing substance use, direct confrontation and persuasion are required to help the person change. ☐True ☐False

7. Resistance to talking about substance use is the direct result of denial, a symptom of the disease of addiction. ☐True ☐False

8. Counselors should emphasize personal choice over clients' behavior, including substance use. ☐True ☐False

9. Substance abusers are generally incapable of making sound decisions in their current state of addiction. ☐True ☐False

10. Resistance is best thought of as a product of the interpersonal context in which it is observed. ☐True ☐False

11. Addicts and alcoholics are not capable of exerting control over their substance use behavior. ☐True ☐False

12. Readiness to make change is the client's responsibility – no one can help them until they decide they are ready. ☐True ☐False

13. The best way to motivate substance users is to help them resolve their ambivalence about change. ☐True ☐False

14. External pressure and consequences is the only way to make substance abusers change. ☐True ☐False

7. Which of the following are principles of a Motivational Interviewing approach to dealing with substance use? (select all that apply):

☐ Breakdown denial ☐ Develop discrepancies ☐ Confront resistance

☐ Express empathy ☐ Acceptance of label("alcoholic/addict") is required ☐ Educate about risks

☐ Maximize external pressure ☐ Use subtle coercion ☐ Support self-efficacy

☐ Roll with resistance ☐ Give direct advice ☐ Give clear consequences

☐ Require abstinence as only acceptable goal ☐ Encourage submission to disease

☐ Avoid argumentation

8. Did you receive any prior training in Motivational Interviewing (MI)?

☐Yes

☐No

9. Did you use MI skills with any patients before?

☐yes

☐no

10. I would rate my intent to use MI skills with SUD patients as: (very weak – very strong)

1	2	3	4	5	6	7
Very weak because it won't make any difference						Very strong because it will definitely help

11. I think that nursing staff should use MI skills with SUD patients:

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

12. Indicate the likeliness of the following statements (not at all likely – extremely likely):

	1	2	3	4	5	6	7
	not at all likely						– extremely likely
Other nurses							

think that I should use MI with people who have SUD						
Most people who are important to me think that nurses should use MI with people who have SUD						

Appendix C: Post-training Survey (E-materials group)

1. Please indicate your agreement with these statements about the MI training:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
The overall purpose/goal for this MI training was met.					
The education enhanced my skills in this topic area.					
The education was relevant to my career.					
The education will enhance my knowledge and skills as a practitioner.					
I expect to use the information gained from this education.					

I found this education useful for my professional practice in the future.				
I expect this education to benefit the substance users I may work with in the future.				
I was able to implement MI skills in my clinical practice				

2. Please rate your agreement with this statement on a scale from 1 to 5:

	1	2	3	4	5
I would recommend this training to a colleague					

3. Please rate on a scale from 0 to 10 how confident are you to:

										0
To provide a brief intervention to motivate your patients to lower their substance use levels										
Ask open-										

ended 172raining during the counseling sessions with the patient										
Repeat back to the patient their thoughts and feelings regarding their substance use without judgement										
Ask about then repeat back to the patient their own arguments **against** abstinence										
Ask about then repeat back to the										

patient their own arguments **for** abstinence										
Assess the patient's stage of change for decreasing their substance use										
Assess the patient's self-efficacy for decreasing their substance use										
Assess the importance the patient places on decreasing their substance use										
Convey your belief that they can successfully										

change their level of substance use												
Refrain from giving advice unless you are asked or given permission by the patient												

4. The following statements are either factually true or false, or consistent with ("true") or inconsistent with ("false") a motivational interviewing approach. Indicate your response by circling the appropriate item to the right.

1) Substance users must accept their problem (for example: "I am an alcoholic/addict.") before they can get help. ☐True ☐ False

2) Denial is a characteristic of the disease of addiction. ☐True ☐False

3) Therapists' expectancies for their client's abilities to change have no effect upon whether change occurs. ☐True ☐False

4) Research has failed to find support the existence of an "addictive personality." ☐True ☐False

5) Substance users need to "hit bottom" before they can change. ☐True ☐False

6) If clients are resistant to talk about changing substance use, direct confrontation and persuasion are required to help the person change. ☐True ☐False

7) Resistance to talking about substance use is the direct result of denial, a symptom of the disease of addiction. ☐True ☐False

8) Counselors should emphasize personal choice over clients' behavior, including substance use. ☐True ☐False

9) Substance abusers are generally incapable of making sound decisions in their current state of addiction. ☐True ☐False

10) Resistance is best thought of as a product of the interpersonal context in which it is observed. ☐True ☐False

11) Addicts and alcoholics are not capable of exerting control over their substance use behavior.
☐True ☐False

12) Readiness to make change is the client's responsibility – no one can help them until they decide they are ready. ☐True ☐False

13) The best way to motivate substance users is to help them resolve their ambivalence about change. ☐True ☐False

14) External pressure and consequences is the only way to make substance abusers change. ☐True ☐False

5. Which of the following are principles of a Motivational Interviewing approach to dealing with substance use? (select all that apply):

    ☐ Breakdown denial ☐ Develop discrepancies ☐ Confront resistance

    ☐ Express empathy ☐ Acceptance of label("alcoholic/addict") is required ☐ Educate about risks

    ☐ Maximize external pressure ☐ Use subtle coercion ☐ Support self-efficacy

    ☐ Roll with resistance ☐ Give direct advice ☐ Give clear consequences

    ☐ Require abstinence as only acceptable goal ☐ Encourage submission to disease

    ☐ Avoid argumentation

6. Did you receive any prior training in Motivational Interviewing (MI)?
    ☐Yes

    ☐No

7. Did you use MI skills with any patients before?

    ☐yes

    ☐no

8. I would rate my intent to use MI skills with SUD patients as: (very weak – very strong)

1	2	3	4	5	6	7
Very weak because it						Very strong because it

won't make any difference						will definitely help

9. I think that nursing staff should use MI skills with SUD patients:

Stron gly agree	Agr ee	Somew hat agree	Neit her agree nor disagree	Somew hat disagree	Disag ree	Stron gly disagree

10. Indicate the likeliness of the following statements (not at all likely – extremely likely):

	1 not at all likely	2	3	4	5	6	7 extremely likely
Other nurses think that I should use MI with people who have SUD							
Most people who are important to me think that nurses should use MI with people who have SUD							

Appendix D: Follow-up Survey

1. Did you receive any additional training in Motivational Interviewing (MI) in the past

   three months?

   ☐Yes

   ☐No

   ☐I read some more on MI but no training

2. Did you use MI skills with any patients during the last three months?

   ☐yes

   ☐no

   ☐I didn't manage any patients

3. Please indicate your agreement with these statements:

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
SUD is different from other chronic diseases because drug and alcohol use is a choice				
SUD is a treatable disease				
Treatment with opioid agonist medications is "simply replacing one addiction with another"				
Caring for patients with SUD is as satisfying as other clinical activities				
Patients with SUD are more challenging than the average patient				
People who use drugs are committing a crime and deserve to be punished.				

4. Please rate on a scale from 0 to 10 how confident are you to:

	0	1	2	3	4	5	6	7	8	9	10
To provide a brief intervention to motivate your patients to lower their substance use levels											
Ask open-ended questions during the counseling sessions with the patient											
Repeat back to the patient their thoughts and feelings regarding their substance use without judgement											
Ask about then repeat back to the patient their own arguments **against** abstinence											
Ask about then repeat back to the patient their own arguments **for** abstinence											
Assess the patient's stage of change for decreasing their substance use											
Assess the patient's self-efficacy for decreasing their substance use											
Assess the importance the patient places on decreasing their substance use											
Convey your belief that they can successfully change their level of substance use											
Refrain from giving advice unless you are asked or given permission by the patient											

5. The following statements are either factually true or false, or consistent with ("true") or inconsistent with ("false") a motivational interviewing approach. Indicate your response by circling the appropriate item to the right.

K. Substance users must accept their problem (for example: "I am an alcoholic/addict.") before they can get help. ☐True ☐ False

2. Denial is a characteristic of the disease of addiction. ☐True ☐False

3. Therapists' expectancies for their client's abilities to change have no effect upon whether change occurs. ☐True ☐False

4. Research has failed to find support the existence of an "addictive personality." ☐True ☐False

5. Substance users need to "hit bottom" before they can change. ☐True ☐False

6. If clients are resistant to talk about changing substance use, direct confrontation and persuasion are required to help the person change. ☐True ☐False

7. Resistance to talking about substance use is the direct result of denial, a symptom of the disease of addiction. ☐True ☐False

8. Counselors should emphasize personal choice over clients' behavior, including substance use. ☐True ☐False

9. Substance abusers are generally incapable of making sound decisions in their current state of addiction. ☐True ☐False

10. Resistance is best thought of as a product of the interpersonal context in which it is observed. ☐True ☐False

11. Addicts and alcoholics are not capable of exerting control over their substance use behavior. ☐True ☐False

12. Readiness to make change is the client's responsibility – no one can help them until they decide they are ready. ☐True ☐False

13. The best way to motivate substance users is to help them resolve their ambivalence about change. ☐True ☐False

14. External pressure and consequences is the only way to make substance abusers change. ☐True ☐False

6. Which of the following are principles of a Motivational Interviewing approach to dealing with substance use? (select all that apply):

☐ Breakdown denial ☐ Develop discrepancies ☐ Confront resistance

☐ Express empathy ☐ Acceptance of label("alcoholic/addict") is required ☐ Educate about risks

☐ Maximize external pressure ☐ Use subtle coercion ☐ Support self-efficacy

☐ Roll with resistance ☐ Give direct advice ☐ Give clear consequences

☐ Require abstinence as only acceptable goal ☐ Encourage submission to disease

☐ Avoid argumentation

7. I would rate my intent to use MI skills with SUD patients as: (very weak – very strong)

	1	2	3	4	5	6	7
	Very weak because it won't make any difference						Very strong because it will definitely help

8. I think that nursing staff should use MI skills with SUD patients:

Strongly agree	Agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Disagree	Strongly disagree

9. Indicate the likeliness of the following statements (not at all likely – extremely likely):

	1	2	3	4	5	6	7
	not at all likely						– extremely likely
Other nurses think that I should use MI with people who have SUD							

Most people who are important to me think that nurses should use MI with people who have SUD							

Appendix E: Recruitment poster

Motivational Interviewing (MI) Online Training

Are you a nursing student? Do you want to learn more about how to support patients who use alcohol and drugs?

Dr. Scharf (Psychology), Dr. Kristman and Ms. Einshouka (Health Sciences) invite you to

build your Motivational Interviewing skills while taking part in research!

Participants will spend 1 hour learning Motivational Interviewing skills either in a Simulation format or through review of e-materials. You will receive a certificate of completion for your CV after completion of the training.

Those who complete a follow-up survey 3 months later will receive a $5 Starbucks gift card

To enroll follow this link below:
https://lakeheadhs.co1.qualtrics.com/jfe/form/SV_8elQcGuAr1yJkLc

for more information, please contact:

Maryam Einshouka   **Email:** meinshou@lakeheadu.ca

Appendix F: Control material (e-learning)

Link to audio resources about MI "the spirit of MI" (total time 42 minutes)

https://www.centerforebp.case.edu/resources/tools/the-spirit-of-mi

Third video on this page:

https://www.bu.edu/bniart/sbirt-in-health-care/sbirt-educational-materials/sbirt-videos/

11 questions reminder card

https://www.centerforebp.case.edu/client-files/pdf/miremindercard.pdf

Appendix G: Information letter and consent form

Information Letter

Dear Potential Participant:

You are invited to participate in a research study entitled, "The effect of a Motivational Interviewing training on the usage, knowledge and self-efficacy of undergraduate nurses to support substance users: A comparison of two learning styles". If you decide to participate, you will learn Motivational Interviewing skills for one hour, either through an on-line simulation session *or* through MI materials e-learning session. Then we will ask you to complete three (3) brief surveys (10 min), one each before and after the training, then a follow-up survey three months later. This will result in a maximum 1.5 hour commitment from you.

Your participation in this research is voluntary. Your identity will remain confidential in the surveys; in other words, although others might see you in the learning session, nobody outside of the research team will know your answers on the surveys. We keep this information private.

Before you decide whether or not you would like to take part in this study, please read this letter carefully to understand what is involved. After you have read the letter, please ask any questions you may have.

PURPOSE

Lakehead University researchers want to know which learning style helps nursing students learn motivational interviewing skills. The objective of the motivational interviewing training is to strengthen the skills, competencies, and confidence of future nurses who will work with patients who have alcohol and drug use concerns, with the ultimate goal of helping nurses feel less stressed at work. You are being invited to participate in this training study because you are a third or fourth year nursing student at Lakehead University. Participating nursing students will be randomly assigned to learn Motivational Interviewing skills either through an on-line SIM or through graduate student-directed e-learning session. Both learning sessions will take about an hour.

Participants will also 10 minute survey before and after the training, in addition to a follow-up survey after 3 months.

The principal investigator of this study is Dr. Vicki Kristman, Lakehead University and co-investigators are also all from Lakehead University: Mrs. Maryam Einshouka, Dr. Deborah Scharf.

WHAT INFORMATION WILL BE COLLECTED?

The surveys will cover demographic information like age/sex/year of study, degree of self-efficacy to use motivational interviewing with patients, MI knowledge and attitude, perceived subjective norm about MI use, and intent to use MI in future career, as well as attitudes towards working with people who use alcohol and drugs. Your email addresses will be used as an ID to the three surveys to link the data, then they will be deidentified.

WHAT IS REQUESTED OF ME AS A PARTICIPANT?

Participants are asked to complete the baseline questionnaires, a post-training questionnaire, and the three-month follow-up questionnaire. Participants will be randomized into the simulation or the e-materials trainings, to compare the results between both methods of learning.

To be noted, all surveys and training are going to be held online due to the current pandemic, to limit the spread of COVID-19.

WHAT ARE MY RIGHTS AS A PARTICIPANT?

You are under no obligation to participate and are free to withdraw at any time without prejudice to pre-existing entitlements. Your decision to participate will not affect your marks in any of the courses at Lakehead University or your relationship with any of the investigators.

WHAT ARE THE RISKS AND BENEFITS?

Learning about Motivational Interviewing may increase your skills and self-efficacy for working with people who have alcohol and drug use concerns. There are no risks to participating in the Motivational Interviewing training beyond those you experience in any other University training activity. Specifically, if you feel embarrassed in group learning situations, you may also feel embarrassed during the SIM. We encourage to reach out to https://good2talk.ca/185rainin/ in case you feel emotional distress after the session. Also, feel free to reach out to any of the investigators by email (provided in the recruitment poster).

All participants who complete the study will receive a certificate of Motivational Interviewing training completion. Participants who complete the three-month follow-up questionnaire will receive a $5 Starbucks gift card.

HOW WILL MY CONFIDENTIALITY BE MAINTAINED?

The research team will be aware of your name and have your contact information in order to link the surveys results and arrange a time for the training according to your schedule. The research team will, however, keep this information confidential. That is, they will not share your name or other identifying information with anyone outside of the research team without your explicit consent. Your name nor any other identifying information will be linked to your survey responses.

WHAT WILL MY DATA BE USED FOR:

We will share the results of this study at scientific meetings, in academic journals, and with interested community stakeholders, such as those groups who help people with substance use concerns and who are involved in nursing education. When we share the results of this study, we will do so in aggregate; that is, we will present summary results of the findings that do not identify any individual participant in any way.

WHERE WILL MY DATA BE STORED?

All data will be stored on a Lakehead University password-protected fileshare accessible only to members of the research team. Data will remain at Lakehead University for a minimum of 5 years following completion of the research.

HOW CAN I RECEIVE A COPY OF THE RESEARCH RESULTS?

You can tell us on the consent form (below) if and how you would like to receive a copy of the study results. We can share them with you when the study is complete.

WHAT IF I WANT TO WITHDRAW FROM THE STUDY?
You can withdraw from the study at any time by telling anyone on the research team that you no longer want to take part. Before we publish or present the results of the study, you can let us know and all data collected will be shredded, and electronic data deleted. After we publish or share the study results, however, we will have no way to withdraw your answers and information from the study.

If you want to withdraw from the study, you may contact the research team by e-mailing meinshou@lakeheadu.ca to inform them of your withdrawal. Withdrawing from the study will not impact your position at Lakehead University.

RESEARCHER CONTACT INFORMATION:
Dr. Vicki Kristman (vkristma@lakeheadu.ca)
Ms. Maryam Einshouka (meinshou@lakeheadu.ca)
Dr. Deborah Scharf (dscharf1@lakeheadu.ca)

Lakehead University
955 Oliver Road
Thunder Bay, Ontario
Canada

Please note: There are no conflicts of interest with any members on the research team.

RESEARCH ETHICS BOARD REVIEW AND APPROVAL:
This research study has been reviewed and approved by the Lakehead University Research Ethics Board. If you have any questions related to the ethics of the research and would like to speak to someone outside of the research team, please contact Sue Wright at the Research Ethics Board at 807-343-8283 or research@lakeheadu.ca.

Informed Consent Form

MY CONSENT:
I agree to the following:
✓ I have read and understand the information contained in the Information Letter
✓ I agree to participate
✓ I understand the risks and benefits to the study
✓ That I am a volunteer and can withdraw from the study at any time, and may choose not to answer any question
✓ That the data will be securely stored at Lakehead University for a minimum period of 5 years following completion of the research project
✓ I understand that the research findings will be made available to me upon request
✓ My identity will remain confidential
✓ All of my questions have been answered
By consenting to participate, I have not waived any rights to legal recourse in the event of research-related harm.

Full Name (please print):_____

Date:_____

Email: _____

Signature:_____

I consent to having my survey's answers used by the research team for the purpose of the Motivational Interviewing project   YES ☐   NO ☐

I would like to receive a copy of the study results: YES ☐   NO ☐

Appendix H: SIM session power point

1

2

3

4

5

6

Slide 7

Core Interviewing Skills: OARS

O
- Open questions

A
- Affirming

R
- Reflecting

S
- Summarizing

Slide 8

Open questions

- A question that invites a person to think a bit before responding:
- "What makes this important to you to talk about this now?"
- "How has this problem affected your day-to-day life?"
- "How do you hope your life might be different 5 years from now?"
- "Where do you think this path you're on is leading you?"
- "How would you like to use our time?"
- "If our work together goes well, what would you like to see changed?"

Slide 9

Open questions

- A closed question:
  - "Have you been feeling this way a long time?"
  - "Do you want to stop drinking?"
  - "So what are you going to do: quit or cut down?"
  - "Don't you think it would be better for you to stop altogether?"
- Open questions lead to more information and exploration, and can be used to promote change talk:
  - Patient: "Sometimes when I wake up in the morning after drinking, I don't feel so good."
  - Provider: "In what ways do you feel bad?"

Slide 10

Role playing

Slide 11

Core Interviewing Skills: OARS

O
- Open questions

A
- Affirming

R
- Reflecting

S
- Summarizing

Slide 12

Affirming

- To accentuate the positive, to support and encourage
- Not the same as praise, it's not "I am proud of you"
- Examples of affirmation:
  - "Thanks for coming in today and arriving early!"
  - "Your attention was great even though it didn't turn out as you would like."
  - "You've tried really hard since I last saw you."

Affirming

- Affirming by **reframing** a patient's actions into a **positive light**:
  - "You're feeling really bad that you didn't stick to your plan and drank three times this week. What strikes me though, is how different this is from where you started. Two months ago, you were drinking every day of the week, look how much closer you are to your goal!"
- Affirming by commenting on what you perceive to be a patient's **positive traits or skills**:
  - "You got really discouraged but still came back, you're very persistent!"
  - "With all you've been through, I'm not sure if I would have been able to come out of it as well as you have. You're a real survivor"

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Affirming

- Affirming is a great way to respond to change talk:
  - Patient: "I think I could stop drinking if I really decided to"
  - Provider affirming: "When you make up your mind about something, you get it done."

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Role playing

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Core Interviewing Skills: OARS

- O
  - Open questions
- A
  - Affirming
- R
  - Reflecting
- S
  - Summarizing

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Reflecting

- Reflective listening involves making a guess about what the person means.
- It involves statements of understanding
  - Patient: "I'm feeling pretty depressed today"
  - Provider reflecting: "You're feeling kind of down."

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Reflecting

- Reflections can promote change talk:
- Patient: "Drinking is really starting to impact the money in my bank account lately"
- Provider reflecting "You've noticed your drinking is taking a toll financially"

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Role playing

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Core Interviewing Skills: OARS

O
- Open questions

A
- Affirming

R
- Reflecting

S
- Summarizing

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Summarizing

- Reflections that pull together several things that a person has told you
  - "So one year from now, you hope to have a good job, one that you enjoy and were you get to work with people. You've been relating more to your children lately, and you'd like that to continue. You also said you'd like to quit drinking."

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Summarizing

- A summary can pull together the change talk a patient has provided
- "So here's what you've told me so far. You've noticed you're drinking more than you used to, and that's scared you a little. When you wake up in the morning, you feel pretty bad- headache, tired, nervous. You're not enjoying going to work as much as you used to. What else have you noticed?"

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Role playing

23

Core Interviewing Skills: OARS

O
- Open questions

A
- Affirming

R
- Reflecting

S
- Summarizing

24

Responding to sustain talk

- The more people verbalize and explore sustain talk, the more they talk themselves out of changing.
- No need to be alarmed by sustain talk – it is a normal part of ambivalence!
- Don't go fishing for sustain talk.
- Use reflecting to respond to it.
- Goal is to acknowledge what the person is saying and not push against it in a way that is likely to promote more sustain talk.
- Example
  - Patient: "I don't think my drinking is problematic"
  - Provider: "Drinking hasn't caused you any issues"
- Example:
  - Patient: "My life is fine the way it is"
  - Provider: "You wouldn't change a thing about your life right now."

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MI and advice giving

- The purpose is not to deliver advice, but rather to promote change.
- First, ask permission:
  - "Is there any information I can help you with?"
  - "May I share with you a bit about the risks of drinking?"
  - "Would you like to know about the harms of drinking?"
- Second, be clear and concise in the information you provide.
- Third, ask open questions to get at the patient's interpretation and understanding.

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Role playing

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Motivational Interviewing: Do's and Don'ts

Do's	Don'ts
- Ask open-ended questions that promote exploration - Demonstrate you're listening by reflecting and summarizing your patient's experiences - Recognize, support, and encourage your patient's strengths and efforts - Encourage and focus on change talk through your reflections - When appropriate, ask your patient whether they would like information on a particular topic - Approach conversations about change as a collaborative experience	- Only ask closed ended questions or leading questions - Give advice or information without asking permission - Follow your own agenda for the conversation - Focus on sustain talk in your reflections and summarizing - View yourself as the expert

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Appendix I-1: Greenland method for confounders selection (Chapter 4)

Self-efficacy

Model		unstandardized Beta	Standard error	Br-Bc	(Br-Bc)²	SE current²	SE reduced²	SE² difference	β²-SE² (MSE difference)
Current 1	training type	-3.403	3.557			12.65225			
With Age, baseline self-efficacy, gender, prior training, stigma, year									
Reduced 1	training type (dropping Age)	-2.389	3.33	1.014	1.028196	12.65225	11.0889	1.563349	-0.535153
Reduced 2	Training type (dropping Baseline Self efficacy)	-6.623	4.511	-3.22	10.3684	12.65225	20.349121	-7.69687	18.065272
Reduced 3	193raining type (dropping Gender)	-0.496	3.352	2.907	8.450649	12.65225	11.235904	1.416345	7.034304
reduced 4	Training type (dropping Prior training)	-2.065	3.278	1.338	1.790244	12.65225	10.745284	1.906965	-0.116721
Reduced 5	Training type (dropping Stigma)	-3.533	3.601	-0.13	0.0169	12.65225	12.967201	-0.31495	0.331852
Reduced 6	Training type (dropping year)	-3.837	3.718	-0.434	0.188356	12.65225	13.823524	-1.17128	1.359631
current 2	training type	-2.389	3.33			11.0889			
With baseline self-efficacy, gender, prior training, stigma, year									

Reduced 2-1	**Training type (dropping Baseline Self efficacy)**	-5.655	4.315	-3.266	10.66676	11.0889	18.619225	-7.53033	18.197081
Reduced 2-2	**194raining type (dropping Gender)**	-0.209	3.197	2.18	4.7524	11.0889	10.220809	0.868091	3.884309
Reduced 2-3	**Training type (dropping Prior training)**	-1.524	3.135	0.865	0.748225	11.0889	9.828225	1.260675	-0.51245
Reduced 2-4	**Training type (dropping Stigma)**	-2.365	3.379	0.024	0.000576	11.0889	11.417641	-0.32874	0.329317
Reduced 2-5	**Training type (dropping year)**	-2.308	3.54	0.081	0.006561	11.0889	12.5316	-1.4427	1.449261
Current 3 **With baseline self-efficacy, gender, stigma, year**	**training type**	-1.524	3.135			9.828225			
Reduced 3-1	**Training type (dropping Baseline Self efficacy)**	-5.991	3.971	-4.467	19.95409	9.828225	15.768841	-5.94062	25.894705
Reduced 3-2	**training type (dropping Gender)**	0.055	3.058	1.579	2.493241	9.828225	9.351364	0.476861	2.01638
Reduced 3-3	**Training type (dropping Stigma)**	-1.579	3.177	-0.055	0.003025	9.828225	10.093329	-0.2651	0.268129
Reduced 3-4	**Training type (dropping year)**	-1.773	3.317	-0.249	0.062001	9.828225	11.002489	-1.17426	1.236265

Attitude

Model		unstandardized Beta	Standard error	Br-Bc	(Br-Bc)²	SE current²	SE reduced²	SE² difference	β²-SE² (MSE difference)
Current 1	training type	0.644	0.675			0.455625			
With baseline attitude, gender, prior training, stigma									
Reduced 1-1	training type (dropping baseline attitude)	0.267	0.718	-0.377	0.142129	0.455625	0.515524	-0.0599	0.202028
Reduced 1-2	training type (dropping Gender)	0.752	0.62	0.108	0.011664	0.455625	0.3844	0.071225	-0.059561
Reduced 1-3	Training type (dropping Prior training)	0.733	0.621	0.089	0.007921	0.455625	0.385641	0.069984	-0.062063
reduced 1-4	Training type (dropping Stigma)	0.648	0.671	0.004	0.000016	0.455625	0.450241	0.005384	-0.005368
current 2	training type	0.733	0.621			0.385641			
with baseline attitude, gender, stigma									
Reduced 2-1	training type (dropping baseline attitude)	0.373	0.661	-0.36	0.1296	0.385641	0.436921	-0.05128	0.18088
Reduced 2-2	training type (dropping Gender)	0.8	0.585	0.067	0.004489	0.385641	0.342225	0.043416	-0.038927
Reduced 2-3	Training type (dropping Stigma)	0.728	0.618	-0.005	0.000025	0.385641	0.381924	0.003717	-0.003692
Current 3	training type	0.8	0.585			0.342225			

With baseline attitude and stigma								
Reduced 3-1	training type (dropping baseline attitude)	0.476	0.624	-0.324	0.104976	0.342225	0.389376	-0.04715	0.152127
Reduced 3-2	Training type (dropping Stigma)	0.778	0.58	-0.022	0.000484	0.342225	0.3364	0.005825	-0.005341
Current 4	training type	0.778	0.58						
With baseline attitude								
Reduced 4-1	training type (dropping baseline attitude)	0.385	0.626	-0.393	0.154449	0.3364	0.391876	-0.05548	0.209925

Knowledge

Model		unstandardized Beta	Standard error	Br-Bc	(Br-Bc)²	SE current²	SE reduced²	SE² difference	β²-SE² (MSE difference)
Current 1	**training type**	-0.391	0.285			0.081225			
With baseline knowledge, ethnicity, gender, prior training, stigma									
Reduced 1	**training type (dropping baseline knowledge)**	-0.264	0.283	0.127	0.016129	0.081225	0.080089	0.001136	0.014993
Reduced 2	**Training type (dropping ethnicity)**	-0.428	0.29	-0.037	0.001369	0.081225	0.0841	-0.00288	0.004244

Reduced 3	training type (dropping Gender)	-0.195	0.269	0.196	0.038416	0.081225	0.072361	0.008864	0.029552
reduced 4	Training type (dropping Prior training)	-0.293	0.257	0.098	0.009604	0.081225	0.066049	0.015176	-0.005572
Reduced 5	Training type (dropping Stigma)	-0.389	0.282	0.002	4E-06	0.081225	0.079524	0.001701	-0.001697
current 2	training type	-0.293	0.257			0.066049			
With baseline knowledge, ethnicity, gender, stigma									
Reduced 2-1	training type (dropping baseline knowledge)	-0.252	0.26	0.041	0.001681	0.066049	0.0676	-0.00155	0.003232
Reduced 2-2	Training type (dropping ethnicity)	-0.321	0.262	-0.028	0.000784	0.066049	0.068644	-0.0026	0.003379
Reduced 2-3	training type (dropping Gender)	-0.163	0.249	0.13	0.0169	0.066049	0.062001	0.004048	0.012852
Reduced 2-4	Training type (dropping Stigma)	-0.295	0.254	-0.002	4E-06	0.066049	0.064516	0.001533	-0.001529
Current 3	training type	-0.295	0.254			0.064516			
With baseline knowledge, ethnicity, gender									
Reduced 3-1	training type	-0.25	0.257	0.045	0.002025	0.064516	0.066049	-0.00153	0.003558

Model		unstandardized Beta	Standard error	Br-Bc	(Br-Bc)²	SE current²	SE reduced²	SE² difference	β²-SE² (MSE difference)
	(dropping baseline knowledge)								
Reduced 3-2	Training type (dropping ethnicity)	-0.328	0.26	-0.033	0.001089	0.064516	0.0676	-0.00308	0.004173
Reduced 3-3	training type (dropping Gender)	-0.163	0.245	0.132	0.017424	0.064516	0.060025	0.004491	0.012933

Subjective norm

Model		unstandardized Beta	Standard error	Br-Bc	(Br-Bc)²	SE current²	SE reduced²	SE² difference	β²-SE² (MSE difference)
Current 1	training type	-1.122	0.646			0.417316			
With baseline subjective norm, gender, prior training, stigma									
Reduced 1-1	training type (dropping baseline subjective norm)	-1.455	0.669	-0.333	0.110889	0.417316	0.447561	-0.03025	0.141134
Reduced 1-2	training type (dropping Gender)	-0.527	0.619	0.595	0.354025	0.417316	0.383161	0.034155	0.31987
Reduced 1-3	Training type (dropping Prior training)	-0.681	0.614	0.441	0.194481	0.417316	0.376996	0.04032	0.154161

| reduced 1-4 | Training type (dropping Stigma) | -1.126 | 0.651 | -0.004 | 1.6E-05 | 0.417316 | 0.423801 | -0.00649 | 0.006501 |

Appendix I-2: Greenland method (Chapter 5)

Self-efficacy

	Model	unstandardized Beta	Standard error	Br-Bc	(Br-Bc)²	SE current²	SE reduced²	SE² difference	β²-SE² (MSE difference)
Current 1	**self-efficacy**	0.012	0.008			0.000064			
	training type, Post-training attitude, post-training knowledge, Post-training subjective norm,								
Reduced 1	dropping Knowledge	0.012	0.009	0	0.0000000	0.000064	0.000081	-0.000017	0.0000170
Reduced 2	Dropping attitude	0.012	0.008	0	0.0000000	0.000064	0.000064	0	0.0000000
reduced 3	Dropping SN	0.013	0.009	0.001	0.0000010	0.000064	0.000081	-0.000017	0.0000180
reduced 4	Dropping year	0.016	0.008	0.004	0.0000160	0.000064	0.000064	0	0.0000160
reduced 5	Dropping TT	0.013	0.008	0.001	0.0000010	0.000064	0.000064	0	0.0000010
Current 2	**self-efficacy**	0.012	0.008			0.000064			
	knowledge, SN, year, TT								
reduced 1	Dropping knowledge	0.012	0.009	0	0.0000000	0.000064	0.000081	-0.000017	0.0000170
reduced 2	Dropping SN	0.013	0.008	0.001	0.0000010	0.000064	0.000064	0	0.0000010
reduced 3	Dropping year	0.016	0.008	0.004	0.0000160	0.000064	0.000064	0	0.0000160
reduced 4	Dropping TT	0.013	0.008	0.001	0.0000010	0.000064	0.000064	0	0.0000010

Attitude

	unstandardized Beta	Standard error	Br-Bc	(Br-Bc)²	SE current²	SE reduced²	SE² difference	β²-SE² (MSE difference)
attitude	-0.037	0.06			0.0036			
Post-training self-efficacy, post-training knowledge, Post-training subjective norm, training type								
dropping knowledge	-0.016	0.06	0.021	0.0004410	0.0036	0.0036	0	0.0004410
dropping SE	-0.036	0.062	0.001	0.0000010	0.0036	0.003844	-0.00024	0.0002450
dropping SN	-0.045	0.059	-0.008	0.0000640	0.0036	0.003481	0.000119	-0.0000550
dropping TT	-0.042	0.059	-0.005	0.0000250	0.0036	0.003481	0.000119	-0.0000940
Attitude	**-0.05**	**0.058**			**0.0034**			
post training SE, post-training Knowledge								
dropping SE	-0.051	0.061	-0.001	0.0000010	0.003364	0.003721	-0.00036	0.0003580
dropping knowledge	-0.029	0.059	0.021	0.0004410	0.003364	0.003481	-0.00012	0.0005580

Subjective norm

	unstandardized Beta	Standard error	Br-Bc	(Br-Bc)²	SE current²	SE reduced²	SE² difference	β²-SE² (MSE difference)
subjective norm	0.049	0.056			0.003136			
Post-training self-efficacy, post-training attitude, Post-training knowledge,training type								
				0.0000000			-0.00011	
dropping knowledge	0.049	0.057	0		0.003136	0.003249		0.0001130
dropping SE	0.05	0.058	0.001	0.0000010	0.003136	0.003364	-0.00023	0.0002290
dropping attitude	0.055	0.055	0.006	0.0000360	0.003136	0.003025	0.000111	-0.0000750
dropping tt	0.049	0.056	0	0.0000000	0.003136	0.003136	0	0.0000000
subjective norm	0.055	0.055			0.003025			
Post-training self-efficacy,Post-training knowledge								
dropping knowledge	0.052	0.056	-0.003	0.0000090	0.003025	0.003136	-0.00011	0.0001200
dropping SE	0.055	0.057	0	0.0000000	0.003025	0.003249	-0.00022	0.0002240

Appendix J: Introduction pre-reading material

You are under no obligation to participate and are free to withdraw at any time without prejudice to pre-existing entitlements. Your decision to participate will not affect your marks in any of the courses at Lakehead University or your relationship with any of the investigators.

Please, note that all the trainings and the surveys will take place online, due to the current pandemic of COVID-19.

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Ms. Maryam Einshouka (meinshou@lakeheadu.ca)

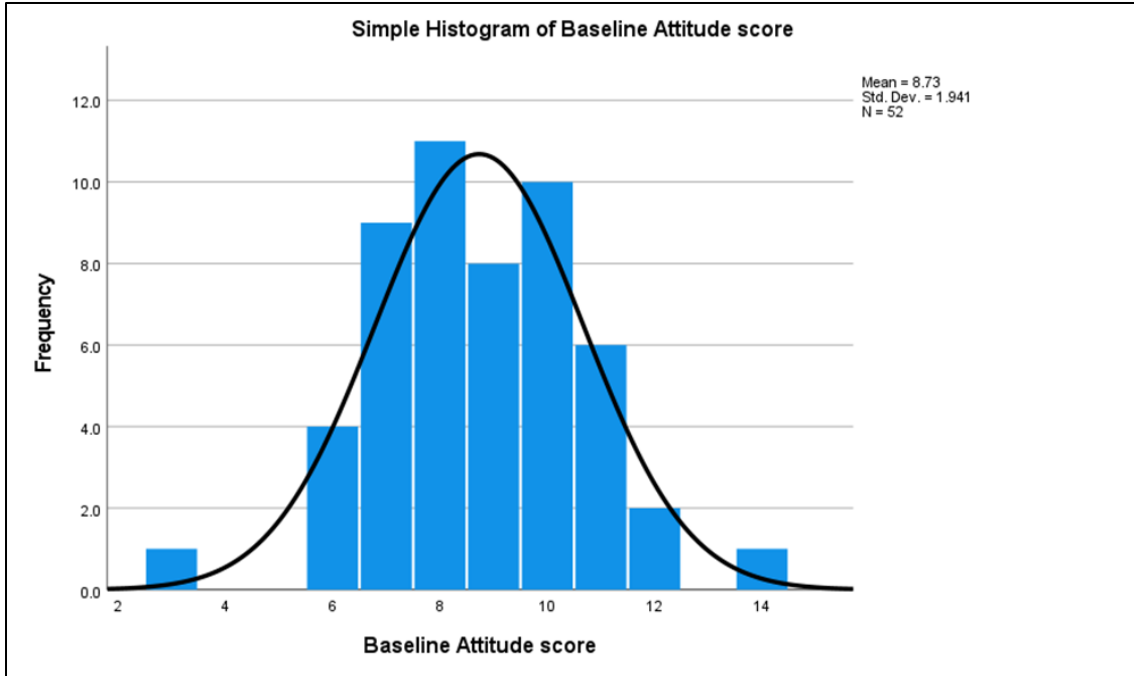Dr. Deborah Scharf (dscharf1@lakeheadu.ca)

Video link

https://www.youtube.com/watch?v=s3MCJZ7OGRk

Video Appendix

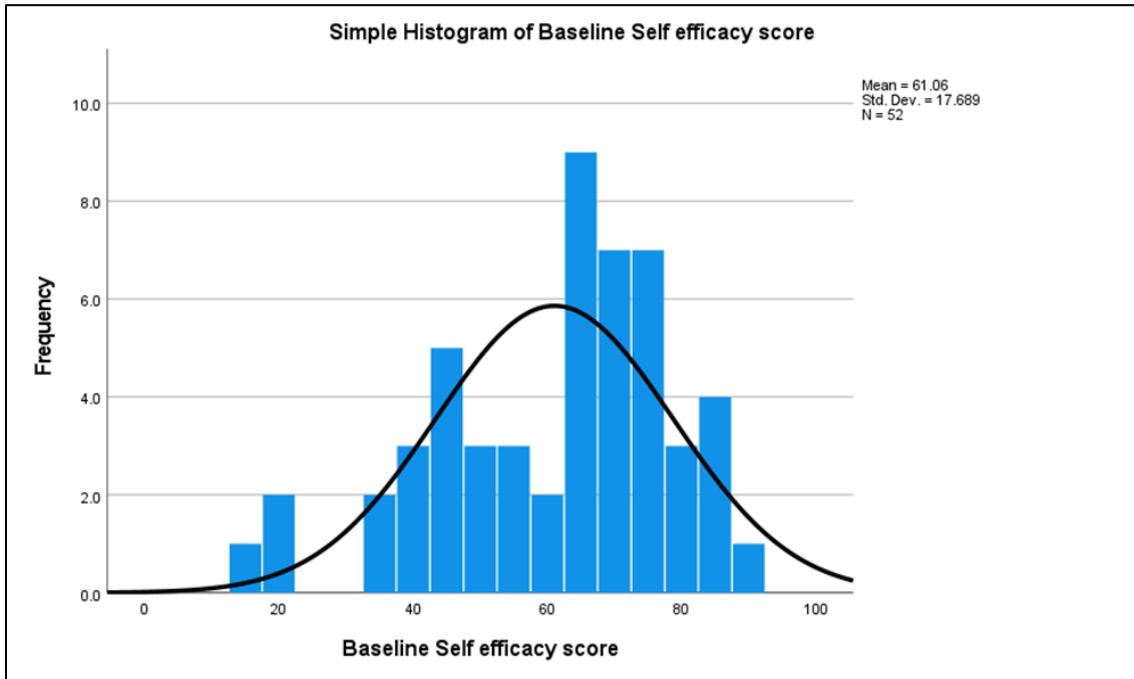1) Definition of MI (00:28)

2) Ambivalence (3:03)

3) Concepts of MI (4:41)

4) Core skills (5:38)

   a) Open questions (6:13)

   b) Affirmation (7:06)

   c) Reflections (7:42)

   d) Summary (8:50)

5) Four processes (10:06)

   a) Engaging (10:40)

b) Focusing (13:30)

c) Evoking "Change talk" (14:17)

d) Planning (15:42)

Appendix K-1: Chapter 4 histograms

Descriptive statistics (Histograms)

Simple Histogram of Baseline Intent score

Mean = 5.9
Std. Dev. = 1.39
N = 52

Simple Histogram of Post training Self Efficacy score

Mean = 81.71
Std. Dev. = 14.29
N = 52

Simple Histogram of Post training Attitude score

Mean = 9.62
Std. Dev. = 2.242
N = 52

Simple Histogram of Post training Knowledge score

Mean = 3.63
Std. Dev. = .929
N = 52

Simple Histogram of Post training Subjective norm score

Mean = 11.77
Std. Dev. = 2.289
N = 52

Appendix K-2: Chapter 5 histograms

Descriptive histograms

Simple Bar of Baseline Intent score

Mean = 5.9
Std. Dev. = 1.39
N = 52

Simple Bar of Post training Intent score

Mean = 6.31
Std. Dev. = 1.076
N = 52
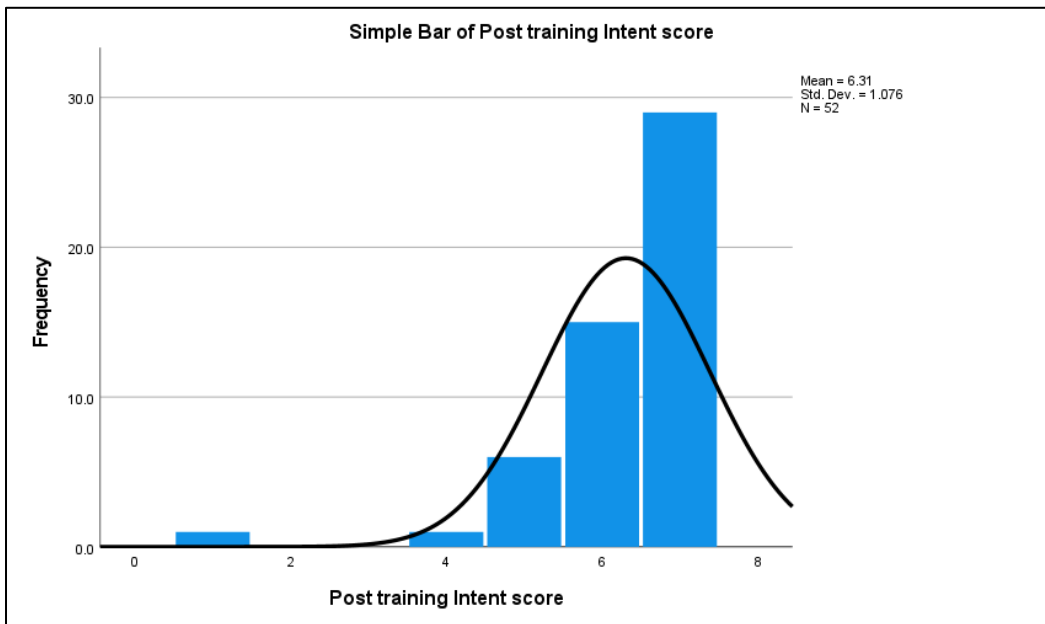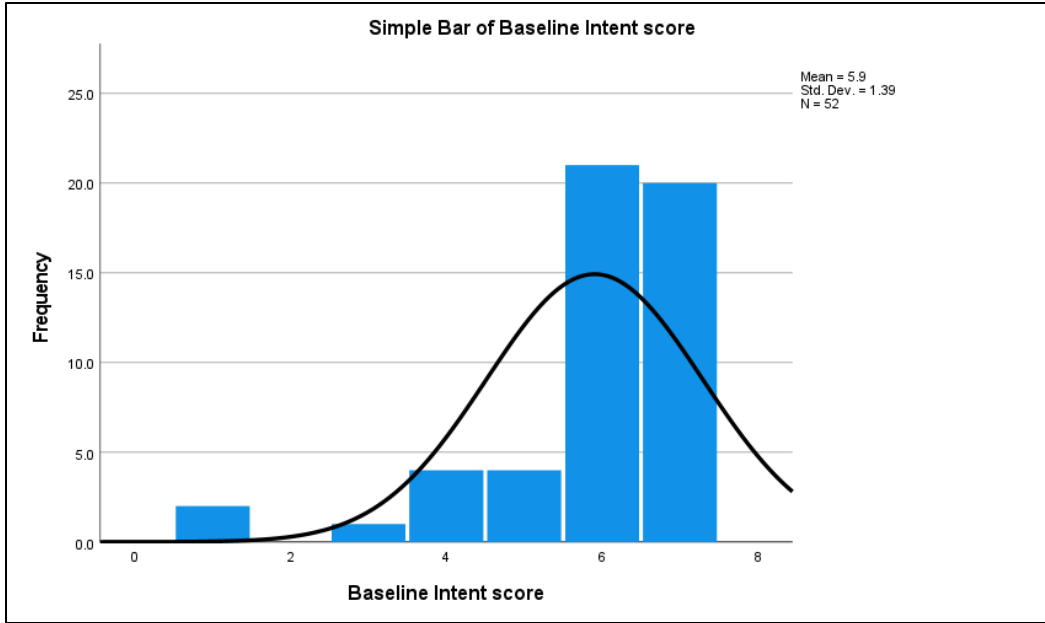
Mean intent score by training type, across T1, T2, and T3

Clustered Bar Mean of Baseline Intent score, Mean of Post training Intent score, Mean of 3-months Intent score by Training type
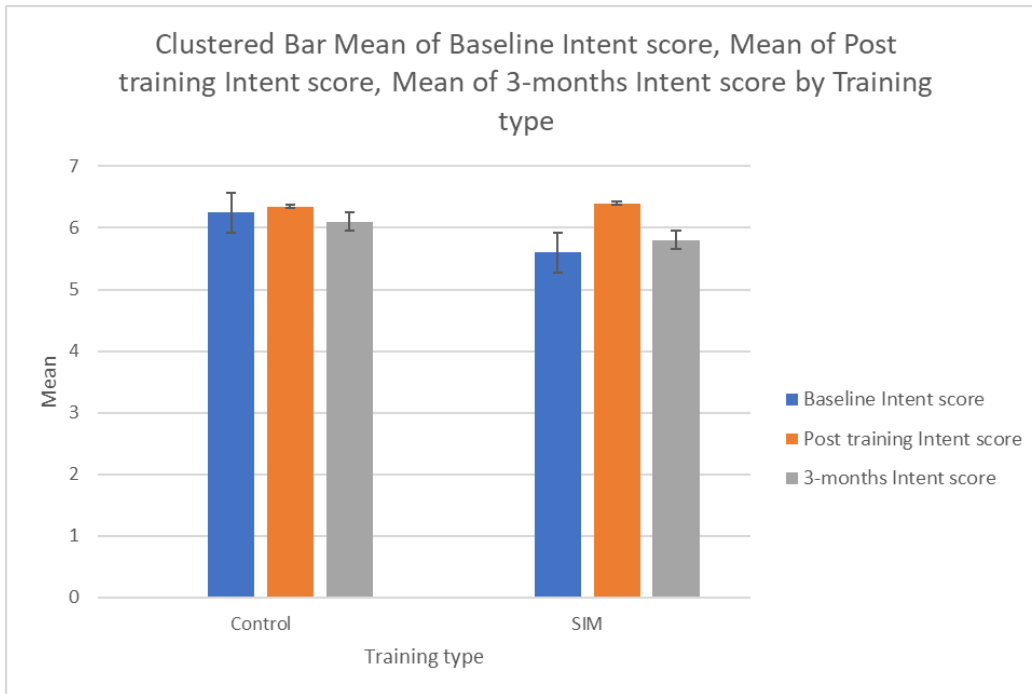
Appendix L: Independent t-test results (Chapter 4)

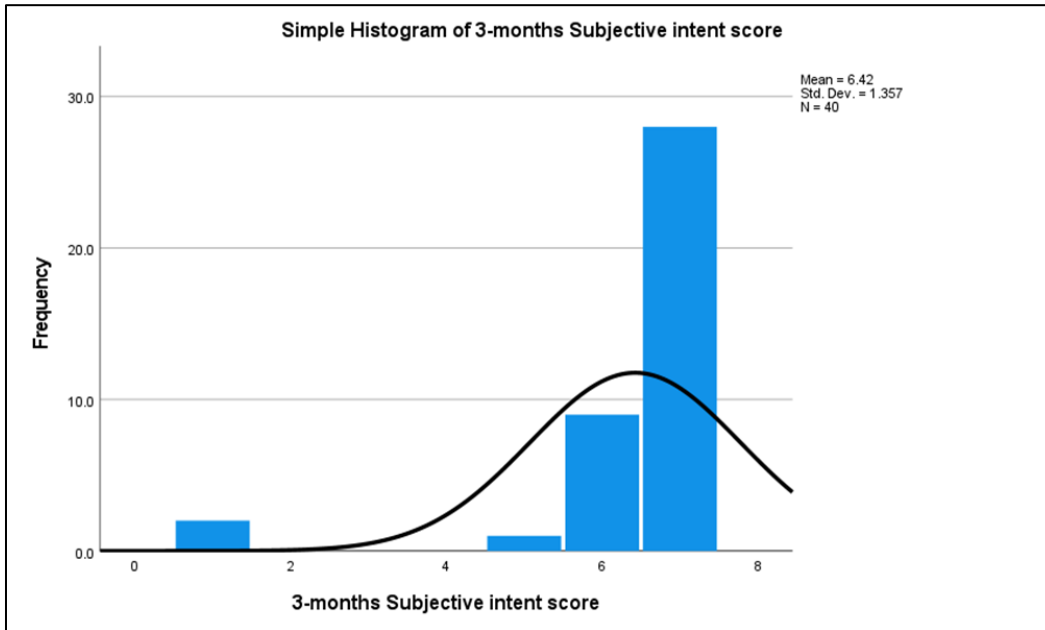| Factors		Sample size	Post-training Self-efficacy				Post-training attitude				Post-training Knowledge				Post-training Subjective norm			
			mean	SD	p-value		mean	SD	p-value		mean	SD	p-value		mean	SD	p-value	
					equal variances	equal variances not assumed			equal variances	equal variances not assumed			equal variances	equal variances not assumed			equal variances	equal variances not assumed
Training (n=52)	SIM	26	79.15	12.27	0.20	0.20	9.81	2.37	0.54	0.54	3.58	1.03	0.66	0.66	11.46	2.16	0.34	0.34
	Control	26	84.27	15.89			9.42	2.14			3.69	0.84			12.08	2.42		
Year (n=52)	1 &2	14	73.71	17.83	0.01	0.05	9.14	3.01	0.29	0.57	3.57	1.09	0.56	0.73	11.50	2.50	0.32	0.38
	3 & 4	38	84.66	11.69			9.79	1.91	0.80	0.82	3.66	0.88	0.91	0.91	11.87	2.23	0.87	0.88
Age (n=51)	20 and below	11	87.18	12.22	0.16	0.13	9.36	2.90	0.68	0.74	3.18	1.08	0.07	0.13	11.55	2.16	0.72	0.71
	21 to 25	21	79.80	11.09	0.44	0.40	9.43	1.96	0.63	0.61	3.71	0.85	0.62	0.61	11.76	2.12	0.99	0.99
	26 to 29	8	90.75	7.57	0.05	0.01	10.88	2.03	0.08	0.09	3.50	0.75	0.66	0.61	10.75	3.53	0.17	0.38
	30 and above	11	71.82	19.13	0.01	0.06	9.00	1.89	0.31	0.26	4.00	1.00	0.14	0.18	12.55	1.51	0.21	0.11
Gender (n=52)	male	7	75.86	21.67	0.25	0.45	8.14	2.79	0.06	0.17	3.14	1.10	0.13	0.22	10.57	2.80	0.14	0.25
	female	44	82.55	13.04	0.33	0.49	9.77	2.10	0.24	0.40	3.73	0.90	0.09	0.14	12.00	202.00	0.09	0.16
	not male or female	1	86.00		0.77		13.00		0.13		3.00		0.50		10.00		0.44	
Ethnicity (n=52)	white	32	81.03	14.94	0.67	0.66	10.00	2.11	0.12	0.13	3.88	0.75	0.02	0.03	11.84	2.46	0.77	0.76
	Others	20	82.80	13.48			9.00	2.36			3.25	1.07			11.65	2.03		
Prior MI training	NO	39	80.36	14.84	0.24	0.20	9.69	2.37	0.67	0.63	3.59	0.90	0.55	0.58	11.90	2.20	0.49	0.53
	YES or reading	13	85.77	12.09			9.38	1.85			3.77	1.01			11.38	2.56		
Prior use of MI (n=52)	NO	44	81.43	14.28			9.68	2.30			3.57	0.95			11.77	2.43		
	Yes	8	83.25	15.20	0.74	0.76	9.25	1.83	0.62	0.57	4.00	0.76	0.23	0.18	11.75	1.39	0.98	0.97
Stigma score (Pre) (n=52)	High	4	83.12	15.69	0.86	0.76	10.29	1.86	0.74	0.82	3.59	1.00	0.42	0.41	11.94	2.68	0.17	0.37
	Low	44	82.48	12.36			9.19	2.02			3.76	0.70			12.10	1.80		

Appendix M: Models summary (Chapter 4)

A) Post-training score approach

Model Summary									
				Std. Error	Change Statistics				
			Adjusted R	of the	R Square				Sig. F
Model	R	R Square	Square	Estimate	Change	F Change	df1	df2	Change
Self-efficacy	.725[a]	0.526	0.474	10.363	0.526	10.195	5	46	0.000
a. Predictors: (Constant), Baseline Self efficacy score, Gender, Year of study (dichotomous), Training type, Baseline stigma									

Model Summary									
				Std. Error	Change Statistics				
			Adjusted R	of the	R Square				Sig. F
Model	R	R Square	Square	Estimate	Change	F Change	df1	df2	Change
Attitude	.443[a]	0.196	0.163	2.051	0.196	5.979	2	49	0.005
a. Predictors: (Constant), Baseline Attitude score, Training type									

Model Summary									
				Std. Error	Change Statistics				
			Adjusted R	of the	R Square				Sig. F
Model	R	R Square	Square	Estimate	Change	F Change	df1	df2	Change
Knowledge	.453[a]	0.206	0.138	0.863	0.206	3.040	4	47	0.026
a. Predictors: (Constant), Baseline Knowledge score, Gender, Ethnicity (dichotomous), Training type									

Model Summary									
				Std. Error	Change Statistics				
			Adjusted R	of the	R Square				Sig. F
Model	R	R Square	Square	Estimate	Change	F Change	df1	df2	Change
Subjective norm	.554[a]	0.307	0.232	2.006	0.307	4.084	5	46	0.004
a. Predictors: (Constant), Baseline Subjective norm score, previous training (yes/no), Baseline stigma, Gender, Training									

B) Change in score approach

Model Summary									
				Std. Error	Change Statistics				
			Adjusted R	of the	R Square				Sig. F
Model	R	R Square	Square	Estimate	Change	F Change	df1	df2	Change
Self-efficacy	.408[a]	0.166	0.095	13.149	0.166	2.344	4	47	0.068
a. Predictors: (Constant), Baseline stigma, Training type, Gender, Year of study (dichotomous)									

Model Summary									
				Std. Error	Change Statistics				
			Adjusted R	of the	R Square				Sig. F
Model	R	R Square	Square	Estimate	Change	F Change	df1	df2	Change
Attitude	.254[a]	0.065	0.046	2.236	0.065	3.462	1	50	0.069
a. Predictors: (Constant), Training type									

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
Knowledge	.236[a]	0.055	-0.004	1.169	0.055	0.940	3	48	0.429

a. Predictors: (Constant), Ethnicity (dichotomous), Training type, Gender

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
Subjective norm	.190[a]	0.036	-0.046	2.579	0.036	0.440	4	47	0.779

a. Predictors: (Constant), previous training (yes/no), Baseline stigma, Gender, Training type