The Intersection of Ambiguity Tolerance and Mindfulness: Applications to Counsellors-in-Training

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Abstract

Ambiguity is inherent to the therapeutic process and can be a catalyst for the significant stress experienced during clinical training. The ability to tolerate ambiguity is a key characteristic of master therapists and has been associated with clinician well-being as well as therapeutic outcomes and satisfaction. As such, scholars have previously suggested that ambiguity tolerance (AT) is something that must be developed in counsellors-in-training (CITs) over the course of their education. There have been several suggestions on how to enhance AT, from unstructured courses and assignments to engaging in surrealist art to discussing ambiguity in supervision. However, empirical exploration of such strategies is limited in the current literature. More recently, researchers have turned to mindfulness and compassion-based strategies as a tool for self-care with CITs; highlighting its benefits on well-being and clinical work in both the short and long-term. Interestingly, some qualitative studies have also highlighted their potential in cultivating AT. While there has been some work highlighting the conceptual intersections between mindfulness, compassion, and AT, there is generally a dearth of empirical literature and the findings have been equivocal. Thus, this dissertation sought to elucidate the relationship between mindfulness, compassion, and AT to develop a mindfulness and compassion-based training for CITs that emphasizes the cultivation of AT. The first study was a meta-analysis of 38 randomized controlled trials (RCT) that examined the impact of meditation or mindfulness training on healthcare professionals and trainees. Findings supported the use of such interventions in improving well-being and reducing stress, highlighted the differing effects of training type on outcomes, and suggested the importance of tailoring training to the specific population. The second study examined the associations between two forms of Western mindfulness (meditative and Langer) and self-compassion with AT as well as the effect of a brief

mindfulness induction on AT using a RCT design. 165 undergraduate students participated, and the findings suggest that a brief induction is likely insufficient in increasing AT and that interventions should perhaps combine both conceptualizations of mindfulness. The final study assessed the impact of a six-week mindfulness and compassion program on 23 CITs from across Canada. This training was designed for CITs and emphasized the exploration of ambiguity in clinical work. Results of this pilot study suggested it is feasible and acceptable for CITs. Increases in AT, mindfulness, and self-compassion were found at post-training and at three-month follow-up. A general discussion follows the presentation of the three manuscripts, highlighting the research and clinical implications of the three studies, identifying limitations, and offering directions for further research.

Keywords: ambiguity tolerance, compassion, counsellors-in-training, Langer mindfulness, meditative mindfulness

Résumé

L'ambiguïté est inhérente au processus thérapeutique et peut être un catalyseur du stress vécu durant la formation clinique. La capacité à tolérer l'ambiguïté est une caractéristique des thérapeutes expérimentés qui a été associée au bien-être des cliniciens ainsi qu'aux résultats thérapeutiques et à la satisfaction des clients. C'est la raison pour laquelle les chercheurs ont suggéré que la tolérance à l'ambiguïté (TA) doit être cultivée chez les stagiaires cliniciens (SC) durant leur formation clinique. Plusieurs stratégies ont été suggérées pour améliorer la tolérance à l'ambiguïté. Parmi ces stratégies sont des cours et devoirs non structurés, de l'expérimentation avec de l'art surréaliste, et des discussions sur l'ambiguïté durant la supervision clinique. Cependant, l'évaluation empirique de ces stratégies demeure limitée. Récemment, les chercheurs se sont penchés sur les stratégies basées sur la pleine conscience et sur la compassion comme outils d'autogestion de la santé mentale des SC, soulignant leurs avantages sur le bien-être et sur le pratique clinique à court et à long terme. De plus, certaines études qualitatives ont également souligné le potentiel de telles stratégies pour cultiver la TA. Bien que certains travaux mettent en évidence des intersections conceptuelles entre la pleine conscience, la compassion et la TA, il y a peu d'études empiriques et les résultats sont équivoques. Ainsi, cette thèse vise à élucider la relation entre la pleine conscience, la compassion et la TA dans le but de développer un programme basé sur la pleine conscience et la compassion pour cultiver la TA chez les SC. La première étude est une méta-analyse de 38 essais contrôlés randomisés (ECR) qui ont examiné l'impact de la méditation ou de la formation à la pleine conscience sur les professionnels de la santé et les stagiaires cliniciens. Les résultats soutiennent l'utilisation de telles interventions pour améliorer le bien-être et réduire le stress parmi les professionnels et les stagiaires. Les résultats soulignent l'impact du type de formation sur les résultats et suggèrent l'importance d'adapter la

formation à la population visée. La deuxième étude a examiné le lien que l'autocompassion et deux formes de pleine conscience occidentale (méditative et celle de Langer) ont avec la TA, ainsi que l'effet d'une brève induction à la pleine conscience sur la TA en utilisant un devis d'ECR. 165 étudiants de premier cycle ont participé à l'étude et les résultats suggèrent qu'une brève induction ne suffit probablement pas à augmenter la TA et que les interventions devraient éventuellement combiner les deux conceptualisations de la pleine conscience. La dernière étude a évalué l'impact d'un programme de six semaines sur la pleine conscience et la compassion auprès de 23 SC de plusieurs régions du Canada. Cette formation a été conçue pour les SC et a mis l'accent sur la cultivation de l'ambiguïté dans la pratique clinique. Les résultats de cette étude pilote suggèrent que le nouveau programme est faisable et acceptable pour les SC, et que des augmentations de la TA, de la pleine conscience et de l'autocompassion ont été constatées à la suite de la formation et lors du suivi de trois mois. Une discussion générale suit la présentation des trois manuscrits, soulignant les implications cliniques et celles sur la recherche des trois études, identifiant les limites et suggérant des directions pour de futures études.

Mots-clés : compassion, pleine conscience de Langer, pleine conscience méditative, stagiaire clinicien, tolérance à l'ambiguïté

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As I write what is to be my last assignment, I am taking full advantage of this section where I can write a little more liberally so long as it is in the guise of acknowledgement. So, I would first like to express gratitude to this convention as it has allowed me to partake once more in productive procrastination. After almost 25 years of schooling and several close call submissions, I am still committed to the thrill of deadline induced panic.

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Graduate school is a tumultuous journey that would be made so much more difficult without the support of friends and family. I hope that being immortalized in this document is sufficient compensation for editing my work and tolerating my rants over the years.

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And finally, I want to address those who might read this. Writing has been an arduous process for me, and the potential of my words falling into the abyss of ProQuest Dissertations, never to be seen again, brings about an uncomfortable knot in my stomach. I write in the hopes that something in here might be worthwhile to someone out there. So, for taking the time to read this (whatever the reason might be), thank you.

Contribution to Original Knowledge

This dissertation demonstrates original scholarship and makes a distinct contribution to the research fields of ambiguity tolerance, mindfulness and compassion, and counsellor-in-training development. The first study is published in the *Journal of Psychosomatic Research* and examines the impact of meditation and mindfulness training on healthcare professionals and trainees using a meta-analysis. The second study is published in *Current Psychology* and assesses the relationship between mindfulness, self-compassion, and ambiguity tolerance and explores the impact of a brief mindfulness intervention on ambiguity tolerance in undergraduate students using a randomized controlled design. The final study is under review for publication and investigates the acceptability and feasibility of a novel six-week mindfulness and compassion training program designed to enhance ambiguity tolerance in counsellors-in-training. Combined these studies offer evidence for the potential of mindfulness and compassion training to be helpful in enhancing the mental health and well-being of counsellors-in-training and to increase ambiguity tolerance.

Contribution of Authors

This dissertation consists of five chapters and three manuscripts and is in accordance with the guidelines of the Faculty of Graduate and Postdoctoral studies. I am the first author on all included studies and am responsible for conducting the literature review, developing the methods, collecting (or overseeing the collection of) data, analyzing the data, interpreting the findings, and writing the manuscripts. I was supported by Dr. Bassam Khoury (Supervisor; Assistant Professor) who provided extensive feedback on the research design, data collection, analysis, and interpretation, and the manuscript. Dr. Khoury is a co-author on all three studies. In addition, Melanie Wisener (Doctoral Candidate) is a co-author on the first manuscript. She aided in the study design, data collection, analysis, and interpretation, as well as drafting and editing the manuscript. For the second and third manuscripts, Marim Ibrahim (Research Assistant) is a co-author. She aided in data collection and analysis as well as contributed to drafting and editing the manuscripts.

Introduction

Working in the mental health field can be a rewarding experience but also one that is emotionally and psychologically exhausting (Mann, 2004). Previous research has highlighted how mental health practitioners experience risk of anxiety, burnout, compassion fatigue, depression, psychological distress, and stress (e.g., Cohen & Collens, 2013; Figley, 2002a; Laverdière et al., 2018; Radeke & Mahoney, 2000). Unmanaged, these issues can further impact clinical care and organizational functioning (e.g., employee turnover; Morse et al., 2012; O'Connor, 2001). Counsellors-in-training (CITs; referring to any student completing studies to become a licensed mental health professional) also experience anxiety, burnout, compassion fatigue, depression, and stress (Cushway, 1992; El-Ghoroury et al., 2012; Kumary & Baker, 2008; Myers et al., 2012; Pakenham & Stafford-Brown, 2012; Richardson et al., 2020; Rummell, 2015). However, they are perhaps especially vulnerable (when compared to their professional counterparts) as graduate school is notably one of the most difficult periods in a counselling career (Nelson et al., 2001; Shapiro et al., 2007; Shen-Miller et al., 2011).

One major catalyst for the challenges and stress faced by CITs is ambiguity (Jahn & Smith-Adcock, 2017; Levitt & Jacques, 2005; Pakenham & Stafford-Brown, 2012; Pica, 1998; Skovholt & Rønnestad, 2003). Ambiguity arises in experiences that are novel, complex, insoluble, and/or incomplete (Budner, 1962; McLain et al., 2015), and it is inherent to clinical work and training. Counselling is both an art and a science that brings together several complex beings (i.e., counsellor and clients) with their own diverse and rich psychological and emotional worlds (Skovholt & Rønnestad, 2003). Attempting to understand and help another person is not a linear process, and there are many active variables that require attention within a session (e.g., body language, countertransference, facial expression). There are also many ways in which one

can work with a client, and there is a need for flexibility when known strategies are unsuccessful. Training is also fraught with ambiguity and is compounded by the number of roles occupied by CITs (Myers et al., 2012). Generally, CITs are often unprepared for the level of ambiguity they will experience in clinical work (Pica, 1998).

Ambiguity tolerance (AT) is a personality trait that predicts the way one reacts to ambiguity in the short and long term (McLain et al., 2015). Individual reactions can range from viewing ambiguity as desirable to experiencing it as threatening and can manifest in the emotional, cognitive, and/or behavioural domains (Budner, 1962; Grenier et al., 2005; McLain, 1993). Generally, correlational research highlights the impact of AT on intrapersonal and interpersonal functioning, coping strategies, diversity acceptance (e.g., ethnocentric and authoritarian views), and decision making (see summaries by Furnham & Marks, 2013; McLain et al., 2015). For those in the mental health field, AT is a characteristic of master therapists and is notably linked to better communication skills, greater work satisfaction, and lower perfectionism (Brams, 1961; Gruberg, 1969; Jones, 1974; Wittenberg & Norcross, 2001). Many have emphasized the importance of developing AT in clinical training and have highlighted strategies such as addressing and normalizing ambiguity in supervision, creating student mentorships, encouraging reflective writing, using ambiguous teaching methods, and supporting engagement in personal therapy (Jahn & Smith-Adcock, 2017; Levitt & Jacques, 2005; Pica, 1998; Skovholt & Rønnestad, 2003; Winborn & Martinson, 1965). However, how much this topic is actually discussed in clinical training remains unclear, and there is a dearth of research that examines how AT is cultivated in CITs and what methods are effective (Jahn & Smith-Adcock, 2017).

Another emerging and promising strategy for enhancing AT is mindfulness and compassion training (Bohecker et al., 2016; Christopher & Maris, 2010). Such trainings have

been previously used with CITs and have been found to support self-care practice and increase well-being (Rudaz et al., 2017; Shapiro et al., 2007; Testa & Sangganjanavanich, 2016). Mindfulness can be conceptualized via two schools of Western thought: 1) meditative mindfulness (MM) originated from Buddhist philosophy, and it emphasizes purposeful and nonjudgmental awareness and attention to one's internal and external states (Kabat-Zinn, 1991), and 2) Langer mindfulness (LM) developed from socio-cognitive theory, and it emphasizes active and effortful attention to one's current external environment such that one is engaging with multiple perspectives openly and flexibly (Langer, 1989). While MM uses meditation as a means of cultivating mindfulness, LM utilizes brief induction tasks that target a key component in its definition (e.g., producing novelty by asking the individual to determine several novel uses for a common object). Compassion is also derived from Buddhism and can be directed to both the self and others. Strauss et al. (2016) suggested that compassion is an affective, cognitive, and behavioural process through which one recognizes and understands the universality of suffering, experiences empathy and emotional resonance for the suffering experienced by a person (whether self or other), tolerates one's emotional reaction to remain open and accepting of the suffering, and acts to alleviate suffering. There are many strategies that have been developed to foster compassion (e.g., self-compassion break and loving-kindness meditation).

Conceptual work by several researchers have highlighted the relationship between AT, MM, and LM. For example, Anxiety/Uncertainty Management Theory suggests that when attempting to manage ambiguity and anxiety arising from cultural adjustment, LM can aid in the cognitive process by supporting the individual in being open to novelty (Gudykunst, 1998). It is further suggested that meditation can aid in the management of anxiety. In a study examining how rural nurses tolerate ambiguity, Knight et al. (2016) highlighted mindfulness as a key

component as it helps maintain awareness of oneself and different perspectives when making decisions. Correlational research suggests a positive relationship between AT, MM, LM, and self-compassion (Fulton, 2016; Hitsuwari & Nomura, 2021; Ie et al., 2012; Robinson, 2019). Furthermore, qualitative work by Christopher and Maris (2010) and Bohecker et al. (2016) highlighted the impact of mindfulness training (via an elective course and experiential group respectively) on CITs' observation and reactiveness towards ambiguity as well as their skill navigating ambiguity. Taken together, there is some evidence that highlights how learning and practicing mindfulness and compassion may enhance AT.

However, the empirical research is very limited and does not explore 1) differences between MM, LM, and compassion on their relationships with AT, 2) the effects of short-term inductions versus comprehensive trainings on AT, and 3) how a combination of MM, LM, and compassion training may impact CITs' AT and overall well-being in the short and long-term. Thus, the overarching goals of this dissertation are to understand the relationship between AT, mindfulness, and compassion and then to apply this knowledge in developing a mindfulness and compassion-based intervention for CITs that emphasizes AT development.

Research Objectives

Chapter 1 of this dissertation is a thorough literature review that critically examines the literature on AT and mindfulness and highlights similarities between these two constructs. The review will also emphasize the discussion of AT and mindfulness within the CIT literature.

Chapter 2 (*Mindfulness training for healthcare professionals and trainees: A meta-analysis of randomized controlled trials*) assesses the effectiveness of meditation and mindfulness-based training on healthcare professionals and trainees. This study examines the impact of mindfulness training on a variety of distress and well-being related outcomes, helps

establish the benefits of using mindfulness intervention with CITs, and offers guidance in developing a novel training program.

Chapter 3 (*Cultivating Ambiguity Tolerance through Mindfulness: An Induction Randomized Controlled Trial*) assesses the relationship between mindfulness, self-compassion, and AT cross-sectionally as well as examines the impact of a brief mindfulness induction on AT compared to a control. This study highlights how a model combining both Western approaches of mindfulness (meditative and Langer) accounts for more variance in AT than separately; suggesting training programs should integrate both approaches. Additionally, it appears that a brief induction is not sufficient in enhancing AT.

Chapter 4 (*Enhancing ambiguity tolerance in counsellors-in-training: A pilot program*) assesses the feasibility and acceptability of a novel mindfulness and compassion training program designed specifically for CITs. This pilot study builds on the findings of Chapter 2 and 3, and it examines the impact of the program on three dimensions of AT and other distress and well-being related outcomes.

Bridging Chapters are found between each manuscript to highlight how each study helps to inform the direction and design of the others.

Finally, Chapter 5 is a general discussion of the three studies; noting any key conclusions and implications that can be drawn from this body of research. This chapter further highlights the limitations of the studies and describes opportunities for future directions.

Chapter 1: Literature Review

There are two main literatures to be examined in this review: 1) ambiguity tolerance and 2) mindfulness and compassion. These concepts will be defined, strategies for their enhancement will be clarified, and their effects on well-being will be summarized. As both fields of study have vast research backgrounds, emphasis will be placed on highlighting the literature as it pertains to counsellors-in-training (CITs). A conceptual intersection of ambiguity tolerance, mindfulness, and compassion will be proposed, and evidence for their relationship will also be presented. The limitations of the current literature will also be highlighted as to support the objectives of this dissertation.

Ambiguity Tolerance

Ambiguity in Clinical Training

Facing ambiguity is a ubiquitous task in life and impossible to avoid in therapy (Bordin, 1955; Gruberg, 1969; Jahn & Smith-Adcock, 2017; Quinlan et al., 2021; Skovholt & Rønnestad, 2003). Most simply, an experience is ambiguous when it contains 1) unfamiliar information, 2) complex information, 3) contradictory or insoluble information, and/or 4) incomplete information (Budner, 1962; McLain, 1993). Reflecting on the process of therapy, human beings are innately complex, and counsellor and client(s) come together to resolve challenging psychological concerns while managing the intrapersonal and interpersonal interactions of their histories, intersectional identities, and worldviews. More layers of ambiguity are added depending on the number of clients involved in the therapy (e.g., couples or family therapy for which members may have competing interests to navigate), the risk of the client harming themselves or others, the complexity of the client's presenting concerns and diagnoses, and the need to manage ethical dilemmas (Quinlan et al., 2021). In addition, the therapeutic relationship

is always evolving, and counsellors must attend to many active session variables in session while holding a constant stream of information that is communicated both verbally and nonverbally (Skovholt & Starkey, 2010). This process can be chaotic and confusing; with ambiguity being a source of anxiety for both therapist and client (Bordin, 1955; Skovholt & Starkey, 2010).

For CITs, their lack of experience makes the counselling process and their clients' presenting problems largely novel. They are further attempting to learn, integrate, adapt, and apply knowledge and skills from multiple sources with clients while managing their own reactions and boundaries as well as facing the pressure of evaluation (Levitt & Jacques, 2005; Skovholt & Rønnestad, 2003). Unlike their professional counterparts, CITs' professional identity and theoretical framework is generally fragile and incomplete which can make ambiguity harder to navigate. In addition, CITs face ambiguity due to the many positions they occupy in clinical training (Myers et al., 2012). As graduate students, they are working to meet academic requirements and expectations, accepting critical feedback, and managing complex supervisory and collegial relationships (Jahn & Smith-Adcock, 2017; Levitt & Jacques, 2005; Rønnestad & Skovholt, 2003; Skovholt & Rønnestad, 2003). They may also face discomfort with moving from concrete learning models with clear answers and structured courses to ones emphasizing multiplistic thinking, trial-and-error and unstructured assignments (Levitt & Jacques, 2005). In their personal lives, CITs must renegotiate familial and social dynamics, reconcile their professional and personal (e.g., child, friend, sibling, parent, partner) identities, and establish new boundaries (Jahn & Smith-Adcock, 2017). This process can be potentially stressful and conflictual. For example, it can be difficult navigating the line between expressing empathy and compassion as a supportive friend versus as a counsellor. Furthermore, there may be feelings of isolation due to the confidential nature of this work. Much of the CIT's work life cannot be

shared nor be fully understood in personal relationships. The establishment of supportive professional networks is important; however, it can also create challenges. CITs must reconcile being colleagues, research collaborators, friends, and competitors (e.g., for funding or internships), and one of the barriers to accessing mental health care in graduate students can be stigma amongst peers (Rummell, 2015).

Although ambiguity can be overwhelming, it is also a necessary therapeutic variable. Ambiguity arguably facilitates deeper understanding of clients' emotions and motivations, effectiveness of interpretations, relational depth, and transference responses (Bordin, 1955; Stone & Shertzer, 1963). Furthermore, ambiguity creates opportunities for growth and developing meaning as both require challenging oneself, disrupting comfort, and risk taking. Taken together, learning to tolerate ambiguity is a critical task for CITs and helping them do so should be a key component of clinical training (Eriksen & McAuliffe, 2006; Jahn & Smith-Adcock, 2017; Levitt & Jacques, 2005; Pica, 1998; Skovholt & Rønnestad, 2003).

Definition

The reaction individuals have to ambiguity in the short and long term is predicted by a personality variable known as ambiguity tolerance (AT; Furnham & Marks, 2013; McLain et al., 2015). AT was initially conceptualized by Frenkel-Brunswik (1949) who examined its role in the way people form judgments of others and the relationship between it and authoritarianism. Those more tolerant of ambiguity display greater acceptance of cognitive and emotional ambivalence and flexibility, while those more intolerant utilize a dichotomous and rigid cognitive style such that they contain ambiguity by narrowing their awareness, seeking what is familiar, and maintaining their beliefs despite contradictory evidence. This definition has been refined over the years with Budner (1962) describing AT as one's reaction to ambiguity and tendency to interpret

it as attractive or aversive, and Norton (1975) clarifying the types of stimuli that can bring about ambiguity and the differences in individual perception of whether a stimulus is ambiguous. More recently, McLain (1993) defined AT as a "a range, from rejection to attraction, of reactions to stimuli perceived as unfamiliar, complex, dynamically uncertain, or subject to multiple conflicting interpretations" (p. 184). These reactions manifest in affective, cognitive, and behavioural domains (Bhushan & Amal, 1986; Grenier et al., 2005). Emotions can range from appreciation and excitement to anger and fear, cognitions can range from acknowledging ambiguity and being curious to negative self-perception and rigid thinking, and behaviours can range from approach and seeking support to avoidance and rejection (Grenier et al., 2005; Jahn & Smith-Adcock, 2017; Quinlan et al., 2021).

Definitions of AT remain equivocal (see review by Furnham & Marks, 2013), and there is debate on its dimensionality and stability. While there is a tendency to support AT as unidimensional (e.g., McLain, 2009) but multifaceted (e.g., Herman et al., 2010), others have suggested it is multidimensional (e.g., Lauriola et al., 2016). Specifically, the three dimensions are: 1) *affective* (i.e., feeling discomfort with ambiguity), 2) *cognitive* (i.e., responding to ambiguity with moral absolutism and splitting), and 3) *epistemic* (i.e., approaching and needing complexity and novelty). Furthermore, some researchers have argued that AT is context-specific (e.g., Durrheim & Foster, 1997) rather than a personality trait and recommend developing contextualized measures. Regarding stability, AT may change from experience and over time (e.g., Helson & Wink, 1992; Ndoja et al., 2020) and can be experimentally manipulated (e.g., Endres et al., 2015; Sagioglou & Forstmann, 2013). Geller (2013) further proposed that AT may exist as both a trait and a state. Perhaps trait AT reflects one's general attitude and response

towards ambiguous stimuli while one's state AT is temporary and differs depending on contextual factors (e.g., how threatening the stimulus might feel to the perceiver).

Another key issue in defining AT is its relationship with intolerance of uncertainty (see reviews by Grenier et al., 2005; Rosen et al., 2014). First linked to the literature on worry, intolerance of uncertainty is conceptualized as a dispositional characteristic reflecting how one perceives uncertainty and reacts emotionally, cognitively, and behaviourally (Dugas et al., 2004; Freeston et al., 1994). It appears to be a central construct in conceptualizations for the etiology, development, and treatment of anxiety disorders like Generalized Anxiety Disorder (Buhr & Dugas, 2006; Dugas et al., 1998). Conducting a factor analysis of intolerance of uncertainty measures with a nonclinical population, Birrell et al. (2011) operationalized it as 1) desiring predictability and 2) incapacitation during uncertainty. It is unsurprising intolerance of ambiguity and intolerance of uncertainty are used interchangeably in the literature (e.g., Jach & Smillie, 2019) as both involve cognitive processes whereby one perceives and interprets an ambiguous/uncertain stimulus as threatening and subsequently respond to the stimulus with anxiety and avoidance (Grenier et al., 2005). Furthermore, empirically, they are moderately to strongly correlated (e.g., Buhr & Dugas, 2006; Jach & Smillie, 2019; Paralkar & Knutson, 2021). In an attempt to reconcile intolerance of ambiguity and uncertainty, Hillen et al. (2017) developed a model that subsumes ambiguity under the umbrella of uncertainty tolerance; proposing that ambiguity is a source of uncertainty (along with probability and complexity) for which individuals will respond on affective, cognitive, and behavioural levels.

However, other researchers have pointed to some important differences between ambiguity and uncertainty. Conceptually, Grenier et al. (2005) proposed a temporal difference where intolerance of uncertainty is oriented towards future situations and potential negative

consequences of uncertainty whereas AT is concerned with the present or the *here and now* situation. This further suggests ambiguity precedes and may develop into uncertainty (Carleton, 2012; Krohne, 1993). Although this has not been empirically validated (Rosen et al., 2014), worry (i.e., apprehension of future events) is more strongly associated with intolerance of uncertainty compared to AT (e.g., Buhr & Dugas, 2006); this fits well with the temporal hypothesis. Furthermore, there are differences in their prediction of approach and avoidance coping strategies in the face of academic stress (Paralkar & Knutson, 2021). Compared to intolerance of uncertainty, intolerance of ambiguity uniquely predicted approach coping strategies (negative relationship) and was a stronger predictor of avoidant strategies (positive relationship). Paralkar and Knutson (2021) proposed that ambiguity emerges as a stronger predictor than intolerance of uncertainty because academic stress is more present-oriented, and that these findings offer support to the temporal distinction. Finally, correlations between AT, intolerance of uncertainty, and neuroticism and extraversion highlight interesting patterns. In Lauriola et al. (2016), the *affective* dimension appears to mirror intolerance of uncertainty; they have the strongest correlation compared to the other dimensions and both had similar coefficient sizes for extraversion (i.e., small to moderate) and neuroticism (i.e., moderate to large). The *cognitive* and *epistemic* dimensions had small to moderate correlations with intolerance of uncertainty. Furthermore, the *cognitive* dimension was not correlated with extraversion or neuroticism while the *epistemic* dimension had a small correlation with extraversion. These patterns perhaps reflect how AT and intolerance of uncertainty are related but ultimately distinct constructs. For this dissertation, the decision to focus on AT is because the target population is ultimately graduate students who face academic anxieties and stressors that tend to stem from present-oriented situations (e.g., providing therapy, engaging in supervision and courses, etc.).

Measurement

AT has been measured using both self-report questionnaires (e.g., Budner, 1962) and perceptual tasks (e.g., Sagioglou & Forstmann, 2013); however, many of them have been criticized for having poor psychometric properties (see review by Furnham & Marks, 2013). One unidimensional measure of AT is the Multiple Stimulus Types Ambiguity Tolerance scale (McLain, 1993) which was further refined into a shorter second version (McLain, 2009). This is based on McLain's (1993) definition of AT and has been found to have strong psychometric properties. More recently, Lauriola et al. (2016) developed a multidimensional measure of AT (*affective*, *cognitive*, and *epistemic* dimensions) by analyzing the hierarchical structure of seven AT questionnaires (comprising of 133 items). It has good psychometric properties and has been used cross-culturally with American, Italian, and Japanese samples (Hitsuwari & Nomura, 2021; Lauriola et al., 2016). While these two measures are cross-contextual, measures of AT for specific contexts like career decisions, cross-cultural research, interpersonal ambiguity, as well as medical and veterinary students have been developed (Hammond et al., 2017; Hancock et al., 2015; Herman et al., 2010; Wolfradt et al., 1999; Xu & Tracey, 2015). Lastly, there are currently no state measures of AT.

Correlates and Effects

Furnham and Marks (2013) conducted a thorough examination of the correlates of AT and highlighted how this construct has been studied across many fields (e.g., business, education, healthcare). AT is positively associated with agreeableness, career decision making, curiosity, conscientiousness, creativity, emotional appraisal of others, empathy, extraversion, heuristic and complex thinking styles, life satisfaction, openness to diversity and experience, positive affect, psychological mindedness and well-being, resilience, self-efficacy, and wisdom (e.g., Babaei et

al., 2021; Beitel et al., 2004; Geller et al., 2021; Hitsuwari & Nomura, 2021; Hwang & Choi, 2020; Ie et al., 2012; Jach & Smillie, 2019; Litman, 2010; Mangione et al., 2018; Park et al., 2020; Wolfradt et al., 1999; Xu & Tracey, 2015; Zenasni et al., 2008). It is further negatively associated with anger, authoritarianism, anxiety, burnout, ethnocentrism, external locus of control, job stress, magical thinking, need for cognitive closure, negative affect, neuroticism, perfectionism, and worry (e.g., Babaei et al., 2021; Banning, 2003; Beitel et al., 2004; Buhr & Dugas, 2006; Gärtner et al., 2020; Iannello et al., 2017; Jach & Smillie, 2019; Lauriola et al., 2016; Litman, 2010; Mangione et al., 2018; Van Hiel et al., 2010; Zhaleh et al., 2018).

For therapists, higher AT correlates with lower perfectionism and greater work satisfaction (Wittenberg & Norcross, 2001). Openness to ambiguity is a characteristic of master therapists, and it further aids in preventing professional stagnation and premature closure to how one might conceptualize and work with a client (Jennings et al., 2005). There is also some research that suggests counsellors with higher AT use a more client-centered (e.g., seeking clarification, using silence) rather than directive (e.g., advising, evaluating) approach (Gruberg, 1969). The impact on counselling effectiveness is more equivocal; while Gruberg (1969) also found greater effectiveness when responding to clients (as rated by counselling educators), Jackson and Thompson (1971) did not. For CITs, AT has been found to correlate with greater effectiveness in communication and ability to convey empathy and respect (Brams, 1961; Jones, 1974). Clients of CITs with high AT were noted to return to session significantly more often than those with lower AT albeit there were no differences in client satisfaction (Foote et al., 1975).

Furthermore, there are differences in how therapists might cope with ambiguity. For example, they might accept their limitations and what they cannot control, develop their self-awareness, engage in positive and normalizing self-talk, explore different perspectives, prepare

for ambiguity, reframe ambiguity as something positive, seek supervision and reassurance, as well as focus more on themselves (e.g., by grounding and remaining present) or the client (e.g., by reviewing the case, gathering more information) in session (Jahn & Smith-Adcock, 2017; Quinlan et al., 2021). They also may feel more positively about ambiguity, experiencing curiosity, excitement, and hope (Jahn & Smith-Adcock, 2017). These responses reflect approach and acceptance towards ambiguity and may be more accessible to those with higher AT.

On the other hand, being overwhelmed by ambiguity can bring feelings of anger, anxiety, despair, inadequacy, frustration, pressure, self-doubt, and shame in CITs (Jahn & Smith-Adcock, 2017). CITs may feel a lack of control over the session and their client's reactions and reduce ambiguity by avoiding clients, taking a reductionist or single perspective approach, and clinging to a manualized process (McAuliffe & Lovell, 2006; Pica, 1998; Quinlan et al., 2021). These responses are reflective of intolerance towards ambiguity and may lead to the therapist becoming less attentive, flexible, and sensitive towards their client's needs (Maguen, 1993; Pica, 1998).

Strategies for Cultivating AT

There have been several suggestions as to how AT may be cultivated. For example, connecting with one's humanity, engaging in humanities-related activities (e.g., making art, reading or writing for pleasure), examining the many meanings of visual artworks, reflective writing and thinking about the emotional and cognitive effects of ambiguity (i.e., engaging in metacognitive awareness), and using a case method of teaching (Bentwich & Gilbey, 2017; Iannello et al., 2017; Luther & Crandall, 2011; Mangione et al., 2018; Nevalainen et al., 2010). For CITs, Winborn and Martinson (1965) noted ambiguity can be integrated in teaching methods by not using models or offering direct advice. Rather, educators should allow students to wrestle with developing their own techniques and critically reflect on all theoretical orientations. Other

recommendations include having supervisors acknowledge and predict ambiguity early in the training, encourage learning through practice as well as trial-and-error, facilitate group discussions that normalize student experiences, and share their personal experiences with managing ambiguity (Jahn & Smith-Adcock, 2017; Levitt & Jacques, 2005; Pica, 1998; Skovholt & Rønnestad, 2003). Students can also create student mentorship programs, engage in reflective writing, and seek personal therapy. In a positive feedback loop, appreciating the positive aspects of ambiguity (e.g., how it facilitates creativity and growth), deliberately engaging with ambiguity, and finding meaning in ambiguity can foster confidence and hope about managing future ambiguity (Boss, 2006; Jahn & Smith-Adcock, 2017). It is important to note the literature on the ways AT can be promoted in CITs is limited as many of the listed suggestions have not been studied quantitatively. Given the importance of AT for the development of CITs, new promising strategies, like mindfulness and compassion training (e.g., Bohecker et al., 2016; Christopher & Maris, 2010), are worthwhile to be investigated.

Mindfulness and Compassion

In the past four decades, there has been an explosion of mindfulness and compassion research. Systematic reviews and meta-analyses have consistently demonstrated their impacts on physical and psychological well-being across different clinical and nonclinical populations (e.g., Anand et al., 2021; Carrière et al., 2018; Carsley et al., 2018; Chiesa & Serretti, 2009, 2011; Ferrari et al., 2019; Grossman et al., 2004; Gu et al., 2015; Khoury et al., 2017a; Khoury et al., 2017b; Khoury et al., 2013b; Khoury et al., 2015; Kirby et al., 2017; MacBeth & Gumley, 2012; Per et al., 2020; Schmelefske et al., 2020; Virgili, 2013; Wilson et al., 2019; Zainal et al., 2013). This is equally true for CITs. Scholars have been interested in the use of mindfulness and compassion as clinical interventions as well as tools for clinical development and self-care (Baer,

2003; Beaumont & Hollins Martin, 2016; Carson & Langer, 2004; Gockel, 2010; Lomas et al., 2018; Mace, 2007; Neff & Germer, 2022; Nelson et al., 2018; Rudaz et al., 2017; Shapiro et al., 2007; Shonin et al., 2013). The benefits of mindfulness and compassion training with CITs makes it a compelling strategy to apply in the enhancement of AT. However, like AT, there are conceptual issues surrounding the definitions of mindfulness and compassion (Hart et al., 2013; Khoury, 2019; Khoury et al., 2017a; Strauss et al., 2016). Thus, it is necessary to separately review the two operationalizations of Western mindfulness, 1) meditative mindfulness (MM) and 2) Langer mindfulness (LM), as well as compassion towards both the self and others.

Meditative Mindfulness

Definition. MM has its origins in Buddhist schools of thought which emphasize present awareness, meditation practice, and freedom from suffering (Dunne, 2011, 2015; Shonin et al., 2014). It found prominence in Western literature through the initial efforts of Jon Kabat-Zinn and colleagues who described mindfulness as a nonjudgmental process of purposefully attending to the present (Kabat-Zinn, 1991, 1994). By default, the brain is in a mind-wandering (MW) state where one reacts to stimuli on autopilot, one's attention is shallow and fleeting, and one's thoughts are wandering from the present towards the past or future (Christoff et al., 2009; Kabat-Zinn, 1994; Mason et al., 2007). MM is a mode of consciousness that requires self-regulation of attention such that one can manage and return attention towards present internal (e.g., affect, cognitions, physiological responses) and external (e.g., surrounding environment) stimuli (Hart et al., 2013; Khoury et al., 2017a). One engages in a metacognitive process whereby they freely observe whatever stimuli comes into awareness; noticing not only the stimuli, but also the shifts between what is being perceived (Bishop et al., 2004; Kabat-Zinn, 1994; Shapiro et al., 2006; Siegel et al., 2009). They detach from what arises without judgment and apply a stance of

acceptance, curiosity, and equanimity. This detachment supports a shift in how one perceives their experience (i.e., reperceiving one's emotions, thoughts, beliefs, memories, physiological responses, etc.) which helps reduce emotional reactivity and, ultimately, suffering.

Measurement. MM can be further conceptualized as a trait (i.e., one's general tendency to be mindful) and a state (i.e., brief and immediate experience of mindfulness) for which there are specific self-report measures. The Five Facet Mindfulness Questionnaire (FFMQ) is a popular measure for trait MM and highlights five main facets of MM: 1) *observing* the present, 2) *describing* it with words, 3) *acting with awareness* in response, and maintaining a stance of 4) *nonjudgment* and 5) *nonreactivity* towards one's arising emotions and thoughts (Baer et al., 2006). State MM can be measured using the Toronto Mindfulness Scale (TMS) which has two facets: 1) *curiosity* which characterizes the stance one takes when attending to the present and 2) *decentering* which refers to the ability to detach from one's experience (Lau et al., 2006).

Practice Methods. While it is possible to enter mindful states without intention and practice, these states are fleeting and inconsistent (Howells et al., 2010). To develop one's skill of choosing, entering, and maintaining a mindful state, meditative practice is necessary (Bishop et al., 2004). Meditation (e.g., breathing, concentrative, focused attention, insight-based, movement, open monitoring, Vipassana) is one strategy for practicing mindfulness (see review by Khoury et al., 2017a). Brief inductions (e.g., a 15-minute focused-breathing exercise) can increase state MM (e.g., Erisman & Roemer, 2010). There are also comprehensive programs that aim to develop trait MM; most popularly the Mindfulness-Based Stress Reduction (MBSR) program (Kabat-Zinn, 1982, 1991; Kabat-Zinn et al., 1986; Kabat-Zinn et al., 1985). This intensive eight-week program includes two hours of weekly psychoeducation, group discussion, formal meditative practice in addition to a meditation retreat (three to seven hours) and home

practice of meditation (45 minutes/day). MBSR has been adapted for the treatment of particular presenting issues (e.g., depression; Segal et al., 2013) and specific populations (e.g., healthcare students; de Vibe et al., 2013). Other similarly comprehensive programs with MM as a central focus have also been developed (e.g., Swift et al., 2017).

Correlates and Training Effects. There is a substantial body of quantitative and qualitative literature on the benefits of MM. First, trait MM correlates positively with well-being related factors like confidence, emotional intelligence, empathy, job and life satisfaction, openness to experience, positive emotions, self-awareness, self-compassion, self-efficacy, self-esteem, as well as negatively with burnout, depression, emotional regulation difficulties, experiential avoidance, negative emotions, social anxiety, and stress (e.g., Atanes et al., 2015; Baer et al., 2006; Baer et al., 2008; Brown & Ryan, 2003; Butts & Gutierrez, 2018; Keane, 2013; May & O'Donovan, 2007; Mesmer-Magnus et al., 2017; Slonim et al., 2015; Testa & Sangganjanavanich, 2016; Walach et al., 2006). MM inductions have been shown to improve performance on tasks requiring complex higher-order functions (see review by Gill et al., 2020) as well as better regulation of negative emotion, more prosocial behaviour, and reduction of negativity and sunk-cost biases (Arch & Craske, 2006; Hafenbrack et al., 2020; Hafenbrack et al., 2014; Kiken & Shook, 2011). MM-based interventions have been found to improve cognitive abilities, confidence integrating mindfulness into therapy and in managing stress, mindfulness, positive affect, self-esteem, self-compassion, and quality of life while reducing anxiety, burnout, blood pressure, depression, emotional reactivity, negative affect, rumination, and stress (e.g., Aggs & Bambling, 2010; Chen et al., 2013; Chiesa et al., 2011; Felton et al., 2015; Godfrin & van Heeringen, 2010; Goldin & Gross, 2010; Kim et al., 2009; Martin-Asuero et al., 2014; Newsome et al., 2012; Shapiro et al., 2005; Shapiro et al., 2007; Strauss et al., 2021). Such

benefits appear to persist in the long-term (e.g., after six years; Christopher et al., 2011; de Vibe et al., 2018). Given these benefits, MM practice is both a clinical tool and a strategy for self-care.

MM also has implications in clinical training (Campbell & Christopher, 2012; Christopher & Maris, 2010). Martin (1997) suggested mindfulness is a common factor underlying the therapeutic process, and mindfulness conceptually intersects with many therapeutic modalities including: existential, cognitive-behavioural, humanistic, marriage and family, and psychodynamic therapies (e.g., Bianco et al., 2016; Gambrel & Keeling, 2010; Harris, 2013; Jooste et al., 2015; Segal et al., 2013). For CITs, MM practice can also aid in developing their professional identity and skills that are more difficult to teach like attentive, empathic, and nonjudgmental engagement with clients, attunement towards self and clients, emotional awareness and tolerance, metacognitive awareness, managing silence, self-awareness of countertransference and professional limitations, self-care, and therapeutic presence and responsiveness (Bruce et al., 2010; Chrisman et al., 2009; Christopher et al., 2006; Christopher & Maris, 2010; Dong et al., 2018; Fauth et al., 2007; Gockel, 2010; Hemanth & Fisher, 2015; Keane, 2013; Martin, 1997; McCollum & Gehart, 2010; Rimes & Wingrove, 2011; Schomaker & Ricard, 2015). In turn, this practice can affect client care. CITs can become more flexible and creative when applying a therapeutic framework so that a model is not improperly imposed (Gockel, 2010). They also can respond with more openness to their clients' reactions in session, which is especially important during therapeutic ruptures (Fauth et al., 2007). In addition, therapists with greater MM and meditation practice tend to perceive their working alliance more positively (Johnson, 2018; Johnson et al., 2019; Ryan et al., 2012). From the clients' perspective, greater MM in the therapist correlated with greater empathy (Fulton, 2016) and better interpersonal functioning on client rated measures (Ryan et al., 2012). Grepmair et al. (2007)

also found that clients of CITs who practiced daily mindfulness viewed their treatment more positively and had greater symptom reduction compared to clients of CITs who did not. Taken together, there is strong evidence for the benefits of MM training on CITs' self-care, clinical growth, and client outcomes.

Langer Mindfulness

Definition. LM does not stem from Buddhist traditions and was conceptualized by Ellen Langer and colleagues as a socio-cognitive ability (Langer et al., 1978). It is a way of functioning where one is actively and effortfully regulating their attention and awareness towards the present, specifically their external environment (Langer, 2005). They engage creatively with what enters awareness, remain flexible and cognizant of context, are open to novelty and new information, actively create new categories, seek and hold multiple perspectives, and have increased sensitivity to difference and the changing environment (Langer, 1989, 1997; Sternberg, 2000). Through this process, one has greater capacity to tolerate uncertainty, to be flexible, and to engage meaningfully (Carson & Langer, 2006). Like MM, this contrasts a default mindless state where one is processing external stimuli through automatic cognitive and behavioural scripts; inflexibly relying on previously defined or familiar approaches, categories, and rules without attendance to novelty and context (Langer, 1992; Langer & Piper, 1987). This rule-governed state can lead to rigidity when interpreting stimuli and making decisions as well as limit authenticity and self-acceptance (Carson & Langer, 2004, 2006; Langer & Imber, 1979).

Measurement. Similar to MM, LM can be conceptualized as a trait and a state. However, only one validated measure of trait LM exists (i.e., the Langer Mindfulness Scale; Pirson et al., 2012). This scale highlights four subfactors of LM, specifically: 1) *engagement* with the present environment and awareness of shifts, 2) *flexibility* by viewing things from multiple perspectives,

3) *seeking novelty* by maintaining a stance of openness and curiosity to the present, and 4) *producing novelty* by creating new categories and meanings (Bodner & Langer, 2001).

Practice Methods. A state of mindfulness can be induced using instruction-based tasks that emphasize one or more subfactors of LM. For example, an individual might read a short description of a person's actions and then be asked to provide several reasons for the person's behaviour from different perspectives (Ie et al., 2012). Flexibility and production of novelty are required to complete this task, as are creativity and the ability to shift away from one's initial response. The individual actively and intentionally shifts their cognitive process; thus, moving from a state of mindlessness to one of mindfulness (Hart et al., 2013). While comprehensive trainings have been developed for MM, LM techniques have not been merged into a program (Hart et al., 2013; Khoury et al., 2017a). However, it has been proposed that the intentional interruption of mindless states through mindfulness strategies strengthens trait LM over time.

Correlates and Training Effects. There is a wealth of literature highlighting the positive effects of LM. Correlational research demonstrates higher trait LM is positively associated with cognitive reappraisal, complexity in thinking style, creativity, decision-making, employee engagement, experiential learning styles, humour, job, life, and marital satisfaction, openness, physical health, positive affect, quality of life, reappraisal, self-esteem, as well as psychological, social, and subjective well-being (Brockman et al., 2017; Burpee & Langer, 2005; Haigh et al., 2011; Ie et al., 2012; Moafian et al., 2017; Pagnini et al., 2018; Pagnini et al., 2019; Pagnini et al., 2014; Pirson et al., 2012). Furthermore, it is negatively associated with anxiety, attachment anxiety and avoidance, adverse psychological symptoms, depression, fatigue, negative affect, need for structure, and sleep issues. Research on LM interventions have also shown increased alertness, attention, creativity, learning, longevity, performance, perceived competence, physical

health, problem solving, productivity, and visual acuity as well as decreased alcoholism, arthritis pain, burnout, stress, and stereotyping (Alexander et al., 1989; Anglin et al., 2008; Djikic et al., 2008; Grant et al., 2004; Langer et al., 2010; Langer, 1989; Langer et al., 1989; Langer & Moldoveanu, 2000; Langer & Piper, 1987; Langer & Rodin, 1976; Langer et al., 2009; Levy et al., 2001; Ostafin & Kassman, 2012; Rodin & Langer, 1977). LM can have further interpersonal implications where mindful speakers were perceived to be more genuine, warmer, and better leaders (Kawakami et al., 2000), and mindful adults were more preferred by children and their interactions had more positive impacts on them (Langer et al., 2012).

For CITs, Carson and Langer (2004) highlighted the importance of mindful practice as it can support personal and client mental health, diagnostic decision making, and clinical collaboration. The distress or symptoms experienced by clients can perhaps be conceptualized as a form of mindlessness where automaticity, certainty (i.e., single perspective taking), and rigidity underlie maladaptive thinking and behaviour. These patterns likely originate from previously adaptive strategies being applied to other experiences without considering changes in context (i.e., a mindless response). A mindful approach to therapy would support a client in accepting uncertainty, attending to variability, being open to categorizing experiences flexibly as situations shift, deconstructing and contextualizing “good” and “bad” labels, and examining different perspectives (Carson & Langer, 2004; Pagnini et al., 2016). This process can aid clients in feeling greater agency, control, and empowerment as well as in re-interpreting their constructed life story (Fatemi & Langer, 2018; Pagnini et al., 2016). It is also important for clinicians to be mindful when assessing clients; otherwise, they risk applying biased and inappropriate diagnostic labels that can pigeonhole clients and problematize normal behaviour (Langer & Abelson, 1974). Strategies that can help facilitate LM include: 1) seeking novelty in one’s understanding of

clients and considering alternative conceptualizations, 2) using conditional wording to facilitate creativity and an open mindset, 3) thinking about complexity and paradoxes, and 4) finding humour by viewing experiences from multiple perspectives (Carson & Langer, 2004).

Compassion

Definition. Compassion, like MM, has its origins in Buddhist philosophy and reflects a selfless desire for all beings (including strangers and oneself) to be free from suffering (Bodhi, 1994; Shonin et al., 2014). It was brought into Western psychological literature through the work of Paul Gilbert and Kristin Neff (Gilbert, 2006; Neff, 2003a) who further highlighted the applications of compassion in therapy (e.g., Gilbert, 2010; Neff & Germer, 2022). Gilbert (2009a) defined compassion as both an emotional response to suffering (e.g., feeling deeply touched by it) and a behavioural response where one seeks to help. It further consists of caring, emotional distress tolerance, empathy, nonjudgment, sensitivity, and sympathy. Neff (2003a) popularized a definition of self-compassion that is an attitude towards oneself during times of inadequacy and suffering. Those who respond more compassionately offer themselves kindness rather than judgment, recognize suffering is a shared human experience rather than something that happens only to the individual, and observe their suffering with openness and nonjudgment rather than being caught in their emotions and thoughts. A similar definition based on this theoretical model is offered for compassion towards others (Pommier et al., 2020). It is important to note the definition of compassion generally lacks consensus and suffers from several key issues (e.g., the inclusion of mindfulness within their definition; see Khoury, 2019). A review of definitions by Strauss et al. (2016) suggested compassion is an affective, cognitive, and behavioural process that involves: 1) awareness and recognition of suffering, 2) acknowledgment

that suffering is universal, 3) affective connection to the experienced suffering, 4) tolerance of the feelings that arise in response, and 5) motivation to act in response and alleviate suffering.

Measurement. There are several measures to examine compassion towards self and others; however, they do face psychometric and theoretical shortcomings (see review by Khoury, 2019). The most popular validated measure of self-compassion is based on Neff's (2003a) definition (i.e., Self-Compassion Scale; Neff, 2003b). It is composed of six factors that are split between three positive (i.e., *self-kindness*, *common humanity*, and *mindfulness*) and their opposing negative (i.e., *self-judgment*, *isolation*, and *over-identification*) dimensions. Pommier et al. (2020) extended this work by developing a scale measuring compassion towards others (i.e., Compassion Scale) while Neff et al. (2021) developed a state measure of self-compassion. The Sussex-Oxford Compassion Scales were developed based on Strauss and colleagues' (2016) definition and include measures of compassion towards self and others (Gu et al., 2020).

Practice Methods. Similar to MM, there are both meditations and comprehensive training programs that aim to cultivate compassion (Khoury, 2019). Formal practices include affectionate breathing, compassion meditation, compassionate body scan, loving-kindness while informal practices can include compassionate letter writing, self-compassion break, and soothing touch (Hofmann et al., 2011; Neff & Germer, 2013). Such practices have been used as inductions to increase a state of self-compassion (e.g., Kirschner et al., 2019; Odou & Brinker, 2014). Khoury (2019) reviewed several comprehensive programs, noting differences in the emphasis on and types of meditations as well as integration of mindfulness and other non-meditative components (e.g., psychoeducation). For example, the Mindful Self-Compassion Training, which has a similar structure to MBSR (i.e., 2.5 hours for eight weeks with a retreat and 40 minutes of daily home practice), aims to increase self-compassion and has been used with general and

healthcare worker populations (Neff & Germer, 2013; Neff et al., 2020). Similarly, Compassion Cultivation Training is an eight-week program that includes both compassion towards self and others as well as mindfulness components (Jazaieri et al., 2013; Scarlet et al., 2017).

Correlates and Training Effects. There is strong evidence for the benefits of compassion. Correlational research demonstrates positive relationships between self-compassion and basic psychological needs, close and dependable attachment, life satisfaction, positive affect, self-esteem, self-reassurance, social connectedness, student communication in classes, and well-being as well as negative relationships with anger, anxiety, anxious attachment, burnout, compassion fatigue, depression, difficulties in emotion regulation, fear of compassion, fear of evaluation, need for cognitive closure, negative affect, rumination, self-consciousness, self-criticism, somatic symptoms, stress, thought suppression, and worry (Beaumont et al., 2016; Dreisoerner et al., 2020; Finlay-Jones et al., 2015; Gilbert et al., 2011; Gu et al., 2020; Long & Neff, 2018; López et al., 2018; Neff, 2003b; Neff et al., 2007; Neff et al., 2008; Neff & Vonk, 2009; Odou & Brinker, 2014; Raes, 2010; Van Dam et al., 2011). Similarly, compassion for others is positively correlated with altruism, compassionate action, disposition, engagement, and love, empathy and empathic concern, forgiveness, mental well-being, mindfulness, perspective taking, social connectedness, social desirability, and wisdom (Gu et al., 2020; Pommier et al., 2020). It is also negatively correlated with burnout, depression, fear of compassion, neuroticism, and stress. Compassion-based inductions have been found to decrease negative affect, physiological arousal, and self-criticism as well as increase affiliative affect, motivation for self-improvement, parasympathetic activation, self-compassion, and social connectedness (Breines & Chen, 2012; Kirschner et al., 2019; Leary et al., 2007; Odou & Brinker, 2014; Seppala et al., 2014). Finally, compassion interventions have been found to increase calmness, compassion for

self and others, happiness, life satisfaction, mindfulness, optimism, self-esteem, self-reassurance, and self-soothing, and they have also been found to reduce anxiety, burnout, depression, eating disorder pathology, emotional avoidance, fear of compassion, feelings of inferiority, mind-wandering, rumination, self-criticism, secondary traumatic stress, shame, social comparison, submissive behaviour, and stress (Arimitsu, 2016; Gilbert & Procter, 2006; Jazaieri et al., 2013; Jazaieri et al., 2016; Jazaieri et al., 2018; Judge et al., 2012; Kelly et al., 2017; Laithwaite et al., 2009; Lucre & Corten, 2013; Neff & Germer, 2013; Neff et al., 2020; Scarlet et al., 2017; Shapira & Mongrain, 2010; Smeets et al., 2014).

Integration of compassion programs in clinical training has been proposed by several researchers for its benefits in cultivating self-care and clinical skills (e.g., Bibeau et al., 2016; Boellinghaus et al., 2012; Patsiopoulos & Buchanan, 2011). Compassion is considered a critical component of the therapeutic process, and therapists must witness and hold the suffering of their clients (Figley, 2002b; Gilbert, 2009b). This process not only helps clients feel safer in navigating their experiences, but also helps the therapist resonate with the underlying suffering, understand their clients more deeply, and offer acceptance (Vivino et al., 2009). However, there are emotional costs to caring that (when insufficiently managed) can lead to compassion fatigue (Figley, 2002a). CITs may be particularly vulnerable due to the emotionally demanding process of clinical training that can evoke anxiety and self-criticism (Beaumont & Hollins Martin, 2016; Beaumont et al., 2017; Finlay-Jones et al., 2017). Compassion training may be an important mechanism for building resilience, developing healthier coping strategies, and regulating affect (Beaumont & Hollins Martin, 2016; Beaumont et al., 2017; Finlay-Jones et al., 2017). CITs learn to recognize, normalize, and accept the latent difficulties of clinical training and work as well as to respond in a way that is self-supportive rather than self-critical and perfectionistic (Beaumont

et al., 2017; Finlay-Jones et al., 2017). Fostering openness to imperfection can also help CITs be more honest in disclosing mistakes and managing affective and cognitive reactions in response to critical feedback from supervisors and clients (Beaumont & Hollins Martin, 2016; Beaumont et al., 2017; Bell et al., 2017; Neff & Vonk, 2009). Compassion training has been found to increase happiness, mindfulness, psychological well-being, self-compassion and reduce depression, difficulties in emotion regulation, self-judgment, and stress (Beaumont et al., 2017; Finlay-Jones et al., 2017; Yela et al., 2020). Qualitative research further highlights benefits on cognitive processes important to therapeutic work, specifically an increase in attentional flexibility and self-reflection and a reduction in rumination and worry (Bell et al., 2017). Taken together, increasing compassion can aid CITs in their management of clinical training and work.

Intersection of Ambiguity Tolerance and Mindfulness/Compassion

Conceptual Links

From reviewing the AT and mindfulness/compassion literatures, several basic similarities between these constructs can be identified. They have affective, cognitive, and behavioural components, are oriented to the present, emphasize metacognitive awareness as a mechanism to tolerate ambiguity or be mindful, and are associated with a wide range of physical, social, and psychological health outcomes. However, an important difference is the consistent empirical literature demonstrating the effectiveness of specific strategies and trainings in developing trait mindfulness and compassion. This research is much more limited for AT. Interestingly, some of the suggestions that have been made for increasing AT are reminiscent of mindfulness and compassion strategies. For example, reflective writing involves introspection and metacognitive awareness which are emphasized in MM. The process of examining multiple meanings in works of art would be a strategy aligned with LM as one would need to remain cognitively open to

novel and different perceptions. Validating the common experience of ambiguity is an important supervision strategy for building tolerance, and this is reflective of the common humanity component of compassion.

There are two conceptual models that have proposed a link between AT and mindfulness. First, the Anxiety/Uncertainty Management Theory was developed in the context of how individuals adjust to new cultures and suggests that they must manage the ambiguity and anxiety that arises in the process (Gudykunst, 1998). LM was identified as a way of cognitively managing ambiguity and anxiety by opening the individual to novelty, creating new categories rather than relying on established cultural frames and broad conceptions, and flexibly holding multiple perspectives. Meditation was also identified as a tool for managing anxiety. Second, the Ambiguity Tolerance Interface was developed in the context of understanding leadership effectiveness and suggests the interface is composed of AT and four correlates that are involved in ambiguity management: 1) LM, 2) aesthetic judgment or the ability to reflect on and learn from one's knowledge, experiences, and preferences and to acknowledge their impacts on decision making, 3) spirituality or the way one approaches existential questions (e.g., self-transcendence, finding meaning) which can be managed using spiritual schemas (e.g., faith and hope), and 4) creativity or the ability to be flexible and innovative (Lane & Klenke, 2004). While MM is not explicitly noted, the themes of spirituality and aesthetic judgment seem to reflect key components of MM like being able to introspect and develop awareness of oneself as well as the Buddhist concept of *remembering* in which the ability to remember and reflect on the past can bring awareness and existential purpose (Khoury et al., 2017a).

These models demonstrate the potential application of mindfulness in AT cultivation. Adding to these theories, mindfulness and compassion may impact each of the dimensions of

AT. For the *affective* dimension, MM supports emotion regulation, and meditative training is associated with reduced emotional intensity and reactivity (Roemer et al., 2015). LM can also support emotion regulation through its association with cognitive reappraisal, a strategy of reframing in order to reduce emotional intensity (Haigh et al., 2011). Compassion also involves mindful recognition of affect that arises from suffering and tolerating the emotions (Strauss et al., 2016). Self-compassion is an adaptive emotion regulation strategy whereby the individual is better able to regulate negative emotions arising from a perceived threat, in this case ambiguity (Gilbert, 2009a; Inwood & Ferrari, 2018).

For the *cognitive* dimension, the characteristics of rigidity and dichotomous thinking is reflective of the mindless state described in LM. Flexibility and the ability to hold and shift between multiple perspectives is critical to the conceptualization of LM (Langer, 1989). MM also involves cognitive flexibility through the process of reperceiving whereby one is able to detach from past frameworks and shift perspectives (Shapiro et al., 2006). Compassion perhaps inherently requires the holding of multiple perspectives and a process of reframing to learn from the experience. For example, when one makes a mistake, a compassionate response would involve acknowledging and recognizing the error and the emotions that arise (e.g., shame, sadness) while also accepting that mistakes are human and recognizing that a person still deserves kindness even when they fail. One might also examine the multiple contributing factors to a mistake while also taking responsibility for their contribution.

For the *epistemic* dimension, it is possible the management of the other dimensions may support an approach towards ambiguity. LM emphasizes seeking novelty and suggests engaging in ambiguity (e.g., using conditional wording, considering paradoxes) can foster tolerance (Carson & Langer, 2004). Furthermore, learning to and practicing meditation is an inherently

ambiguous task. Perhaps the process of coping with this ambiguity can develop appreciation for ambiguity and confidence in one's ability to manage ambiguity. In turn, this can then be translated to other experiences. Finally, Fulton (2016) noted how being unable to resolve or manage ambiguity may be perceived as a failure or a form of inadequacy. One might attempt to avoid feeling this way by avoiding ambiguity. However, if the individual is more readily able to offer themselves kindness in the face of difficulty, then they may be more open to approaching ambiguity. They may also view ambiguity more positively by recognizing it as part of common humanity and a means of connecting to others.

Empirical Evidence

There has been some empirical research highlighting the relationship between both operationalizations of Western mindfulness, compassion, and AT. First, neuroscientific research has found mindfulness decreases activity within the default-mode network; a system activated when at rest and that is associated with mind-wandering and self-referential processing (Garrison et al., 2015; Gruberger et al., 2011). An important node within the network is the precuneus which has consistently been shown to reduce in activity during meditation. The precuneus has also been implicated in AT research; specifically, AT is negatively correlated with regional gray matter volume in the precuneus (Tong et al., 2015) and is associated with the deactivation of the precuneus (Mazhirina et al., 2020). Furthermore, a study examining decision making in an ambiguous situation found activation of the left insula; an area associated with decision making, emotional experience and recognition, empathy, and parasympathetic responses (Pushkarskaya et al., 2010; Uddin et al., 2017). Increase in its activation is also associated with greater mindfulness and appears to be an effect of mindfulness training (Hölzel et al., 2011; Tomasino & Fabbro, 2016). Research has consistently found a positive relationship has been found between

compassion and gray matter volume in the anterior insula, and the left insula is more activated when providing a compassionate response (Fehse et al., 2015; Hou et al., 2017). These findings highlight the potential neurological mechanisms through which mindfulness and compassion practice might enhance AT.

Second, cross-sectional research suggests American adults with greater MM and LM are better at tolerating ambiguity and note moderately sized correlations (Ie et al., 2012; Robinson, 2019). Furthermore, Hitsuwari and Nomura (2021) examined correlations between MM facets and the dimensions of AT in Japanese adults. For the *affective* dimension, they found greater discomfort with ambiguity was negatively correlated with all MM facets except *observing* (in which they found a significant positive correlation). Moderate correlations were found with *nonjudging* and *acting with awareness*, small to moderate correlations were found with *describing* and *nonreactivity*, and the smallest correlation was with *observing*. For the *cognitive* dimension, moral absolutism and splitting correlated negatively only with *acting with awareness* and *nonjudging*, and these correlations were small. For the *epistemic* dimension, need for novelty and complexity was positively associated with *observing* (moderate), *describing* (small to moderate), and *nonreactivity* (small) facets. They further found a small but significant negative correlation with *nonjudging*. The differences in how MM relates to each dimension of AT suggest a greater influence in the *affective* as compared to the *cognitive* dimension. For self-compassion, a moderate to large correlation was found with AT in 55 CITs (Fulton, 2016).

Third, qualitative research about the way ambiguity is managed by different populations further highlights these relationships. Chesley and Wylson (2016) described how mindfulness may support business leaders in embracing ambiguity and being more effective when managing organizational changes. Participants noted mindful awareness and acceptance towards both

themselves and others as particularly helpful when managing ambiguity. Those with greater MM further described managing ambiguity using meditative practices and self-care, seeking external support from senior leaders, mentors, and other advisors, as well as trusting themselves and normalizing ambiguity. Furthermore, Knight et al. (2016) developed a model for how nurses in rural settings learn to master ambiguity. Two of the main components are mindful recognition and management of multiple perspectives and creativity; these are characteristic of LM. They also noted the need for metacognitive awareness (i.e., having awareness of one's mindset when negotiating and making decisions) which is an important mechanism in MM.

There is also preliminary evidence of the benefits incurred from mindfulness-based trainings. A quasi-experimental study examining the effects of an eight-week MM training based on MBSR with infertile women found significantly greater AT post-training compared to an inactive control (Hassannejad Emamchay & Zabihi, 2021). For CITs, Christopher and Maris (2010) summarized nine years of qualitative research on a fifteen-week (2.5 hours, twice per week) graduate course on MM for CITs. The course involved didactic, discursive, and practical components with students engaging in mindfulness practice both in and out of class. Participants reported being better able to tolerate ambiguity; particularly when managing the multiple co-occurring emotions and reactions that can arise towards other people and situations. They further described how they developed their ability to observe emotions and thoughts and create space between their internal state and habitual reactions. Being less reactive supported greater openness and flexibility, fostered self-compassion, and increased their skill in managing ambiguity. When examining the course's long-term influence, participants continued to highlight the impact on managing ambiguity; specifically, they noted greater tolerance, valuing ambiguity more, and viewing the process of tolerating ambiguity as healing (Christopher et al., 2011).

Additionally, Bohecker et al. (2016) examined the impact of an eight-week experiential group that was based on mindfulness and sought to help CITs with learning to navigate and manage ambiguity. They found that the training supported participants' development of self-reflecting skills, their ability to manage cognitive complexity and tolerate ambiguous and difficult emotions, as well as their knowledge of how to apply mindfulness in clinical practice. To navigate ambiguity and build greater tolerance, participants 1) felt *fear* about not knowing what would happen in the group process, 2) *learned* mindfulness skills that could help with managing emotional reactions, 3) *practiced* those skills, 4) *integrated* (with intention) mindfulness constructs into their personal cognitive structures which changed how they responded to difficult emotions (e.g., increasing awareness and observation, reducing reactivity), and 5) *translated* what they learned into other domains beyond the group (e.g., clinical work).

These studies generally point to a positive relationship between MM, LM, compassion, and AT. However, there are several caveats. First, Fulton (2016) did not find an association between MM and AT in CITs. It should be noted the sample size was small (i.e., 55 participants) when compared to Robinson (2019) and Hitsuwari and Nomura (2021) who found significant positive associations (i.e., 253 and 385 participants respectively). Second, Brendel et al. (2016) examined the impact of an eight-week MM training on business leader's AT compared to a control. They found benefit-consistent but insignificant change and suggested the training may have been too short for a significant change to emerge. Their training is less comprehensive (participants only meditated) and shorter (45 minutes per week) than the programs by Christopher et al. (2006) and Bohecker et al. (2016). Ultimately, these equivocal findings and the limited literature highlight the need for more comprehensive cross-sectional and experimental research to elucidate the potential impact of mindfulness and compassion on AT.

Limitations and Research Directions

There are several key limitations in the current literature. First, defining AT, mindfulness, and compassion is complicated due to variations in conceptualizations and different operationalizations. These issues impact the psychometric validity of measures, especially for AT. There is also no state measure of AT or LM. Second, integration of LM into a training program has not been done before nor have MM and LM been directly compared in a research study. There are also methodological concerns where researchers evaluating the effects of induction or training programs tend to not include a measure of mindfulness. This is a significant issue as it leaves uncertainty about whether the induction or training was successful due to the mindfulness practice or another variable. Third, although there is a substantial body of research on the effectiveness of mindfulness and compassion training, there needs to be an updated review of the literature specific to healthcare workers and trainees that rigorously examines randomized controlled trials and includes a wide range of outcomes (rather than only looking at specific distress outcomes like burnout or stress). There is also a need to contrast the effectiveness of different types of interventions on outcome (e.g., MBSR versus only meditation) to understand what would be most helpful when designing a program for CITs. Fourth, there is a dearth of empirical evidence regarding the relationship between AT, mindfulness, and compassion as well as their potential impacts on training. While there are qualitative studies that have examined the impact of mindfulness training on CITs, it has not been quantitatively examined. Importantly, the one quantitative study that did examine the effects of meditative practice found no significant change. It would also be interesting to examine the effect of induction (as compared to a full training program). One induction study found that intolerance towards ambiguity could be increased by evoking religious concepts (Sagioglou & Forstmann,

2013); however, induction strategies to increase AT have not been explored. The equivocal findings in both cross-sectional and experimental studies highlight a need for further research.

These limitations guide the research direction, specifically this dissertation seeks to:

1) Systematically review the literature on mindfulness training in healthcare professionals and trainees and conduct a meta-analysis of randomized controlled trials that looks at a large range of outcomes. Subgroup comparisons can elucidate the impact of intervention type, control type, target population (professionals versus trainees), and format of delivery on outcomes. The results from such a study could offer recommendations for designing a mindfulness training program that is tailored to the needs of CITs.
2) Examine the relationship between AT, MM, LM, and compassion cross-sectionally and elucidate the predictive power of mindfulness and compassion on AT. The results could offer recommendations for combining mindfulness and compassion when designing a training program that targets AT and elucidate the mechanisms through which mindfulness and compassion impact AT.
3) Contrast MM and LM inductions using a randomized controlled trial design and examine their effect on AT (measured using a self-report and behavioural measure). The results could offer recommendations on the extent of practice necessary to shift AT and how to accurately assess induction as well as elucidate differences between MM and LM.
4) Develop a comprehensive mindfulness and compassion-based training program that emphasizes AT and is specific for CITs and assess the acceptability and feasibility of this program using a series of quantitative measures and qualitative feedback. The results can offer preliminary support for the application of mindfulness and compassion training on AT with CITs as well as recommendations for enhancing self-care.

Chapter 2: Mindfulness Training for Healthcare Professionals and Trainees: A Meta-analysis of Randomized Controlled Trials

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Abstract

Objective: Healthcare professionals (HCPs) experience a wide range of physical and psychological symptoms that can affect quality of patient care. Previous meta-analyses exploring mindfulness-based interventions (MBIs) for HCPs have been limited by their narrow scope regarding intervention type, target population, and/or measures, and reliance on uncontrolled studies; therefore, a more comprehensive and methodologically rigorous examination is warranted. This study quantified the effectiveness of MBIs on distress, well-being, physical health, and performance in HCPs and HCPs-in-training.

Method: RCTs examining the effect of meditation and MBIs on HCPs and HCPs-in-training were identified and reviewed. Two independent reviewers extracted data and assessed risk of bias.

Results: Thirty-eight studies were included in the analyses (n = 2505; 75.88% female). Intervention had a significant moderate effect on anxiety (Hedge's $g = 0.47$), depression (Hedge's $g = 0.41$), psychological distress (Hedge's $g = 0.46$), and stress (Hedge's $g = 0.52$). Small to moderate effects were also found for burnout (Hedge's $g = 0.26$) and well-being at post-intervention (Hedge's $g = 0.32$). Effects were not significant for physical health and performance. Larger intervention effects on overall outcomes were found with HCPs (Hedge's $g = 0.52$), with Mindfulness-based Stress Reduction intervention (Hedge's $g = 0.47$), and inactive controls (Hedge's $g = 0.36$).

Conclusions: Results suggest mindfulness-based interventions are effective in reducing distress and improving well-being in HCPs and HCP-ITs. Subgroup analyses suggest the importance of exploring potential participants' needs prior to selecting the type of mindfulness intervention. Future studies should assess changes in mindfulness and include active controls.

Key words: healthcare professionals; healthcare trainees; meditation; mindfulness-based interventions; meta-analysis; randomized controlled trials

Introduction

Healthcare professionals (HCPs; e.g., physicians, nurses, psychotherapists) play an invaluable role in maintaining the physical and mental health of society. However, the stressful nature of their work may lead to greater susceptibility to stress, anxiety, depression, burnout, and suicide [1-6]. Not only does this have significant impact on the well-being of the HCPs but may also negatively impact patients and the health care system [7, 8]. For example, stress and burnout have been linked to increased medical errors, longer patient recovery times, and poorer patient care/satisfaction [7, 9, 10]. From an organizational perspective, diminished mental health is associated with reduced work satisfaction and productivity along with increased turnover intent [11, 12].

Attention has also been paid to HCPs-in training (HCPs-IT) as they face a similar susceptibility to the aforementioned concerns [13-15]. In fact, they may be especially vulnerable as they are still learning to apply their knowledge [6, 8, 13]. Their limited experience coupled with an evaluative component can add additional stressors. In turn, psychological distress can affect their clinical competency (e.g., higher error rates), professional qualities (e.g., lower empathy), and patient experience [13-18].

In response to the presented concerns, health and educational organizations have implemented stress management and well-being enhancement programs [6, 19]. One type is based on mindfulness and meditation, where participants learn to be purposefully alert and attentive to the present moment and to self-observe in an objective and detached manner [20]. Several studies have explored the impact of mindfulness training on increasing HCPs and HCPs-IT psychosocial well-being (e.g., managing stress, decreasing anxiety and depressive symptoms, reducing burnout, increasing self-compassion) as well as patient well-being (e.g., reducing

medical errors) [8, 21-26]. Whereas some interventions focus solely on meditation (e.g., guided breathing), others use mindfulness-based interventions (MBIs) that combine meditation, discussion, teaching, and homework (e.g., Mindfulness-based Stress Reduction, MBSR) [20].

Several systematic reviews and meta-analyses have been conducted on the effectiveness of meditation and MBIs for HCPs and HCP-Its [1, 6, 19, 22, 27-33]. An effect on stress reduction was generally reported, and some studies found increases in mindfulness, mood, resilience, self-compassion, self-efficacy, and empathy [1, 6, 19, 22, 27-33]. Interestingly, MBIs' effects on anxiety, depression, and burnout were equivocal; some studies reported benefits and others reported insignificant findings [6, 19, 27-29, 31, 32]. This inconsistency may be a result of previous reviews' narrow scope in terms of intervention type, target population, and/or measures [6]. For example, while one recent meta-analysis solely examined the effect of MBIs on stress and only included HCPs [1], another only examined MBSR [30], while others limited their selection to nurses only [29, 32].

Constraints on the selection criteria can reduce the number of included studies; potentially limiting the ability to explore moderating factors. Although it is assumed the teaching and practice of mindfulness is central to the intervention and thus, the effects on measured outcomes, other factors regarding the participants, the intervention, and study methodology could also impact findings. Therefore, it is common practice in meta-analytic research of mindfulness to explore the moderating effects of age, gender, intervention length, duration of homework, and study quality on effect sizes of the outcome measures [23, 34-36]. Generally, age has not been observed to show moderation effects; however, equivocal findings are noted for study quality, duration of treatment and home practice [23, 34-36]. A comparable meta-analysis examining a non-clinical, adult population did not find a moderation for study quality but found weak

moderations for duration [23]. Previous meta-analyses of HCPs and HCPs-IT have not explored these moderating factors, likely due to the limited number of included studies.

Furthermore, many of the reviews examined both controlled and uncontrolled studies. This is problematic as studies with uncontrolled designs may inflate treatment effects compared to randomized control trials (RCTs) [23, 29]. Key benefits of RCTs include greater methodological rigor, reduced bias and effect of nonspecific factors (e.g., time), and potential for evaluation using standardized criteria (e.g., Cochrane Risk of Bias Tool) [6, 37]. To more precisely explore the effects of MBIs, it is of interest to focus solely on RCTs.

Currently, the literature search for previously published reviews took place before January 2017 and the meta-analyses examined a relatively small sample of studies (ranging from 8 to 28) of which even fewer are RCTs (ranging from 2 to 16) [1, 19, 27, 29, 31].As mindfulness is a growing field of research, the large amount of newly published articles coupled with the aforementioned limitations strongly signal the need for an updated systematic analysis of the effects of meditation and MBIs on HCPs and HCPs-IT that 1) has wide inclusion criteria regarding population, intervention outcome, and intervention type, and 2) includes only RCTs.

Study Objectives

We conducted a comprehensive meta-analysis of any study utilizing a RCT design to compare a group of HCPs or HCPs-IT completing a meditation training or MBI with a control group on at least one quantitative outcome (including distress, well-being, physical health, performance, and mindfulness). The present analysis further seeks to 1) explore the impact of intervention type, control type, format of intervention delivery, and target population on outcomes, and 2) examine moderator variables (i.e., age, gender, length of intervention, duration of homework, and study quality).

Methods

This meta-analysis was completed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [38]. The PRISMA Checklist can be found in the online supplement.

Eligibility Criteria

Studies eligible for inclusion were peer-reviewed articles and dissertations adhering to the following PICOS criteria: 1)sample consisted solely of HCPs and/or HCPs-IT, 2) intervention was based primarily on meditation or mindfulness (e.g., MBSR, mindfulness-based cognitive therapy, Vipassana meditation, movement meditation) and could be conducted in person or online and in group or individual settings, 3) intervention must be compared to a control condition (both active and inactive controls are acceptable), 4) at least one quantitative measure (e.g., mindfulness, anxiety, well-being, clinical skills) taken at baseline and post-intervention must be reported, and 5) an RCT design must be used.

Studies were excluded if: 1) quantitative measures were not used to evaluate effects on HCPs or HCPs-IT (e.g., qualitative studies), 2) mindfulness or meditation was not the primary intervention (e.g., Dialectical Behavioral Therapy) [39], 3) data were insufficient to compute standardized mean effects, 4) data were already included in other articles, and 5) publication language was not in English or French.

Search Strategy and Data Sources

Four electronic databases (PsycINFO, PubMed, Medline, and Proquest Dissertation and Theses) were searched using the terms: *meditation or mindfulness* AND *health* professionals or psychologist or trainee or counsellor or nurse or doctor or therapist * or intern or psychiatrists or social worker or medical or student* AND *random**. The search was limited to abstract and

title for PubMed and Proquest Dissertation and Theses. PsycInfo and Medline searches were limited to title, abstract, and subject heading. An example of a full electronic search strategy can be found in the online supplement. Reference lists of retrieved articles and systematic reviews were manually reviewed. Our search was conducted from the first available date to August 26, 2018.

Study Selection

Duplicates were removed using Endnote X8.2 and exported to Rayyan, an online screening tool [40]. A non-blinded, standardized protocol was used to determine inclusion eligibility using the aforementioned criteria by the first (CS) and second (MW) authors. To ensure consistency in the selection process, CS and MW separately assessed the same 68 articles (10% of the articles following duplication removal) and compared reasons for inclusion or exclusion. As CS and MW agreed on all articles, they then each assessed half of the remaining articles using the same eligibility criteria. Following initial exclusion, CS and MW discussed the remaining 126 full-text articles to assess for inclusion. Any disagreements were resolved through consultation with the third author (BK). Authors of six eligible studies with missing data were contacted to request additional information. Two authors responded, and their studies were included. The selection process is outlined in Figure 1.

Data Items

We extracted the following information from each trial: 1) study characteristics (publication year, randomization procedure, research design, type of control and follow-up time), 2) participant characteristics (sample size for intervention and control groups, age, gender, type of HCP and attrition rate), and 3) intervention characteristics (e.g., type of intervention, length of intervention, length of homework, and instructor qualification).

Data pertaining to all available outcomes at all time points were included to reduce selection bias. We categorized our outcomes into: 1) distress outcomes (e.g., burnout), 2) well-being outcomes (e.g., self-compassion), 3) physical health outcomes (e.g., heart rate), and 4) performance outcomes (e.g., clinical skills). Mindfulness was examined separately as it is the main process component of the interventions.

Assessing Risk of Bias

We produced a fail-safe *N* and funnel plot to measure publication bias across studies [41]. Rules outlined in Chapter 8 of The Cochrane Handbook, Version 5.1.0 were used to examine risk of bias within studies [42]. CS and MW assessed each article independently and resolved any scoring differences through discussion. A quality score (high, low, or unclear) was assigned to seven different risk factors.

Analyses

The meta-analysis was conducted using Comprehensive Meta-Analysis, Version 3.070 [43]. Effect sizes were computed mostly using means and standard deviations. Some studies required the extraction of *F* and *p* statistics. If correlations between pre and post intervention measures were unavailable, a conservative estimate ($r = .7$) was used [23, 34, 36, 41]. Mean Hedge's *g*, 95% confidence interval (95% CI), and *p* values were computed for all studies. Calculation of mean effect size was conducted by pooling individual effect sizes for each outcome measure; utilizing a random effects model as it is more conservative and resilient to heterogeneity [23]. The I^2 statistic was used to examine heterogeneity (low at 25%, moderate at 50%, and high at 75%] [44].

In addition, we grouped and reported outcomes based on 1) target population (i.e., HCPs and HCPs-IT), 2) intervention type (e.g., MBSR, meditation protocol), 3) control type (i.e.,

active and inactive), and 4) facilitator type (e.g., electronic delivered, trained facilitator). Furthermore, we conducted meta-regression analyses to determine the effect of moderators on the pooled effect size. We examined only between-subject effects and explored five moderators: 1) mean age, 2) percentage of female participants, 3) intervention length, 4) duration of home practice (if indicated in the intervention protocol), and 5) study quality score.

Results

Study Characteristics

The data from 40 articles were included [21, 24-26, 45-80]. However, two pairs of papers used the same population and methodology [52, 53, 66, 67]. Therefore, they were combined in the analyses; leaving 38 included studies (see Table 1). Thirty studies (79%) were published as journal articles and 8 studies were doctoral dissertations. Twenty studies were conducted in North America, 8 in Asia, 3 in Australia and New Zealand, 6 in Europe, and 1 in South America. Sampling strategies included simple (n = 20), stratified (n = 10), block (n = 4), cluster (n = 3), and minimization (n =1).

Participant Characteristics

2505 participants were included (75.88% female). Most of the studies (n = 26; 68%) were conducted with HCPs-IT; specifically, 12 studies with medical students/residents, 7 with nursing, 4 with counsellors/psychologists, and 3 with mixed medical and other specialties. For HCP studies (n = 12), 6 were conducted with nurses, 4 with mixed HCPs, and 2 with physicians. Mean age ranged from 19.27 to 50.

Intervention Characteristics

Interventions consisted of MBSR (n = 6), modified MBSR (MBSR-M; n = 11), other MBIs (MBIs-O; n = 9), and meditation (n = 12). MBSR studies used the standard protocol,

whereas MBSR-M studies shortened the intervention length and/or made changes to suit a medical/hospital setting (e.g., using examples relevant to physicians). MBIs-O were any non-MBSR protocols that integrate teaching, mindfulness, and discussion (e.g., Eight-Point Program of Easwaran) [81]. Meditation interventions focused solely on teaching/practicing one meditation type (e.g., Vipassana). The duration of the interventions (intervention and homework) ranged from 2.5 to 70 hours. Intervention was most commonly delivered by trained professionals (n = 20; e.g., MBSR instructor), followed by students (n = 6; e.g., peer-led interventions), and by electronics (n = 5). Seven studies did not specify the training of the facilitator. Thirty-four studies (89%) had one control group while 4 studies had two different control groups. Twenty-one studies were compared to waitlist, 9 to no intervention, 9 to an active intervention (e.g. relaxation task, health education course), and 3 to class or care-as-usual. Twenty-three studies did not include a follow-up component. Follow-up times (n = 15) ranged from 4 to 80 weeks (*M* = 24.27).

Synthesis of Results

The following only reports between-group analyses as it is more conservative and generally less susceptible to bias [82]. Measures at post-intervention and follow-up were compared to baseline. Main analyses are presented in Table 2 (see the online Supplement for additional analyses).

Interventions had a small to moderate significant effect on overall outcome at post-intervention (Hedge's g = 0.35; 95% CI [0.27, 0.43]) and follow-up (Hedge's g = 0.31; 95% CI [0.16, 0.46]). Heterogeneity was low at both timepoints. For distress related outcomes, significant moderate effects on anxiety (Hedge's g = 0.47; 95% CI [0.27, 0.67]), depression (Hedge's g = 0.41; 95% CI [0.26, 0.57]), psychological distress (Hedge's g = 0.46; 95% CI [0.30,

0.62]), and stress (Hedge's g = 0.52; 95% CI [0.35, 0.69]) were found at post-intervention. A small significant effect was found on burnout (Hedge's g = 0.26; 95% CI [0.11, 0.42]). At follow-up, a significant small to moderate effect was found only for stress (Hedge's g = 0.34; 95% CI [0.11, 0.57]). Heterogeneity was moderate, except for depression and burnout (low). This indicates the need for some caution when interpreting results. For well-being related outcomes, interventions had significant small to moderate effect at post-intervention (Hedge's g = 0.32; 95% CI [0.23, 0.42]) and follow-up (Hedge's g = 0.33; 95% CI [0.17, 0.49]) with low heterogeneity at both timepoints. Self-compassion (a measure included in the well-being related outcomes) had a significant small to moderate effect at post-intervention (Hedge's g = 0.35; 95% CI [0.05, 0.65]) with low heterogeneity. No significant effects on physical health and performance outcomes at both timepoints were found. Finally, a small to moderate effect on mindfulness was observed at post-intervention (Hedge's g = 0.35; 95% CI [0.24, 0.45]) and follow-up (Hedge's g = 0.34; 95% CI [0.17, 0.52]) with low heterogeneity at both timepoints.

Synthesis of Grouped Analyses

Grouped analyses are summarized in the online supplement. At post-test, larger intervention effects on overall outcomes were found with HCPs (Hedge's g = 0.52; 95% CI [0.34, 0.70]), MBSR intervention (Hedge's g = 0.47; 95% CI [0.17, 0.76]), and inactive controls (Hedge's g = 0.36; 95% CI [0.28, 0.45]). Of the studies that specified the type of facilitator (e.g., electronic-delivery, trained instructor, student), electronic-delivery produced the largest effect on overall outcome (Hedge’s g = 0.39; 95% CI [0.17, 0.61]). Larger intervention effects on mindfulness were also found with HCPs (Hedge’s g = 0.48; 95% CI [0.25, 0.71]), MBSR intervention (Hedge's g = 0.45; 95% CI [0.22, 0.69]), and electronic-delivery (Hedge's g = 0.38; 95% CI [0.10, 0.65]).

In addition, MBSR had the largest effect on stress (Hedge's g = 0.77; 95% CI [0.02, 1.52]. MBIs-O had the largest effect on burnout (Hedge's g = 0.47; 95% CI [0.10, 0.85] and MBSR-M had largest effects on anxiety (Hedge's g = 0.70; 95% CI [0.30, 1.09]), depression (Hedge's g = 0.68; 95% CI [0.41, 0.94], and psychological distress (Hedge's g = 0.52; 95% CI [0.25, 0.80]. Well-being outcomes were most effected by meditation (Hedge's g = 0.44; 95% CI [0.14, 0.74]. Finally, the largest intervention effects for mindfulness were found with HCPs (Hedge's g = 0.48; 95% CI [0.25, 0.71) and through MBSR (Hedge's g = 0.45; 95% CI [0.22, 0.69]). Heterogeneity was moderate to high for the effect of MBSR on stress and for MBSR-M on anxiety and psychological distress (all other findings had low heterogeneity). Caution may be needed when interpreting these findings. Follow-up findings suggest MBSR-M had the largest effect on both overall outcomes (Hedge's g = 0.42; 95% CI [0.20, 0.64) and mindfulness (Hedge's g = 0.45; 95% CI [0.19, 0.71) with low heterogeneity.

Risk of Bias Within Studies

Results are displayed in Figure 2. Most studies were rated at low (63%) or unclear (34%) risk for random sequence generation. For allocation concealment, almost all studies (97%) had unclear risk, with the remaining 3% at high risk. All studies had high risk of performance bias, as it is not feasible to blind participants. Almost all studies (97%) had unclear risk for detection bias, with the remaining 3% identified as high risk. Attrition bias was generally low (42%) or unclear (26%) risk, although 32% were at high risk. For reporting bias, risk was either low (11%) or unclear (89%). In terms of other biases, most studies were identified as low (61%) or unclear (13%) risk, although 26% were deemed high risk. To assess the effect of study quality, values of 0 to high risk, 1 to unclear, and 2 to low risk were assigned and scores were added together for

each article. Out of a possible 14 points, quality scores ranged from 6 to 11 with an average of 8.10 (SD = 1.23).

Risk of Bias Across Studies

The effect size for all controlled analyses corresponded to a z-value of 8.82 ($p < .001$); signifying at least 732 studies with null effect would be needed to invalidate our findings. Using the Trim and Fill method, 9 studies would need to fall on the left of the mean effect size for a symmetrical funnel plot (Figure 3). The new imputed effect size was Hedge's g = 0.28 (95% CI [0.20, 0.35]). Although the imputed effect size is smaller than the original effect sizes, these analyses still suggest our effect sizes are valid and robust.

Additional Analyses

Following intervention, the effect size of overall outcomes was positively moderated by age (n = 31; β = 0.01, SE = 0.001, $p < 0.001$), percentage of female participants (n = 35; β = 0.004, SE = 0.001, $p < 0.001$), intervention length (n = 32; β = 0.02, SE = 0.003, $p < 0.001$), duration of home practice (n = 19; β = 0.01, SE = 0.003, $p < 0.001$), and study quality score (n = 38; β = 0.04, SE = 0.01, $p < 0.001$). Although these moderations were positive and significant, they were very weak in predicting changes in intervention effect sizes.

Discussion

Summary of Main Analyses

This meta-analysis examined 40 articles (38 studies) using a RCT design to explore the effects of meditation/mindfulness training on psychological, physical, and performance outcomes in HCPs and HCPs-ITs. Consistent with previous reviews, our results suggest these interventions have small to moderate effectiveness at post-intervention and follow-up, specifically for distress and well-being related outcomes. [1, 6, 23, 31].

HCPs and HCPs-IT may experience negative psychological outcomes due to the stressful nature of their work, and mindfulness-based interventions were generally found to reduce symptoms. Significant moderate effects on anxiety, depression, psychological distress, and stress were found, along with a small effect on burnout. Only stress showed a small to moderate effect at follow-up. Whereas moderate effects on stress have been generally consistent in other meta-analyses, other symptoms, such as depression and anxiety have been more equivocal; especially burnout [6, 29, 31]. One meta-analysis found no significant effects [19], two had too few studies to compute effects [1, 31], and one found small to moderate effects on emotional exhaustion and large effects on the personal accomplishment facets of burnout [27]. However, the meta-analyses with significant effects had more studies, suggesting more robust findings. Our findings were more conservative than previous meta-analyses, but we included more studies. These conservative findings are also reflective of the general physician burnout research [7].

Beyond distress, measures of well-being, physical health, and performance also contribute to overall health and can be protective factors [6]. Furthermore, changes in clinical skills will naturally affect patient outcome. A small to moderate significant effect was found on well-being, which is consistent with previous reviews and meta-analyses [23, 27, 31]. However, physical health, cognitive performance, and clinical skills were not significantly affected by mindfulness training. Other related meta-analyses have not quantified these effects, though qualitative analyses suggest potential benefits [27, 29]. The scope of our interpretation is reduced due to the limited number and high heterogeneity of studies including clinical skills outcomes. Furthermore, combining psychosocial with physical and cognitive measures may underestimate the observed effects.

Finally, when exploring the effects of MBIs, it is important to examine whether a change in mindfulness occurs, as the primary goal of MBIs is to increase mindfulness. However, less than half the studies (47%) included a validated measure. The results suggested a small to moderate increase in mindfulness that persisted to follow-up, which is aligned with previous reviews and meta-analyses [23, 31].

Summary of Grouped Analyses

When reporting differences between HCPs and HCPs-IT, we found larger effects of mindfulness training on overall outcomes (including mindfulness) at both timepoints for HCPs. A similar difference was found in a previous meta-analysis, where interventions targeting younger physicians had smaller benefits on burnout than those with more experience [7]. Although these findings do not discount the benefit of mindfulness with HCPs-IT, they reflect the potential for HCPs and HCPs-IT to require differing forms of support [7].

There were a wide range of included interventions, and all appeared to significantly affect overall outcomes. However, specific interventions appeared to affect individual outcomes differently. For example, MBSR had the largest reported effect on stress, but no significant effects on burnout or well-being. This finding may help clarify why previous meta-analyses have reported equivocal results; differing effects will likely be found depending on intervention type. In addition, previous research found MBSR had larger reported effects than meditation training alone; particularly for stress reduction [31]. While our results echo this finding on distress-related outcomes, meditation appeared to be most effective in increasing well-being. This highlights the possibility that the multi-faceted methods of MBIs are more important in reducing distress, but simpler methods of meditation practice are sufficient when focusing on well-being. Further research is needed to explore this potential difference.

It may be of value for future studies to continuing exploring other characteristics of HCPs and HCPs-IT to develop a more holistic and broad understanding of the impacts of mindfulness. Knowledge can be drawn from the included studies; while measures of anger, altruism, compassion to others, coping, empathy, life satisfaction, quality of life, self-efficacy, self-esteem, and spirituality were extracted, there were too few studies to warrant separate analysis. We may also recommend exploring measures related to qualities and skills often considered desirable in professionals (e.g., ambiguity tolerance, emotional intelligence, empathy, humility, leadership, resilience) [83-87] as well as utilizing behavioural measures to assess impact on important clinical skills (e.g., diagnostic accuracy). Furthermore, exploration of the interpersonal impacts of mindfulness training may be of value. A qualitative review of MBIs on nurses suggested improved communication with both patients and colleagues [29]. Considering HCPs and HCPs-IT work in a social field, it may be relevant to explore the impacts of mindfulness on work relationships (e.g., satisfaction) and perceived comfort with patients.

Modifying established interventions (like MBSR) to suit the needs of participants and setting may also be worthwhile as MBSR-M tended to have better individual outcome and long-term effects than traditional MBSR. Beyond adjusting duration of intervention, further integration of self-compassion may be important. Like mindfulness, self-compassion derives from Buddhism and is most simply described as compassion towards oneself; particularly in moments of failure or suffering [88]. Self-compassion has been suggested to have a complementary role to the effects of mindfulness on clinical outcomes (e.g., anxiety, burnout, depression, stress, quality of life) as well as a mediating effect on the relationship between mindfulness and well-being following a MBSR program [23, 34, 89]. Furthermore, self-compassion has been found to positively correlate with well-being and negatively correlate with

psychopathology (i.e., anxiety, depression, and stress) [90]. Similar benefits have also been suggested for HCPs, along with reported improvement HCP-patient relations [33]. In the present meta-analysis, self-compassion also showed a significant, but small to moderate, impact on overall outcome. Taken together, integrating self-compassion with mindfulness training may be a valuable avenue of research for HCPs and HCPs-IT. Future studies could 1) explore the effects of developed trainings like the Mindful Self-Compassion Program [91], 2) understand the impact of adding self-compassion by comparing a MBI with enhanced self-compassion focused discussion and practice to the standard protocol, and 3) compare self-compassion-based meditation (ex. Love and Kindness meditation) practice to other meditations.

Although intervention delivery differed between studies, significant effects were consistently found. It appears that whether the intervention is delivered electronically, by a student, or by a trained facilitator, there are significant increases in overall outcomes and mindfulness. Interestingly, electronic-delivery produced the highest effects. This finding suggests online mindfulness training may be an important avenue for HCPs and HCPs-IT. It has been noted that time constraints in the lives of HCPs and HCPs-IT likely contribute to the high attrition in mindfulness studies and the difficulty of integrating mindfulness into the workplace [1, 71, 76]. For example, there is a practical issue of finding a time in which a group of HCPs and HCPs-IT may be available to attend a person-led intervention. Furthermore, the costs of hiring trained facilitators with significant mindfulness experience may also be a barrier for implementation of trainings. Electronically delivered MBIs may be more economical and practical ways for HCPs and HCPs-IT to develop mindfulness skills and warrant further study.

Examining the type of control yielded a caveat to our presented results. There were far fewer active (24%; e.g., somatic relaxation) compared to inactive controls (e.g., waitlist), and

active control studies showed lower effects. Active controls have more stringent designs and are better able to account for the placebo effect. Furthermore, most interventions reviewed do not include mindfulness practice in isolation from other components. Therefore, it is possible the effects of intervention may be due to other factors (e.g., group discussion) [6].

Finally, all moderators showed significant but weak effects on outcome. These findings are similar to a previous meta-analysis examining healthy populations [23]; although the authors did not find a moderation effect of quality score and mean age. Interestingly, study quality score appears to positively moderate the efficacy of intervention such that higher quality studies suggest higher effect sizes. This contrasts a larger meta-analysis which found a significant weak, but negative moderation effects of study quality and age [34]. The reason for this discrepancy is unclear; however, we suspect there may have been an effect of study size, as studies of higher quality also had greater sample sizes. Measuring these effects was limited as some studies did not provide enough detail to extract accurate information on moderators. It is especially important authors report accurate information on intervention and home practice type and duration as the potential impact of these moderators can guide the development of future interventions and are also more equivocal in the field.

Limitations

This meta-analysis had moderate to high heterogeneity on some study outcomes; particularly when exploring the effects of MBSR and MBSR-M. This may be due to inconsistency in study measures and variations of intervention design. While this is consistent with previous analyses, caution is needed in result interpretation [23]. As previously noted, the included studies often do not measure mindfulness or use an active control. These are problematic practices as they invite potential bias and make findings harder to interpret [6, 23].

For example, it would be expected mindfulness would be significantly affected by meditation and MBIs and would also account for a significant portion of outcome changes. Without measuring mindfulness, it is difficult to interpret whether the intervention was successful in its intent or if other factors are driving the observed changes. In addition, it would be important for studies to quantify and qualify mindfulness practice [30]. MBIs generally include a substantial homework component, and higher intervention attendance and home practice has been associated with greater reduction of mental distress and anxiety [52, 75]. Studies reporting practice found participants generally did less than the prescribed amount and reduced practice over time [52, 54, 57, 79]. To accurately assess the effect of intervention, obtaining and reporting this information is essential. Finally, most studies did not include follow-ups, making it difficult to interpret the long-term effects of intervention.

Based on the aforementioned findings and limitations, we recommend future researchers to 1) explore other facets of health including physical and well-being (e.g., empathy, blood pressure), 2) utilize active controls, 3) include mindfulness measures and meditation logs that note duration, style, and quality of practice, 4) include measures of clinical performance and patient outcomes as mental distress profoundly affect patients, and 5) include long-term follow-ups (e.g., 0.5 to 1-year post-intervention). While both meditation and MBIs have been shown to be beneficial, studies comparing them may help elucidate their effects outcome. For employers and educators, we recommend exploring the needs of their employees/students before selecting an intervention. As previously noted, there is also potential to enhance participant experience by focusing on their common challenges and adapting interventions to meet specific needs.

Conclusion

Despite its limitations, this meta-analysis extends research on mindfulness and HCPs and HCPs-IT by using wide inclusion criteria regarding population and intervention outcomes. This reduced bias in our article selection increased the number of included studies and allowed us to conduct robust additional analyses to quantify nuances in our findings. Furthermore, we solely examined RCTs to increase the methodological rigor of included studies and reduce risk of bias.

Given the important and difficult nature of their work, HCPs and HCPs-IT are encouraged to seek such interventions to help maintain their psychological well-being. The type of intervention employers offer should be reflective of their employees' specific challenges and stage of career. Increased collaboration between providers, researchers, and organizations is also highly warranted to generate access to improved and targeted interventions.

Corrigendum

The authors regret that an error appears in Section 3.3 ‘Intervention Characteristics’.

In the original article the last sentence of this section reads as: “Follow-up times (n = 15) ranged from 4 to 80 weeks (M = 24.27).” However, it should have been written as follows: “Follow-up times (n = 15) ranged from 4 to 312 weeks (M = 43.20).”

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References

[1] Burton A, Burgess C, Dean S, Koutsopoulou GZ, Hugh-Jones S. How Effective are Mindfulness-Based Interventions for Reducing Stress Among Healthcare Professionals? A Systematic Review and Meta-Analysis. Stress health. 2017;33(1):3-13.

[2] Cheung T, Yip PS. Depression, anxiety and symptoms of stress among Hong Kong nurses: a cross-sectional study. Int. J. Environ. Res. 2015;12(9):11072-100.

[3] Davis M, Detre T, Ford DE, Hansbrough W, Hendin H, Laszlo J, et al. Confronting depression and suicide in physicians: a consensus statement. Jama. 2003;289(23):3161-6.

[4] Kumar S. Burnout and Doctors: Prevalence, Prevention and Intervention. Healthcare (Basel). 2016;4(3).

[5] Lim J, Bogossian F, Ahern K. Stress and coping in Australian nurses: a systematic review. Int Nurs Rev. 2010;57(1):22-31.

[6] Lomas T, Medina JC, Ivtzan I, Rupprecht S, Eiroa-Orosa FJ. A systematic review of the impact of mindfulness on the well-being of healthcare professionals. J Clin Psychol. 2018;74(3):319-55.

[7] Panagioti M, Panagopoulou E, Bower P, Lewith G, Kontopantelis E, Chew-Graham C, et al. Controlled Interventions to Reduce Burnout in Physicians: A Systematic Review and Meta-analysis. JAMA Intern Med. 2017;177(2):195-205.

[8] Shapiro SL, Brown KW, Biegel GM. Teaching self-care to caregivers: Effects of mindfulness-based stress reduction on the mental health of therapists in training. Train Educ Prof Psychol. 2007;1(2):105-15.

[9] Halbesleben JR, Rathert C. Linking physician burnout and patient outcomes: exploring the dyadic relationship between physicians and patients. Health Care Manage Rev. 2008;33(1):29-39.

[10] Shanafelt TD, Balch CM, Bechamps G, Russell T, Dyrbye L, Satele D, et al. Burnout and medical errors among American surgeons. Ann Surg. 2010;251(6):995-1000.

[11] Dewa CS, Loong D, Bonato S, Thanh NX, Jacobs P. How does burnout affect physician productivity? A systematic literature review. BMC Health Serv. Res. 2014;14(1):325.

[12] Lo WY, Chien LY, Hwang FM, Huang N, Chiou ST. From job stress to intention to leave among hospital nurses: A structural equation modelling approach. J Adv Nurs. 2018;74(3):677-88.

[13] Dyrbye LN, West CP, Satele D, Boone S, Tan L, Sloan J, et al. Burnout among US medical students, residents, and early career physicians relative to the general US population. Acad Med. 2014;89(3):443-51.

[14] Schwenk TL, Davis L, Wimsatt LA. Depression, stigma, and suicidal ideation in medical students. Jama. 2010;304(11):1181-90.

[15] Shanafelt TD, Bradley KA, Wipf JE, Back AL. Burnout and self-reported patient care in an internal medicine residency program. Ann Intern Med. 2002;136(5):358-67.

[16] Fahrenkopf AM, Sectish TC, Barger LK, Sharek PJ, Lewin D, Chiang VW, et al. Rates of medication errors among depressed and burnt out residents: prospective cohort study. Bmj. 2008;336(7642):488-91.

[17] Thomas MR, Dyrbye LN, Huntington JL, Lawson KL, Novotny PJ, Sloan JA, et al. How do distress and well-being relate to medical student empathy? A multicenter study. J Gen Intern Med. 2007;22(2):177-83.

[18] Tjia J, Givens JL, Shea JA. Factors associated with undertreatment of medical student depression. J Am Coll Health. 2005;53(5):219-24.

[19] Lo K, Waterland J, Todd P, Gupta T, Bearman M, Hassed C, et al. Group interventions to promote mental health in health professional education: a systematic review and meta-analysis of randomised controlled trials. Adv Health Sci Educ Theory Pract. 2018;23(2):413-47.

[20] Kabat-Zinn J, Hanh T. Full catastrophe living: Using the wisdom of your body and mind to face stress, pain, and illness. New York, N.Y.: Delta Trade Paperbacks; 1990.

[21] *Martin-Asuero A, Queralto JM, Pujol-Ribera E, Berenguera A, Rodriguez-Blanco T, Epstein RM. Effectiveness of a mindfulness education program in primary health care professionals: a pragmatic controlled trial. J Contin Educ Health Prof. 2014;34(1):4-12.

[22] Escuriex BF, Labbé EE. Health care providers' mindfulness and treatment outcomes: A critical review of the research literature. Mindfulness. 2011;2(4):242-53.

[23] Khoury B, Sharma M, Rush SE, Fournier C. Mindfulness-based stress reduction for healthy individuals: A meta-analysis. J Psychosom Res. 2015;78(6):519-28.

[24] *Song Y, Lindquist R. Effects of mindfulness-based stress reduction on depression, anxiety, stress and mindfulness in Korean nursing students. Nurse Educ Today. 2015;35(1):86-90.

[25] *Warnecke E, Quinn S, Ogden K, Towle N, Nelson MR. A randomised controlled trial of the effects of mindfulness practice on medical student stress levels. Med Educ. 2011;45(4):381-8.

[26] *Yang E, Schamber E, Meyer RML, Gold JI. Happier Healers: Randomized Controlled Trial of Mobile Mindfulness for Stress Management. J Altern Complement Med. 2018;24(5):505-13.

[27] Dharmawardene M, Givens J, Wachholtz A, Makowski S, Tjia J. A systematic review and meta-analysis of meditative interventions for informal caregivers and health professionals. BMJ support. 2016;6(2):160-9.

[28] Gilmartin H, Goyal A, Hamati MC, Mann J, Saint S, Chopra V. Brief Mindfulness Practices for Healthcare Providers - A Systematic Literature Review. Am J Med. 2017;130(10):1219 e1- e17.

[29] Guillaumie L, Boiral O, Champagne J. A mixed-methods systematic review of the effects of mindfulness on nurses. J Adv Nurs. 2017;73(5):1017-34.

[30] Irving JA, Dobkin PL, Park J. Cultivating mindfulness in health care professionals: a review of empirical studies of mindfulness-based stress reduction (MBSR). Complement Ther Clin Pract. 2009;15(2):61-6.

[31] McConville J, McAleer R, Hahne A. Mindfulness Training for Health Profession Students-The Effect of Mindfulness Training on Psychological Well-Being, Learning and Clinical Performance of Health Professional Students: A Systematic Review of Randomized and Non-randomized Controlled Trials. Explore (NY). 2017;13(1):26-45.

[32] Smith SA. Mindfulness-Based Stress Reduction: An Intervention to Enhance the Effectiveness of Nurses' Coping With Work-Related Stress. Int J Nurs Knowl 2014;25(2):119-30.

[33] Boellinghaus I, Jones FW, Hutton J. The Role of Mindfulness and Loving-Kindness Meditation in Cultivating Self-Compassion and Other-Focused Concern in Health Care Professionals. Mindfulness. 2012;5(2):129-38.

[34] Khoury B, Lecomte T, Fortin G, Masse M, Therien P, Bouchard V, et al. Mindfulness-based therapy: a comprehensive meta-analysis. Clin Psychol Rev. 2013;33(6):763-71.

[35] Eberth J, Sedlmeier P. The effects of mindfulness meditation: a meta-analysis. Mindfulness. 2012;3(3):174-89.

[36] Hofmann SG, Sawyer AT, Witt AA, Oh D. The effect of mindfulness-based therapy on anxiety and depression: A meta-analytic review. J Consult Clin Psychol. 2010;78(2):169.

[37] Higgins JP, Altman DG, Gøtzsche PC, Jüni P, Moher D, Oxman AD, et al. The Cochrane Collaboration's tool for assessing risk of bias in randomised trials. Bmj. 2011;343:d5928.

[38] Moher D, Liberati A, Tetzlaff J, Altman DG, Group P. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS medicine. 2009;6(7):e1000097.

[39] Linehan MM. Cognitive-Behavioral Treatment of Borderline Personality Disorder. New York, NY Guilford Press; 1993.

[40] Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan—a web and mobile app for systematic reviews. Syst. 2016;5(1):210.

[41] Rosenthal R. Meta-analytic procedures for social research: Sage; 1991.

[42] Higgins JPT, Green S (editors). Cochrane Handbook for Systematic Reviews of Interventions. Version 5.1.0 [updated March 2011]. The Cochrane Collaboration. 2011. Available from: www.handbook.cochrane.org.

[43] Borenstein M HL, Higgins J, Rothstein H. ComprehensiveMeta-Analysis. 3.070 ed. Engelwood, NJ: Biostat; 2005.

[44] Higgins JP, Thompson SG, Deeks JJ, Altman DG. Measuring inconsistency in meta-analyses. BMJ. 2003;327(7414):557.

[45] *Alexander GK, Rollins K, Walker D, Wong L, Pennings J. Yoga for Self-Care and Burnout Prevention Among Nurses. Workplace Health Saf. 2015;63(10):462-70; quiz 71.

[46] *Amutio A, Martinez-Taboada C, Delgado LC, Hermosilla D, Mozaz MJ. Acceptability and Effectiveness of a Long-Term Educational Intervention to Reduce Physicians' Stress-Related Conditions. J Contin Educ Health Prof. 2015;35(4):255-60.

[47] *Burger KG. Examining the use of mindfulness meditation to enhance attention regulation efficiency in nursing students [Ph.D.]. Ann Arbor: Duquesne University; 2015.

[48] *Burrows CH. The Effects of Meditation on Counselor Candidates' Self-Actualization [Educat.D.]. Ann Arbor: Western Michigan University; 1984.

[49] *Chang SJ, Kwak EY, Hahm B-J, Seo SH, Lee DW, Jang SJ. Effects of a meditation program on nurses' power and quality of life. Nurs. Sci. Q. 2016;29(3):227-34.

[50] *Chen Y, Yang X, Wang L, Zhang X. A randomized controlled trial of the effects of brief mindfulness meditation on anxiety symptoms and systolic blood pressure in Chinese nursing students. Nurse Educ Today. 2013;33(10):1166-72.

[51] *Danilewitz M, Bradwejn J, Koszycki D. A pilot feasibility study of a peer-led mindfulness program for medical students. Can Med Educ J. 2016;7(1):e31-7.

[52] *de Vibe M, Solhaug I, Tyssen R, Friborg O, Rosenvinge JH, Sorlie T, et al. Mindfulness training for stress management: a randomised controlled study of medical and psychology students. BMC Med Educ. 2013;13:107.

[53] *de Vibe M, Solhaug I, Rosenvinge JH, Tyssen R, Hanley A, Garland E. Six-year positive effects of a mindfulness-based intervention on mindfulness, coping and well-being in medical and psychology students; Results from a randomized controlled trial. PLoS ONE. 2018;13(4):e0196053.

[54] *Erogul M, Singer G, McIntyre T, Stefanov DG. Abridged mindfulness intervention to support wellness in first-year medical students. Teach Learn Med. 2014;26(4):350-6.

[55] *Frisvold MH. The “midlife study”: Mindfulness as an intervention to change health behaviors in midlife women [Ph.D.]. Ann Arbor: University of Minnesota; 2009.

[56] *Greene Y, Hiebert B. A comparison of mindfulness meditation and cognitive self-observation. CJCP. 1988;22(1).

[57] *Ireland MJ, Clough B, Gill K, Langan F, O'Connor A, Spencer L. A randomized controlled trial of mindfulness to reduce stress and burnout among intern medical practitioners. Med Teach. 2017;39(4):409-14.

[58] *Jain S, Shapiro SL, Swanick S, Roesch SC, Mills PJ, Bell I, et al. A randomized controlled trial of mindfulness meditation versus relaxation training: effects on distress, positive states of mind, rumination, and distraction. Ann Behav Med. 2007;33(1):11-21.

[59] *Kang YS, Choi SY, Ryu E. The effectiveness of a stress coping program based on mindfulness meditation on the stress, anxiety, and depression experienced by nursing students in Korea. Nurse Educ Today. 2009;29(5):538-43.

[60] *Kim SH, Schneider SM, Bevans M, Kravitz L, Mermier C, Qualls C, et al. PTSD symptom reduction with mindfulness-based stretching and deep breathing exercise: randomized controlled clinical trial of efficacy. J Clin Endocrinol Metab. 2013;98(7):2984-92.

[61] *Kuhlmann SM, Huss M, Burger A, Hammerle F. Coping with stress in medical students: results of a randomized controlled trial using a mindfulness-based stress prevention training (MediMind) in Germany. BMC Med Educ. 2016;16(1):316.

[62] *Leggett DK. Effectiveness of a brief stress reduction intervention for nursing students in reducing physiological stress indicators and improving well-being and mental health [Ph.D.]. Ann Arbor: The University of Utah; 2010.

[63] *Mackenzie CS, Poulin PA, Seidman-Carlson R. A brief mindfulness-based stress reduction intervention for nurses and nurse aides. Appl Nurs Res. 2006;19(2):105-9.

[64] *Manotas MA. Brief mindfulness training to improve mental health with Colombian healthcare professionals [Psy.D.]. Ann Arbor: California Institute of Integral Studies; 2012.

[65] *Moir F, Henning M, Hassed C, Moyes SA, Elley C. A peer-support and mindfulness program to improve the mental health of medical students. Teach Learn Med. 2016;28(3):293-302.

[66] *Oman D, Richards TA, Hedberg J, Thoresen CE. Passage meditation improves caregiving self-efficacy among health professionals: a randomized trial and qualitative assessment. J Health Psychol. 2008;13(8):1119-35.

[67] *Oman D, Thoresen CE, Hedberg J. Does passage meditation foster compassionate love among health professionals?: A randomised trial. Ment Health Relig Cult. 2010;13(2):129-54.

[68] *Paholpak S, Piyavhatkul N, Rangseekajee P, Krisanaprakornkit T, Arunpongpaisal S, Pajanasoontorn N, et al. Breathing meditation by medical students at Khon Kaen University: effect on psychiatric symptoms, memory, intelligence and academic achievement. J Med Assoc Thai. 2012;95(3):461-9.

[69] *Park J. Randomized controlled trial for stress and anxiety management: biofeedback and mindfulness meditation [M.S.]. Ann Arbor: California State University, Long Beach; 2014.

[70] *Phang CK, Mukhtar F, Ibrahim N, Keng S-L, Mohd. Effects of a brief mindfulness-based intervention program for stress management among medical students: The Mindful-Gym randomized controlled study. Adv Health Sci Educ Theory Pract. 2015;20(5):1115-34.

[71] *Phang KC, Firdaus M, Normala I, Keng LS, Sherina MS. Effects of a DVD-delivered mindfulness-based intervention for stress reduction in medical students: a randomized controlled study. EIMJ. 2015;7(3).

[72] *Pipe TB, Bortz JJ, Dueck A, Pendergast D, Buchda V, Summers J. Nurse leader mindfulness meditation program for stress management: a randomized controlled trial. J Nurs Adm. 2009;39(3):130-7.

[73] *Reiman JW. The Impact of Meditative Attentional Training on Measures of Select Attentional Parameters and on Measures of Client Perceived Counselor Empathy [Ph.D.]. Ann Arbor: Oregon State University; 1984.

[74] *Schroeder DA, Stephens E, Colgan D, Hunsinger M, Rubin D, Christopher MS. A brief mindfulness-based intervention for primary care physicians: a pilot randomized controlled trial. Am J Lifestyle Med. 2018;12(1):83-91.

[75] *Shapiro SL, Schwartz GE, Bonner G. Effects of mindfulness-based stress reduction on medical and premedical students. J Behav Med. 1998;21(6):581-99.

[76] *Shapiro SL, Astin JA, Bishop SR, Cordova M. Mindfulness-Based Stress Reduction for Health Care Professionals: Results From a Randomized Trial. Int J Stress Manag. 2005;12(2):164-76.

[77] *Spragg C. The impact of mindfulness practice on mental health service providers-in-training: An examination of mindfulness, self-awareness, empathy, and burnout 2011.

[78] *Swift JK, Callahan JL, Dunn R, Brecht K, Ivanovic M. A randomized-controlled crossover trial of mindfulness for student psychotherapists. Train Educ Prof Psychol. 2017;11(4):235-42.

[79] *van Dijk I, Lucassen P, Akkermans RP, van Engelen BGM, van Weel C, Speckens AEM. Effects of Mindfulness-Based Stress Reduction on the Mental Health of Clinical Clerkship Students: A Cluster-Randomized Controlled Trial. Acad Med. 2017;92(7):1012-21.

[80] *Verweij H, van Ravesteijn H, van Hooff MLM, Lagro-Janssen ALM, Speckens AEM. Mindfulness-Based Stress Reduction for Residents: A Randomized Controlled Trial. J Gen Intern Med. 2018;33(4):429-36.

[81] Oman D, Hedberg J, Downs D, Parsons D. A transcultural spiritually based program to enhance caregiving self-efficacy: A pilot study. Complement Health Pract Rev. 2003;8(3):201-24.

[82] Cuijpers P, Weitz E, Cristea I, Twisk J. Pre-post effect sizes should be avoided in meta-analyses. Epidemiol Psychiatr Sci. 2017;26(4):364-8.

[83] Geller G. Tolerance for ambiguity: an ethics-based criterion for medical student selection. Acad Med. 2013;88(5):581-4.

[84] Gordon EC. Intellectual Humility, Spirituality, and Counselling. J Psychol Theol. 2018;46(4):279-91.

[85] Hadley L, Black D, Welch J, Reynolds P, Penlington C. Encouraging formative assessments of leadership for foundation doctors. Clin Teach. 2015;12(4):231-5.

[86] Matos PS, Neushotz LA, Griffin MTQ, Fitzpatrick J. An exploratory study of resilience and job satisfaction among psychiatric nurses working in inpatient units. Int J Ment Health Nurs. 2010;19(5):307-12.

[87] Nightingale S, Spiby H, Sheen K, Slade P. The impact of emotional intelligence in health care professionals on caring behaviour towards patients in clinical and long-term care settings: Findings from an integrative review. Int J Nurs Stud. 2018;80:106-17.

[88] Neff K. The self-compassion scale is a valid and theoretically coherent measure of self-compassion. Mindfulness. 2016;7(1):264-74.

[89] Evans S, Wyka K, Blaha KT, Allen ES. Self-compassion mediates improvement in well-being in a mindfulness-based stress reduction program in a community-based sample. Mindfulness. 2018;9(4):1280-7.

[90] MacBeth A, Gumley A. Exploring compassion: A meta-analysis of the association between self-compassion and psychopathology. Clin Psychol Rev. 2012;32(6):545-52.

[91] Neff KD, Germer CK. A pilot study and randomized controlled trial of the mindful self-compassion program. J Clin Psychol. 2013;69(1):28-44.

Figure 1

PRISMA Flow Diagram of the Study Selection Process

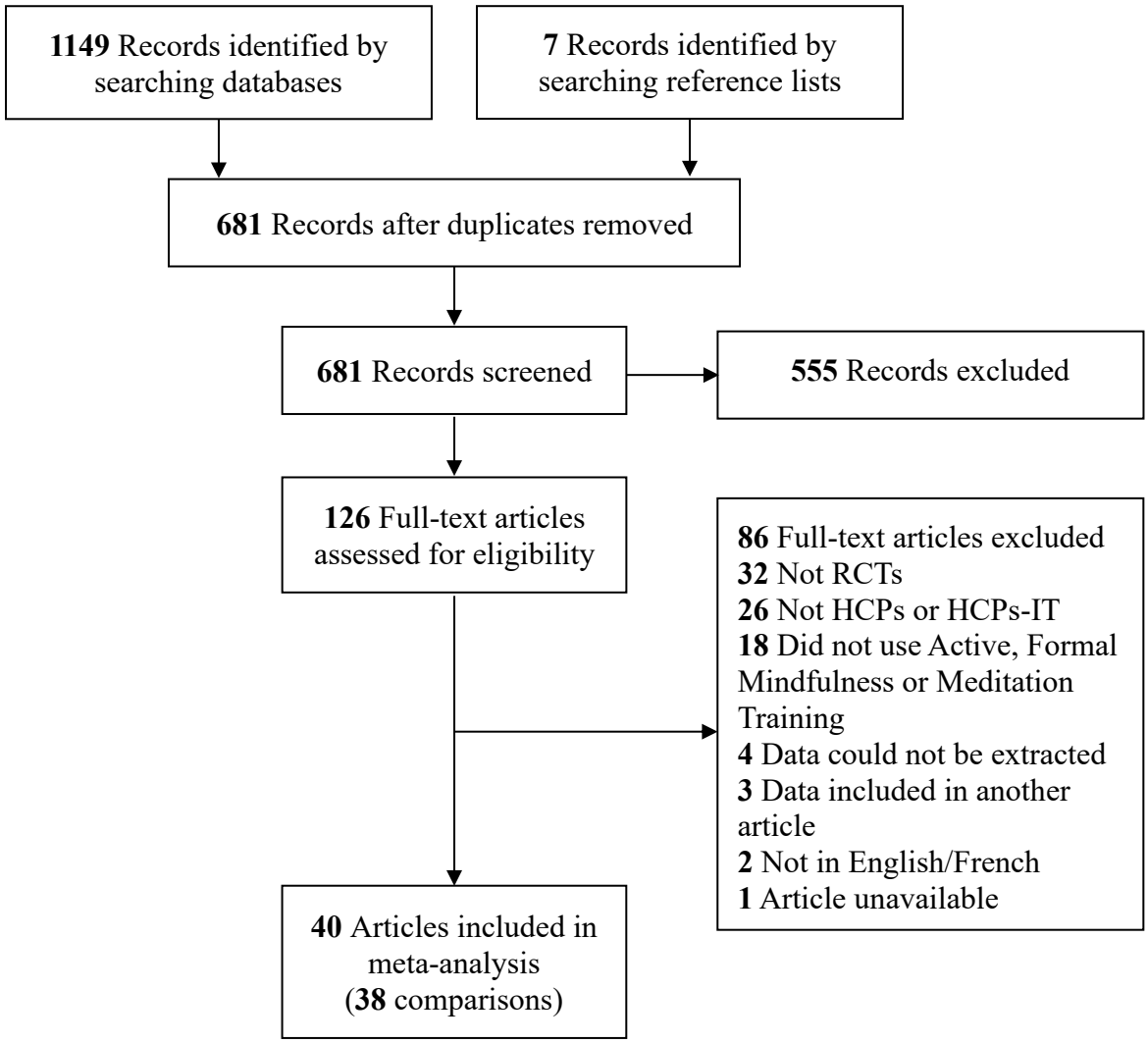


Table 1

Description and effect size analyses of overall outcome and mindfulness for the selected studies

Study Name	Participants (N)	Mean Age	% Female	Int Type (n)	Cx Type (n)	Int Length (Hr)	Attrn Rate (%)	Extracted Measures
Alexander et al., 2015[45]	Nurses (40)	46.38	97.5	MoM (20)	CAU (20)	8 weeks	0	FMI; HPLP-II; MBI
Amutio et al., 2015[46]	Physicians (42)	47.31	57.1	MBSR (21)	Waitlist (21)	70	0	FFMQ; Heart Rate; SRSI
Burger, 2015[47]	Students (Nur; 60)	19.5 to 52	82.7	MM (32)	Waitlist (28)	4.67	13.33	ANT; FFMQ; MAT; PSS-10;
Burrows, 1984[48]	Students (MH; 39)	29.82	56.41	CM (12)	Relaxation (13) No Int (14)	5.67	17.02	POI
Chang et al., 2016[49]	Nurses (50)	31.5	-	MoM (25)	No Int (25)	8.7 + HW	20	PKPCT V II; WHOQol-BREF;
Chen Yu et al., 2013[50]	Students (Nur; 60)	19.5	86.7	MM (30)	No Int (30)	3.5	0	SAS; SDS
Danilewitz et al., 2016[51]	Students (Med; 30)	-	73	MBSR-M (15)	Waitlist (15)	10 + HW	26.67	AAS; DASS; FFMQ; JSPE; SCS
de Vibe et al., 2013; 2018[52,53]	Students (Med&MH; 288)	23.8	76	MBSR-M (144)	No Int (144)	39.5	63.19	FFMQ; GHQ12; MBI; PMSS; SWB; WCC
Erogul et al., 2014[54]	Students (Med; 58)	23.5	45.6	MBSR-M (28)	No Int (30)	33.67	1.69	PSS; RS; SCS

Study Name	Participants (N)	Mean Age	% Female	Int Type (n)	Cx Type (n)	Int Length (Hr)	Attrn Rate (%)	Extracted Measures
Frisvold, 2019[55]	Nurses (40)	48.35	100	MBSR (20)	Health Education (20)	69	5	BMI; CAM-SR; CES-D; DASS-21; PSQI; PSS; Weight
Greene & Hiebert, 1988[56]	Students (Nur; 24)	-	75	MM (12)	CSO (12)	13.5	0	POI; SOSI
Ireland et al., 2017[57]	Students (Med; 44)	26.88	64	MBIs-O (23)	Active Break (21)	10 + HW	0	CBI; PSS-10
Jain et al., 2007[58]	Students (Med&Nur; 104)	25	81.48	MBSR-M (33)	Relaxation (35) Waitlist (36)	12 + HW	22.12	BSI; DER; INSPIRIT-R; PSOM
Kang et al., 2009[59]	Students (Nur; 41)	22.47	100	MBSR-M (21)	No Int (20)	14 + HW	21.95	BDI; PWISF; STAI
Kim et al., 2013[60]	Nurses (22)	46.3	95.45	MoM (11)	No Int (11)	16	4.55	ACTH; Cortisol; DHEAS; PCL-C
Kuhlmann et al., 2016[61]	Students (Med&Dent; 80)	23.39	84	MBIs-O (31)	Relaxation (32) Waitlist (17)	7.5 + HW	56.28	GSI; SSCS
Leggett, 2010[62]	Students (Nur; 85)	-	87.1	MBIs-O (42)	CAU (43)	16.17	5.56	CES-D; CSE; Diastolic; Heart Rate; MAAS; SCCA; Systolic
Mackenzie et al., 2006[63]	Nurses & Nurse aides (30)	46.83	96.67	MBSR-M (16)	Waitlist (14)	5.33	0	JSS; MBI; OLQ; SRDI; SWLS
Manotas, 2012[64]	HCP (131)	39.07	90.24	MBSR-M (66)	Waitlist (65)	17.33	34.35	AAQ-II; BSI; ESQ; FFMQ; PSS; TMS

Study Name	Participants (N)	Mean Age	% Female	Int Type (n)	Cx Type (n)	Int Length (Hr)	Attrn Rate (%)	Extracted Measures
Martin-Asuero et al., 2014[21]	HCP (68)	47	92	MBIs-O (43)	Waitlist (25)	28 + HW	0	FFMQ; JSPE; MBI; PMS
Moir et al., 2016[65]	Students (Med; 275)	20.9	53	MBIs-O (133)	No Int (142)	25 weeks	15.64	GAD; LASA; MSLQ; PCL; PHQ-9; RS
Oman et al., 2008; 2010[66,67]	HCP (61)	22.3	86.21	MBIs-O (30)	Waitlist (31)	16 + HW	4.92	IRI; JS; MMRS; RCSE
Paholpak et al., 2012[68]	Students (Med; 58)	23.29	50	MM (30)	Non-meditative Activity (28)	9.33	0	APM; SCL-90; WMS-I
Park, 2014[69]	Students (Nur; 89)	19.27	100	VM (29)	Biofeedback (29) No Int (31)	4 weeks	0	PSS; STAI
Phang et al., 2015[70]	Students (Med; 73)	21.04	76	MBIs-O (37)	Waitlist (36)	12.33	6.67	GHQ; GSE; MASS; PSS
Phang et al., 2015[71]	Students (Med; 76)	20.93	78.95	MBIs-O (38)	Waitlist (38)	5 weeks	1.32	DASS; GSE; MAAS; PSS
Pipe et al., 2009[72]	Nurses (34)	49.78	96.88	MBSR-M (17)	Leadership Course (17)	22	2.94	CES; SCL-90
Reiman, 1984[73]	Students (MH; 37)	-	-	VM (22)	No Int (15)	23.33	0	TAIS
Schroeder et al., 2018[74]	Physicians (33)	42.76	73	MBSR-M (16)	Waitlist (17)	13	21.21	BRS; MAAS; MBI; PSS; SCBS
Shapiro et al., 1998[75]	Students (Med; 78)	-	56.16	MBSR-M (37)	Waitlist (41)	17.5 + HW	6.41	ECRS; INSPIRIT; SCL-90; STAI

Study Name	Participants (N)	Mean Age	% Female	Int Type (n)	Cx Type (n)	Int Length (Hr)	Attrn Rate (%)	Extracted Measures
Shapiro et al., 2005[76]	HCP (Mix; 38)	-	-	MBSR (18)	Waitlist (20)	16 + HW	26.32	BSI; MBI; PSS; SCS; SWLS;
Song & Lindquist, 2014[24]	Students (Nur; 50)	19.55	81.82	MBSR (25)	Waitlist (25)	16 + HW	12	DASS; MAAS
Spragg, 2011[77]	Students (MH; 30)	25.5	93.75	MBSR (15)	Waitlist (15)	69.5	53.33	IRI; KIMS; MBI; SCS
Swift et al., 2017[78]	Students (MH; 40)	27.5	70	MBIs-O (20)	Waitlist (20)	2.5 + HW	0	FFMQ; TPI-T
van Dijk et al., 2017[79]	Students (Med; 167)	23.5	78.44	MBSR-M (83)	CAU (84)	23.47	25.15	BSI; IBI; FFMQ; JSPE; LiSat-9; MHC-SF

Abbreviations. AAQ-II, Acceptance and Action Questionnaire; AAS, Adapted Altruism Scale; ACTH, adrenocorticotropic hormone; ANT, Attention Network Test; Attrn, Attrition; BDI, Beck Depression Inventory; BMI, Body Mass Index; BRS, Brief Resilience Scale; BSI, Brief Symptom Inventory; CAM-SR, Cognitive and Affective Mindfulness-Self-Report; CBI, Copenhagen Burnout Inventory; CES-D, Centre for Epidemiologic Depression Scale; CSE, Clinical Skills Evaluation; CoM, Concentrative Meditation; Cx, Control; CSO, Cognitive Self-Observation; DASS-21, Depression, Anxiety Stress Scales-21; DASS, Depression, Anxiety, Stress Scales; Dent, Dental; DER, Daily Emotion Report; DHEAS, dehydroepiandrosterone sulfate; ECRS, Empathy Construct Rating Scale; ESQ, Emotional Style Questionnaire; FFMQ, Five Facet Mindfulness Questionnaire; FMI, Freiburg Mindfulness Inventory; GAD-7, Generalized Anxiety Disorder; GHQ, General Health Questionnaire; GHQ12, 12-item General Health Questionnaire; GSE, General Self-Efficacy; GSI, Global Severity Index; GWBS, General Well-Being Scale; HPLP-ll, HCP, Healthcare Practitioner; Health-Promoting Lifestyle Profile; HW, Homework; INSPIRIT-R, Index of Core Spiritual Experiences; Int; Intervention; IRI, Interpersonal Reactivity Index; JS, Johnson Scale; JSPE, Jefferson Scale of Physician Empathy; JSS, Job Satisfaction Survey; KIMS, Kentucky Inventory Mindfulness Skills; LASA, Linear Analog Scale Assessment; LiSat-9, Life Satisfaction Questionnaire; MAAS, Mindful Attention Awareness Scale; MAT, Medication Administration Task; MBI, Maslach Burnout Inventory; Med, Medical; MH, Mental Health; MHC-SF, Mental Health Continuum-Short Form; MHC-SF, Mental Health Continuum-Short Form; MBIs-O, Mindfulness Based Intervention Other; MBSR, Mindfulness Based Stress Reduction; MBSR-M, Mindfulness Based Stress Reduction Modified; MM, Mindfulness Meditation; MoM, Movement Meditation; MMRS, Multidimensional Measure of Religiousness/Spirituality;

MSLQ, Motivated Strategies for Learning; Nur, Nursing; OLQ, Orientation to Life Questionnaire; PCL-C, Post-Traumatic Stress Disorder Checklist–Civilian Version; PCL, Perceived Competence for Learning; PHQ-9, Patient-Health Questionnaire-9; PKPCT V ll, Power as Knowing Participation in Change Test V ll; PMS, Profile of Mood States; PMSS, Perceived Medical School Stress Instrument; POI, Personal Orientation Inventory; PSOM, Positive States of Mind; PSQI, Pittsburgh Sleep Quality Index; PSS-10, Perceived Stress Scale-10; PSS, Perceived Stress Scale; PSW, Penn State Worry; PWI-SF, Psychosocial Well-Being Index Short Form; RCSE, Relationship-Contingent Self-Esteem; RS, Resilience Scale; SAS, Self-Rating Anxiety Scale; SCBS, Santa Clara Brief Compassion Scale; SCCA, Student Clinical Completion Appraisal; SCL90, Symptom Checklist-90; SCS-SF, Self-Compassion Scale-Short Form; SCS, Self-Compassion Scale; SDS, Self-Rating Depression Scale; SOSI, Symptoms of Stress Inventory; SRDI, Smith Relaxation Dispositions Inventory; SRSI, Smith Relaxation States Inventory; SSCS, Chronic Stress Screening Scale; STAI, State-Trait Anxiety Inventory; SWB, Subjective Well-being; SWHI, Survey Work–Home Inter-action; SWLS, Satisfaction With Life Scale; TAIS, Attentional and Interpersonal Style; TMS, Toronto Mindfulness Scale; TPI-T, Therapeutic Presence Inventory-Therapist; UBOS-C, Utrechtse Burnout Schaal (Dutch version of MBI); VM, Vipassana Meditation; WCC, Ways of Coping Checklist; WHOQol-BREF, World Health Organization Quality of Life- BREF

Table 2

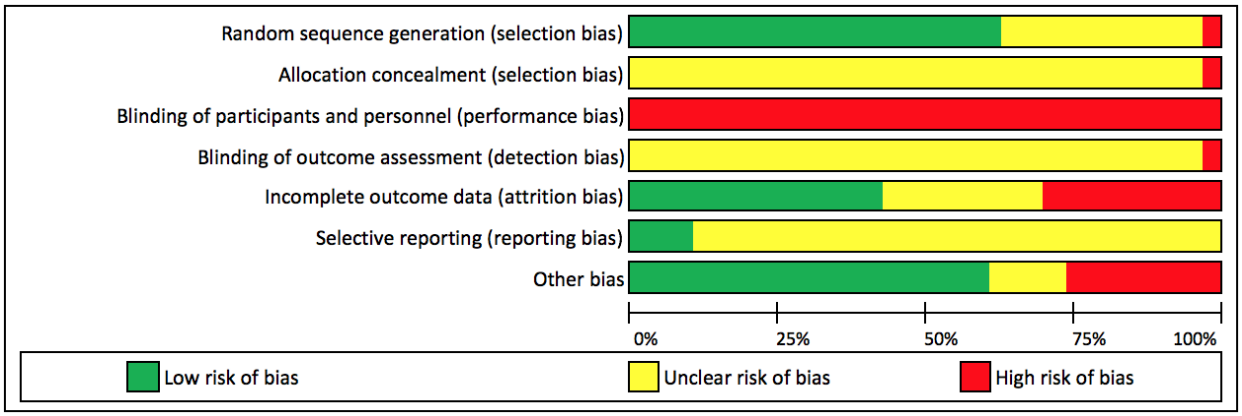
Effect sizes and other between-group statistics for controlled studies at post-intervention and follow-up

Time Point	Outcomes	Ns	Hedge's g	95% CI	*p*	I^2 (%)	Q
Post Intervention	Overall Outcome	38	0.35	0.27, 0.43	$p < 00.001$	0.00	32.72
	Anxiety	14	0.47	0.27, 0.67	$p < 0.001$	53.93	28.22
	Burnout	9	0.26	0.11, 0.42	0.001	0.00	3.71
	Depression	14	0.41	0.26, 0.57	$p < 0.001$	21.46	16.55
	Psychological Distress	14	0.46	0.30, 0.62	$p < 0.001$	40.51	21.85
	Stress	18	0.52	0.35, 0.69	$p < 0.001$	43.40	30.04
	Well-being Outcomes	24	0.32	0.23, 0.42	$p < 0.001$	0.00	15.68
	Physical Health Outcomes	3	-0.13	-0.46, 0.19	0.41	0.00	1.79
	Performance Outcomes	8	0.21	-0.01, 0.43	0.06	37.86	11.26
	Cognitive Performance	5	0.11	-0.11, 0.33	0.34	0.00	1.81
	Clinical Skills	4	0.27	-0.15, 0.68	0.21	68.46	9.51
	Mindfulness	18	0.35	0.24, 0.45	$p < 0.001$	0.00	9.59
Follow-Up	Overall Outcome	10	0.31	0.16, 0.46	$p < 0.001$	0.00	4.72
	Burnout	2	0.60	-0.28, 1.48	0.18	51.39	2.06
	Depression	1	0.40	-0.02, 0.83	0.06	-	-
	Psychological Distress	3	0.20	-0.08, 0.47	0.17	17.21	2.42
	Stress	5	0.34	0.11, 0.57	*0.*004	0.00	3.10
	Well-being Outcomes	9	0.33	0.17, 0.49	$p < 0.001$	0.00	5.52
	Physical Health Outcomes	1	0.13	-0.29, 0.56	0.54	-	-
	Performance Outcomes	1	0.21	-0.14, 0.56	0.24	-	-
	Mindfulness	7	0.34	0.17, 0.52	$p < 0.001$	0.00	3.62

Abbreviations. 95% CI, 95% Confidence Interval; Ns, Number of studies; Post, Post Intervention

Figure 2

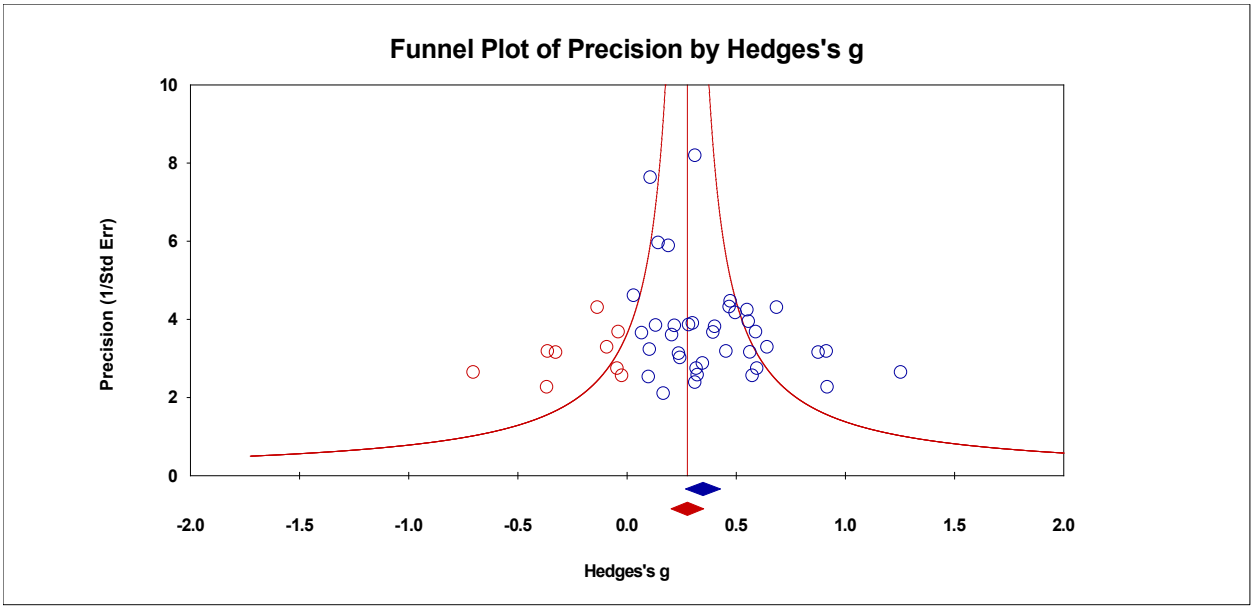
Cochrane risk of bias ratings for individual studies



Note. The average number of included studies falling under low risk (green), unclear risk (yellow), and high risk (red) are shown for each of the seven types of bias.

Figure 3

Funnel plot of precision by Hedge's g for controlled data



Note. In the absence of publication bias, the studies are distributed symmetrically. Larger studies appear towards the top of the graph and cluster around the mean effect size while smaller studies appear towards the bottom.

Bridge to Chapter 3

In Chapter 2, we examined the impact of mindfulness-based interventions (MBIs) on healthcare professionals and trainees. This meta-analysis highlighted the effectiveness of such training on reducing psychological distress (e.g., anxiety, burnout, depression, and stress) and enhancing well-being. They were also effective in increasing mindfulness and self-compassion which are complementary constructs that affect well-being. By examining subgroups, we found that modified versions of established interventions tended to have better outcomes and long-term effects and that professionals and trainees may have different training needs. Furthermore, MBIs that have a more comprehensive program (i.e., includes didactic, discursive, and practice components) seem to have greater effectiveness on reducing distress while meditation-only trainings appear to have greater effectiveness in enhancing well-being. Taken together, we recognize the importance of tailoring MBIs to the target population and their goals.

While these findings point to the beneficial effects of MBIs on trainees, none of the studies examined AT as an outcome. In general, literature on the relationship between mindfulness and AT is limited and equivocal. Some researchers have found significant correlations between MM and AT (Hitsuwari & Nomura, 2021; Robinson, 2019) as well as qualitative support for MM training enhancing AT for counsellors-in-training (CITs; Bohecker et al., 2016; Christopher & Maris, 2010). Others did not find a significant correlation between CITs' AT and MM (Fulton, 2016) nor significant changes in business leaders' AT following a MBI (Brendel et al., 2016). Furthermore, LM and self-compassion have both been found to correlate with AT (Fulton, 2016; Ie et al., 2012); however, to our knowledge, no study has examined the impact of LM or self-compassion training on AT.

To develop a tailored MBI for CITs to enhance AT, we were first interested in examining the relationship between AT and 1) both forms of Western mindfulness (MM and LM) and 2) self-compassion. In addition, we wanted to assess the effect of meditative and Langer mindfulness inductions on AT. A previous study had shown AT can be reduced after priming participants with religious concepts (Sagioglou & Forstmann, 2013). If AT could be significantly enhanced with a brief mindfulness exercise, then we could manage one of the key concerns with implementing MBIs – the time commitment.

Furthermore, the meta-analysis revealed important methodological limitations in the mindfulness literature. First, most studies compare mindfulness training to inactive controls, and these tend to yield greater effect sizes. Thus, to account for the placebo effect and confounding variables, interventions (whether brief or comprehensive) should be compared to an active control. Second, as mindfulness is the focus of the training, one would expect that a measure of trait mindfulness would be included. If trait mindfulness did not change from baseline to post-training, then it would be difficult to argue that any outcome changes are due to the mindfulness component of the training. Although including a mindfulness measure is very important, most studies do not do so. This is further reflected in the induction literature, where another recent meta-analysis found only 14 of the 34 included studies took measures of state mindfulness following induction (Gill et al., 2020). Importantly, studies that have included manipulation checks have shown equivocal results even when using the same measure, mindfulness audio, and comparison task (Lancaster et al., 2016). To be accurate in reporting the effects of brief mindfulness, there is a need to determine whether mindfulness has been successfully induced and how long this mindful state persists. While Erisman and Roemer (2010) found increased state MM persists from after induction to the end of the experiment, such exploration has not been

done with LM (perhaps due to there not being a state LM measure). Finally, while there are three validated measures of state MM, there are no validated measures of state LM and past studies have not directly compared MM and LM. Taken together, there is a need to 1) compare inductions to an active control (i.e., a mind-wandering task), 2) develop strategies for assessing the success of a mindfulness induction, and 3) contrast MM and LM by examining participant perceptions of the likeability and difficulty of the respective tasks and by assessing the persistence and trajectory of the induced mindful effect.

Thus, Chapter 3 describes a two-part experiment that 1) assesses the association between specific meditative mindfulness facets, Langer mindfulness, self-compassion, and ambiguity tolerance using a cross-sectional design, and 2) examines the impact of a meditative or Langer mindfulness induction on AT as compared to a mind wandering control using a randomized control design. It further contrasts participant perceptions of the MM and LM tasks and examines how state MM and LM change across three timepoints within the experiment. Due to the large sample size required to conduct regression analyses and between-group comparisons, we elected to examine an undergraduate student population. The students were from an emerging adult population (18 to 29 years of age) and were recruited from the McGill Psychology Participant Pool which means they were taking at least one course in Psychology to receive course credit. We also focused on mindfulness/meditation novices; specifically, those who do not maintain a consistent mindfulness practice and/or have not attended a training program.

Chapter 3: Cultivating Ambiguity Tolerance through Mindfulness: An Induction Randomized Controlled Trial

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Abstract

Facing ambiguity is ubiquitous and perhaps more apparent as the world faces economic, health, and social crises. Ambiguity tolerance (AT) reflects one's ability to manage novel, complex, and insoluble situations and has important implications on learning, intrapersonal behaviour, and decision making. While AT can increase passively over time, there is some research pointing to mindfulness as a method for cultivating AT. Both forms of Western mindfulness (meditative and Langer) positively correlate with AT; however, no study has explored the direct impact of mindfulness induction. 165 undergraduate participants completed baseline measures of AT, trait meditative (MM) and Langer mindfulness (LM), and self-compassion (SC). Participants were randomly assigned to a condition (meditative, Langer, or mind-wandering control) and responded to measures of AT. Measures of state mindfulness were taken pre-post induction to confirm manipulation success and participants provided feedback on the induction tasks. Regression analyses revealed nonreactivity to inner experience (facet of MM), LM, and SC are significantly associated with AT. However, only nonreactivity adds significantly to the variation in AT beyond what is attributable to LM. Repeated measure ANOVAs confirmed state MM and LM were elevated post-induction compared to the control. However, state mindfulness remained enhanced at the experiment's end only for MM and not LM. Participants also reported finding the LM task more difficult than MM but noted greater focus and ability to follow task instructions. No significant effect of induction was found on AT. Future studies could examine how a combination of MM and LM interventions might enhance AT.

Keywords: meditative mindfulness, Langer mindfulness, ambiguity tolerance, self-compassion

Introduction

Experiencing ambiguity is inherent and inevitable to life. The veracity of this statement is perhaps felt most strongly as the world collectively experiences a global crisis. Decisions are being made, whether at individual, community, national, or international levels, in the face of situations that are novel (i.e., lacking in familiar cues), complex (i.e., requiring management of many relevant cues), insoluble (i.e., involving contradictory cues), and/or incomplete (i.e., needing additional cues) – four characteristics of ambiguity (Budner, 1962; McLain, 1993). The examples of such situations are endless. In academia, educators are adapting to online teaching, university administrators are making decisions about re-opening schools based on changing data, and students are navigating a changed social and academic landscape while facing evaluation that can impact their future. How individuals experience these examples can significantly differ. For some, such ambiguity may be aversive; perhaps presenting a danger to one's well-being or life goals. Others may find ambiguity to be rewarding; perhaps offering an opportunity for growth and self-discovery. This individual difference that predicts one's reactions to ambiguity in both the short and long-term is known as ambiguity tolerance (AT; McLain et al., 2015).

Ambiguity Tolerance

Definitions of AT have varied across time and discipline (see review by Furnham & Marks, 2013). McLain (1993) stated AT is "a range, from rejection to attraction, of reactions to stimuli perceived as unfamiliar, complex, dynamically uncertain, or subject to multiple conflicting interpretations" (p. 184). These reactions can manifest emotionally, cognitively, and behaviourally (Grenier et al., 2005). Contemporary work by Lauriola et al. (2016) examined the hierarchical structure from a battery of AT questionnaires and highlighted three dimensions of AT: 1) affective (i.e., level of distress or discomfort associated with ambiguity), 2) cognitive

(i.e., level of rigidity and moral absolutism in responding to ambiguity), and 3) epistemic (i.e., level of ambiguity acceptance and approach towards novelty and complexity).

Those with higher tolerance may view ambiguity as attractive and respond with curiosity and positive affect (McLain et al., 2015). They may also be motivated to seek ambiguity as it presents a cognitive challenge or opens new potential for perception and behaviour (Hirsh et al., 2012; McLain, 2009). Researchers have found higher AT to be associated with greater affective, cognitive, and eudemonic psychological well-being (Park et al., 2020), appreciation of surrealist media (Swami et al., 2010), career exploration (Xu & Tracey, 2014), curiosity (Litman, 2010), creativity (Hwang & Choi, 2020; Robinson et al., 2019), efforts and behaviours promoting job search (Kwon et al., 2020), empathy (Geller et al., 2021), emotional appraisal of self and others (Mangione et al., 2018), extraversion, (Jach & Smillie, 2019), heuristic and complex thinking styles (Ie et al., 2012), team identification at work (Hwang & Choi, 2020), job satisfaction (Nicolaidis & Katsaros, 2011), independent, participatory, and competitive learning styles (Arquero et al., 2017), need for cognition (Wolfradt et al., 1999), openness to diversity (Geller et al., 2021), openness to experience (Jach & Smillie, 2019), positive affect (Babaei et al., 2021), proactive behaviours towards career (Park et al., 2020), psychological mindedness (particularly in ability to access feelings and willingness to understand oneself and others; Beitel et al., 2004), resilience (Babaei et al., 2021) and self-efficacy in career decision making (Xu & Tracey, 2015). AT also has positive effects on language learning (Başöz, 2015; Chu et al., 2015) and complex decision making (Endres et al., 2009).

On the other hand, those who are more intolerant may interpret ambiguity as threatening (Budner, 1962). In response, they may view the situation as unalterable or try to alter it to suit their perceptions. They may also experience discomfort and display destructive behaviour.

Greater intolerance of ambiguity has been associated with authoritarianism (Adorno et al., 1950), anger (Litman, 2010), burnout (Mangione et al., 2018), career indecision (Xu & Tracey, 2015), conformity to some traditional masculine norms (Park et al., 2020), ethnocentrism (Van Hiel et al., 2010), job stress (Iannello et al., 2017), magical thinking (Beitel et al., 2004), need for course structure (DeRoma et al., 2003), negative affect (Babaei et al., 2021), negative mood at work (Hwang & Choi, 2020), neuroticism (Jach & Smillie, 2019), perfectionism (Gärtner et al., 2020), lower support for diversity related work programs (Chen & Hooijberg, 2000), worry (Buhr & Dugas, 2006), and written and oral communication apprehension (Arquero et al., 2017).

AT appears to be implicated in social domains, intrapersonal behaviours, and decision making (Furnham & Marks, 2013). Thus, exploring how to actively cultivate AT is a promising and important area of study; especially with student populations (Iannello et al., 2017; Merrotsy, 2013). University students tend to be emerging adults; living in a period of transition between adolescence and adulthood that is characterized in part by identity exploration and instability (Arnett, 2007). This is an age of inherent ambiguity as students face the challenges of greater academic and personal autonomy, changing social and familial networks, and managing finances; all challenges that can impact physical and psychological well-being (Burns et al., 2020). Research on AT has found that it may be a cognitive vulnerability factor for hopelessness and depression in undergraduate students (Andersen & Schwartz, 1992) and is a predictor of student strategies in coping with academic stress (Paralkar, 2019). Intolerance of ambiguity positively predicts avoidant strategies (i.e., escaping or denying stress) and negatively predicts approach (i.e., applying effort to change stress) and social support (i.e., consulting others for help to resolve stress) strategies. Furthermore, there is ambiguity in learning anything new, and this can produce negative emotional reactions (e.g., fear) when the learning is particularly ambiguous

and/or cognitively difficult (Bohecker et al., 2016). In turn, students who have difficulty regulating their emotional response to ambiguity may reject or avoid learning. Higher AT is considered desirable in a number of careers in business (Chesley & Wylson, 2016), education (Kajs & McCollum, 2009), medicine (Geller et al., 1990), and psychology (Levitt & Jacques, 2005) with some recommending that AT should be a student selection criterion for post-graduate programs like medicine (Geller, 2013).

Furthermore, surveys of Canadian students have found high prevalence of psychological distress (American College Health Association, 2019, May 10). A trend analysis of cross-sectional research from 2013 to 2019 show that prevalence of stress, anxiety, depression, self-harm, suicidal ideation, and mental illness diagnosis has significantly increased (Linden et al., 2021). Alongside this change, there has been significant increases in students receiving help and noting they would seek help if necessary. This suggests a growing need for supportive resources and for understanding what contributes to distress. Ambiguity underlies the student experience and may be a key source of stress when not successfully managed. The ability to tolerate ambiguity is then likely a mechanism that contributes to the well-being of emerging adults. Thus, the exploration of how to enhance AT would be an important scholarly agenda for Canadians.

Although AT is viewed as a generally stable individual trait (McLain et al., 2015), some research highlights how it may be malleable and can change (both positively and negatively) through experience and time (Endres et al., 2015; Ndoja et al., 2020). There is also some evidence for the impact of brief induction on reducing AT. For example, Sagioglou and Forstmann (2013) primed participants with Christian concepts and found they reported greater ambiguity intolerance on a self-report measure. They proposed that this priming activates prototypical norms like the emphasis of Christianity on moral dichotomies. This would then

manifest in greater intolerance of ambiguity as it is related to rigid and dichotomized thinking. This finding was further supported by two behavioural measures that focused on judgment. First, AT is predictive of esthetic judgment such that those with greater tolerance prefer ambiguous or unusual stimuli (Norton, 1975). Sagioglou and Forstmann (2013) found that those primed with religious concepts rated non-ambiguous images more positively than ambiguous images. Second, in responding to ambiguity, they noted that those who were more intolerant would experience more discomfort and suggested that they would take actions to reduce this discomfort. One such action would be to be more certain in their judgments about an ambiguous stimulus as a way of reducing its ambiguity, and thus, discomfort. Participants were asked to determine the emotion on a series of ambiguous faces and state the certainty of their decision. Those primed with Christian concepts had greater judgment certainty compared to the neutral condition.

However, the research on how to enhance AT is generally limited; with scholars largely offering suggestions rather than empirical research. For example, scholars have suggested AT promotion may occur through educators highlighting how ambiguity is inherent to learning, engagement in reflection about ambiguity, attending to and developing meta-cognitive awareness of their reactions to ambiguity, reflective writing, or exploring multiple meanings of art works (Bentwich & Gilbey, 2017; Iannello et al., 2017; Luther & Crandall, 2011; Nevalainen et al., 2010). Most recently, Bohecker et al. (2016) conducted a qualitative study examining the effects of participation in an 8-week mindfulness-based experiential group on novice counsellors. Participants reported they developed their self-reflection skills and ability to manage ambiguity through this training. While this study did not quantitatively examine changes in AT, it does point to mindfulness as being a potential intervention for cultivating tolerance for ambiguity.

Mindfulness

Definitions of mindfulness vary depending on one's schools of thought (see Khoury et al., 2017). From a contemporary Western perspective, mindfulness has been operationalized using two main approaches: 1) meditative mindfulness (MM; Kabat-Zinn, 1991), and 2) Langer mindfulness (LM; Langer, 1989). MM defines mindfulness as a process of being aware and attentive to the present (Kabat-Zinn, 2003). It is conceptualized to have five facets: 1) *observing* present internal (e.g., emotions, thoughts, sensations) and external states, 2) *describing* present states using words, 3) *acting with awareness*, 4) *nonjudgment* towards internal states, and 5) *nonreactivity* towards arising thoughts and feelings (Baer et al., 2006). LM defines mindfulness as a socio-cognitive ability where one is actively self-regulating their attention and awareness to the present external environment and engaging creatively with what becomes apparent (Langer, 2005). As opposed to a mindless state where information is processed in an automatic and rigid manner, LM involves: 1) *engagement* and awareness of changes in the external environment, 2) *seeking novelty* by being open and curious, 3) *producing novelty* by creating new categories, and 4) *flexibility* by examining the present from different perspectives (Bodner & Langer, 2001).

Conceptual overlaps and differences between MM and LM have been addressed by Hart et al. (2013) as well as Khoury et al. (2017). While they differ in their theoretical underpinnings and have different attentional targets, they both emphasize self-regulation of attention and awareness as central components to being mindful, carry significant physical and psychological benefits, and are modes of consciousness that contrast mind-wandering (i.e., the brain's automatic, default operational state where thoughts tend to wander away from the present; Christoff et al., 2009; Mason et al., 2007). Both MM and LM have unique strategies to help individuals become more mindful and reduce mind-wandering. Importantly, they distinguish

state mindfulness (i.e., brief and immediate mindful experience) from trait mindfulness (i.e., one's general mindful tendency) and propose that mindful tasks induce state mindfulness, and with continued practice, can strengthen trait mindfulness. While meditative practice and longer intervention protocols are characteristic of MM, LM utilizes brief instruction-based tasks that emphasize a particular LM component (e.g., producing novelty by suggesting novel or creative uses for an object). LM researchers suggest their tasks may be easier for non-meditators to grasp (Langer, 2012); however, to our knowledge, direct comparisons between MM and LM inductions have not been made to assess how participants perceive these tasks (e.g., likeability, difficulty) nor to compare the longevity of mindful effects following induction.

With regards to AT, there are important conceptual links with trait mindfulness. Both constructs involve 1) attendance to one's present internal and external worlds (Budner, 1962; Hart et al., 2013), 2) self-regulation of attention and metacognitive awareness (Iannello et al., 2017; Khoury et al., 2017), and 3) positive relationships with numerous well-being related outcomes (Furnham & Marks, 2013; Khoury et al., 2017). LM shares several important similarities with AT given its emphasis on openness and flexibility. However, it does not address the internal responses that can arise from present engagement as directly as MM. Thus, it can be proposed that practice of MM and LM may differ in how they impact AT. When examining their associations with the Big Five personality traits, Siegling and Petrides (2014) found that the strongest predictor of MM is neuroticism (negative association), followed by conscientiousness, openness, and extraversion (positive associations). The strongest predictor for LM is openness, followed by conscientiousness and extraversion. For AT, Lauriola et al. (2016) found the 1) affective domain most strongly correlated with neuroticism followed by extraversion and openness, 2) cognitive domain is only correlated with openness, and 3) epistemic domain is

correlated with openness, extraversion, and conscientiousness. It is likely that both MM and LM contribute to enhancing each dimension of AT; however, these correlations support the suggestion that MM may have stronger effect on affect while LM has a stronger impact on cognition and the epistemic dimension.

Examining each dimension separately, the affective domain captures the anxiety and psychological discomfort that can accompany the experience of ambiguity (Lauriola et al., 2016). Through being in a mindful state, one can observe the emotions that might arise from ambiguity with nonjudgmental awareness and nonreactivity. This process could allow one to safely experience distress without having to avoid it and discover they diminish over time. There is significant neuroscientific and psychological evidence that MM is associated with adaptive emotion regulation (Lutz et al., 2014; Roemer et al., 2015). As summarized by Roemer et al. (2015), MM interventions have been associated with reductions in intensity of distress, emotional reactivity, and negative self-referential processing (e.g., self-criticism) as well as greater experience of positive emotional responses. Furthermore, in a study where participants responded to a film clip that evoked a range of affective responses (arguably ambiguous due to the complexity of emotions), participants who completed a brief mindfulness intervention showed significantly less negative affect and a trend towards more adaptive regulation compared to a control (Erisman & Roemer, 2010). Trait LM is positively related to cognitive reappraisal; an emotion regulation strategy that involves a process of reframing to reduce emotional intensity (Haigh et al., 2011). Taken together, mindfulness enhances emotion regulation which in turn perhaps reduces discomfort when one is faced with ambiguity.

The cognitive dimension captures how those more intolerant of ambiguity may respond with rigidity and dichotomous thinking. This is reflective of the mindless state in LM in which

one is single-minded, unaware of multiple perspectives, and reliant on past cognitive structures. The opposite of rigidity is flexibility which is an important characteristic of both LM and MM. For LM, a mindful state has a flexibility component that involves being able to hold and shift between multiple perspectives (Langer et al., 1989). This allows information to be questioned and reconceptualized such that it can be used in creative ways. Similarly for MM, Shapiro et al. (2006) highlighted the process of reperceiving as a key mindfulness mechanism that facilitates cognitive flexibility. This process involves shifting one's perspective and separating from past frameworks. Interestingly, both MM and LM highlight how mindlessness perpetuates the use of rigid cognitions even when they are no longer adaptive. Research by Chanowitz and Langer (1981) found that mindlessness can prevent learned information from being reconsidered, even if doing so would be beneficial. For MM, Greenberg et al. (2012) found that non-meditators' experience in solving a problem blinded them to new solutions such that they persisted longer than meditators in repeating something that no longer worked. On the other hand, meditative induction has had effects on reducing sunk-cost bias (Hafenbrack et al., 2014). Taken together, mindfulness appears to enhance one's ability to detach from the past and take multiple perspectives which in turn perhaps reduces cognitive rigidity in the face of ambiguity.

Finally, the epistemic dimension examines approach towards ambiguity as well as a desire for novelty and complexity. Perhaps through the proposed managements of the emotional and cognitive reactions to ambiguity, individuals may be more open to accepting it. In addition, LM emphasizes seeking and producing novelty as components of mindfulness. Interestingly, in a study where students were taught information in a conditional manner (e.g., using terms like "could" or "may"), Langer et al. (1989) found students used the information in more creative and mindful ways. Interestingly, this finding then suggests that increasing ambiguity (e.g., by using

conditional words) may help one tolerate it more. This point is also reflected in a suggestion by Carson and Langer (2004) who noted that considering paradoxes (an inherently ambiguous task) could enhance AT. For MM, learning to meditate is an ambiguous task; perhaps engaging with it also supports approaching other forms of ambiguity.

At present, there is some empirical evidence supporting the relationship between trait mindfulness and AT. Ie et al. (2012) found a significant correlation between AT and trait LM in 75 adult participants; suggesting that those with higher trait LM are better at managing ambiguity. Similarly, a dissertation by Robinson (2019) found a significant correlation between AT and trait MM in 253 American adults. Qualitative studies have further emphasized the role of trait LM in mastering ambiguity for rural nurses (Knight et al., 2016) as well as the impact of MM practices on developing AT in counsellors-in-training (Christopher & Maris, 2010). Chesley and Wylson (2016) also explored AT and mindfulness with business leaders and found those who had higher trait mindfulness engaged in MM practices to manage ambiguity, approached ambiguity with curiosity and were more accepting of ambiguity.

Although these studies highlight the potential impact of mindfulness on developing AT, the research is limited and equivocal. For example, unlike Robinson (2019), Fulton (2016) did not find significant correlations between AT and trait MM in a sample of 55 counselling trainees. To our knowledge, there has also not been research examining the impact of a MM or LM induction on AT. While mindfulness programs are beneficial, their logistical demands may make them difficult to incorporate into student schedules. Brief inductions may offer a method for students to briefly enhance AT prior to completing a particularly ambiguous task (e.g., interview, counselling session, ethics exam). The limitations of the literature highlight the need to examine the relationship between trait MM, trait LM, and AT both cross-sectionally and experimentally.

Self-Compassion

Self-compassion is a distinct but complementary concept to mindfulness and may also have implications on AT. Defined as compassion directed inward to the self by Neff (2003a), trait self-compassion consists of three main facets: 1) *self-kindness* where one offers oneself warmth and understanding when experiencing inadequacy or failure, 2) *common humanity* where one recognizes that suffering and imperfection is a shared experience by all humans, and 3) *mindfulness* where one attends to painful emotional and cognitive experiences without avoidance and overly identifying with them. Similarly to trait MM, trait self-compassion helps to regulate emotion through a process of non-judgemental and open awareness of distress (Khoury, 2019).

Fulton (2016) found a significant positive relationship between trait self-compassion and AT in 55 counsellors-in-training. It was suggested that individuals may develop feelings of inadequacy or failure when facing ambiguity as they may not know how to resolve it or feel they failed to manage it well. If they more readily treat themselves with kindness in the face of inadequacy or failure, they may be more willing to approach ambiguity. In addition, like suffering, ambiguity is part of the human condition. Perhaps those who are more self-compassionate see ambiguity as a component of common humanity and then feel more connected with others. Research on the relationship between AT and trait self-compassion is limited, and Fulton (2016) examined a niche sample. Therefore, it is of interest to examine the association between trait self-compassion and AT. This research can add to the conceptual understanding of AT. Furthermore, like mindfulness, there are specific methods for developing trait self-compassion. This makes it another interesting avenue for cultivating AT.

The current study sought to elucidate the relationship between mindfulness and AT by examining trait MM facets, trait LM, and trait self-compassion as predictors of AT using a cross-

sectional design (Objective 1). Furthermore, we conducted a randomized controlled experiment that aimed to compare state MM and state LM induction to a mind-wandering control. We examined the trajectory and persistence of participants' state mindfulness post-induction (Objective 2) and the impact of state MM and LM induction on AT (Objective 3). Finally, we explored participants' perceptions of the likeability and difficulty of the mindfulness tasks and their ability to focus and follow instructions (Objective 4). It is predicted that (1) trait LM and trait self-compassion will be positively associated with AT, (2) state MM and state LM will be elevated post-induction compared to the control, and (3) those in the mindfulness conditions will have significantly greater AT post-induction compared to a mind-wandering control. While previous research suggests trait MM is positively associated with AT, these studies did not examine its individual facets. Thus, the examination of MM facets in the first research objective and differences in participants' perceptions in the fourth objective will be exploratory.

Methods

Participants

Undergraduate students (N = 213) were recruited through an undergraduate psychology participant pool. They were completing their studies at a large urban Canadian university and were compensated using course credits. To be eligible, participants must be novices to mindfulness; specifically, they must not meditate on a regular basis and/or they have not participated in a mindfulness course. Using G*Power 3.1, we estimated needing at least 33 participants per group to detect a medium effect for three independent groups at an alpha of 0.05 and a power of 0.80 (Faul et al., 2007). For the regression analyses, there are seven predictor variables (i.e., five facets of MM, LM, and self-compassion) in total, suggesting a need for at least 103 participants based on the same effect size, alpha, and power (Faul et al., 2009).

Following data cleaning procedures (as noted below in the Data Analyses section), the final database used for analyses included 165 participants. Participants (84.85% Women) ranged in age from 18 to 25 (M = 20.15, SD = 1.49). Most identified themselves as Caucasian (n = 89), were full-time students (n = 159), had a GPA above 2.7 (n = 140), and were not employed (n = 107). Further details about participant demographics can be found in Table 1.

Procedure

The study consisted of two parts, and all measures were administered using LimeSurvey. Ethical approval was obtained from the university's Research Ethics Board.

Part One

Participants were provided access to online questionnaires the day prior to the experiment. They gave informed consent, created a unique alphanumeric identification code, and then completed measures of sociodemographic information, trait MM and LM, self-compassion, and AT. To avoid influencing their performance, the consent form did not include the words "mindfulness" or "ambiguity tolerance." They were told that the study examined people's perceptions when facing novel and complex situations and that they would be completing a series of tasks including questionnaires, following verbal instructions, and responding to social scenarios.

Part Two

Participants were asked to come to a lab setting where they were given access to a computer equipped with a headset and a link to access the online measures. Cubicles were set up to facilitate privacy and minimize external influence. Participants gave consent through the survey and were prompted to enter their unique code; enabling the researchers to match data from both parts during analysis. To blind participants to their condition, they were asked to select

either the number 1, 2, or 3 (as told to them by a trained research assistant) on the survey. Each number corresponded to one of the three conditions, and the research assistant followed a pre-determined, simple randomized list that was generated by computer. The research assistant concealed the list from participants but was not blind to their condition. Participants then followed a standard protocol, they completed: 1) baselines measures of state MM and LM, 2) their assigned induction task, 3) post-induction measures of state mindfulness, 4) a self-report measure of AT and a measure of judgment certainty, 5) end-of-experiment measures of state mindfulness, and 6) four questions assessing their induction experience. To reduce automatic responding by participants, items from the state MM and LM measures were mixed-together and randomly reordered when administered to participants. As the study goals were initially concealed from participants, this was addressed by the research assistant in the debrief. Participants then provided a reconsent for their data to be used.

Conditions

MM

Participants listened to a pre-recorded 15-minute script over headphones. The instructions are typical of mindfulness meditation scripts that focus on open monitoring. When engaging in an open-monitoring meditation, individuals do not focus on a particular object or sensation (e.g., breathing); rather they are asked to monitor whatever comes into their awareness without reacting or judging (Lippelt et al., 2014). Such practices emphasize nonjudgment and nonreactivity (important factors in emotion regulation); both in the monitoring of one's metacognitive process as well as in the awareness of one's automatic cognitive and emotional reactions to internal and external stimuli (Lutz et al., 2008). Furthermore, open monitoring meditation has been associated with divergent thinking which supports the generation of

numerous novel ideas in a context where multiple solutions are possible (Colzato et al., 2012). Taken together, we selected an open monitoring meditation as it appeared to fit well with our model of how mindfulness may impact AT and to support creative thinking in ambiguous contexts. In the current study, participants were directed to observe their sensations and thoughts, become aware of their breath, and notice their body without labelling or judging their experience. For example, "begin to bring your awareness now to your breath without changing it or judging it."

LM

Participants were given 1) three scenarios that described an individual's actions (e.g., "Joe, a college student was texting during his social psychology class"), 2) three nouns (e.g., rain), and 3) three pairs of objects (e.g., lampshade-drape). Participants were asked to provide 1) distinct explanations for the individuals behaviour, 2) reasons as to why the noun could be considered good or bad, and 3) ways in which the objects are similar and dissimilar, and novel uses for each object. These tasks sought to increase mental flexibility and novelty seeking in participants and were described in the methods of Ie et al. (2012) who had examined the relationship between AT and LM cross-sectionally. These tasks were selected as a willingness to seek novelty and to have greater mental flexibility would theoretically reduce the rigidity and dichotomous thinking that is characteristic of low AT. Furthermore, the timing to complete these tasks (participants were given 20 minutes in the original study) would match well with the other conditions.

Mind-wandering Control

Participants listened to a pre-recorded script over headphones asking them to "simply think of whatever comes to their mind" and to do so "without trying to focus on anything in

particular." Variants of these statements were repeated throughout the 15-minute recording. This has been used as a control in other MM induction studies (see e.g., Garland et al., 2015).

Measures

Demographics

A short questionnaire focused on collecting information about the gender, age, ethnicity, education, and employment status of participants.

Trait MM

The Five Facet Mindfulness Questionnaire is a 39-item self-report measure of MM (Baer et al., 2006). Participants rate how true they find items pertaining to five facets of mindfulness on a 5-point Likert scale, ranging from 1 (*Never or Very rarely true*) to 5 (*Very often or Always true*). It had good internal consistency across its five facets: *observing* ($\alpha = 0.79$), *describing* ($\alpha = 0.90$), *acting with awareness* ($\alpha = 0.86$), *non-judgment* ($\alpha = 0.90$), and *nonreactivity* ($\alpha = 0.85$). A sample item is: "I watch my feelings without getting lost in them."

State MM

The Toronto Mindfulness Scale is a 13-item self-report measure of MM (Lau et al., 2006). Participants rate how much they agree with statements pertaining to two facets of state mindfulness (*decentering* and *curiosity*) on a 5-point Likert scale, ranging from 0 (*Not at all*) to 4 (*Very much*). It had adequate internal consistency across timepoints for both the MM (*decentering*: $\alpha = 0.62$ to $\alpha = 0.71$ and *curiosity*: $\alpha = 0.84$ to $\alpha = 0.87$) and mind-wandering conditions (*decentering*: $\alpha = 0.68$ to $\alpha = 0.85$ and *curiosity*: $\alpha = 0.90$ to $\alpha = 0.92$). A sample item is: "I was curious about my reactions to things."

Trait LM

The LM Scale is a 21-item self-report measure of LM (Bodner & Langer, 2001). Participants rate their general agreement with items pertaining the three key components of socio-cognitive mindfulness (i.e., novelty seeking, novelty producing, and engagement). Items are rated on a 7-point Likert scale, ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). It had good internal consistency ($\alpha = 0.84$). A sample item is: "I do not actively seek to learn new things."

State LM

A 5-item version of the LM scale was developed specifically for this study to measure state LM. Participants were asked to consider items based on what they just experienced. The items chosen were most amenable to being adapted while those removed were considered unrelated and likely confusing (e.g., "I seldom notice what other people are up to"). Items are rated on a 7-point Likert scale, ranging from 1 (*Strongly disagree*) to 7 (*Strongly agree*). It had adequate internal consistency across timepoints for both the LM ($\alpha = 0.63$ to $\alpha = 0.73$) and mind-wandering conditions ($\alpha = 0.68$ to $\alpha = 0.71$). A sample item is: "I was not an original thinker."

Self-Compassion

The Self-Compassion Scale is a 26-item self-report measure of self-compassion (Neff, 2003b). Participants rate how often they behave in a manner that is characteristic of self-warmth (i.e., self-kindness, common humanity, and mindfulness) or self-coldness (i.e., self-judgment, isolation, and over-identification). Items are rated on a 5-point Likert scale, ranging from 1 (*Almost never*) to 5 (*Almost always*). It had good internal consistency ($\alpha = 0.94$). A sample item is: "I try to be loving towards myself when I'm feeling emotional pain."

Ambiguity Tolerance

The Multiple Stimulus Types Ambiguity Tolerance Scale-II is a 13-item self-report measure of AT (McLain, 2009). Participants rate statements about their attitude towards ambiguous stimuli using a 7-point Likert scale, ranging from 1 (*Strongly disagree*) to 7 (*Strongly Agree*). It had good internal consistency in Part One ($\alpha = 0.88$) and in each condition of Part Two: MM ($\alpha = 0.91$), LM ($\alpha = 0.88$), and mind-wandering ($\alpha = 0.92$). A sample item is: "I generally prefer novelty over familiarity."

Judgment Certainty

Using a procedure by Sagioglou and Forstmann (2013), participants were shown a series of 15 ambiguously morphed facial expressions in which two of the six universal emotions were morphed in a 50-50 proportion. Images were provided by Daudelin-Peltier et al. (2017) who used faces from the *Karolinska Directed Emotional Faces database* (Lundqvist et al., 1998). Participants were first asked to select the predominant emotion in the image and then rate how certain they were of the judgment on a 7-point Likert Scale, ranging from 1 (*Not at all certain*) to 7 (*Very certain*). Greater judgment certainty is indicative of lower AT. It had good internal consistency in each condition of Part Two: MM ($\alpha = 0.78$), LM ($\alpha = 0.74$), and mind-wandering ($\alpha = 0.83$).

Induction Experience Questions

To obtain information about participants' subjective experience completing the inductions, participants were asked to rate how much they liked the induction task, how difficult they found it, how much they were able to focus on the task, and how long they could follow instructions. The questions on likeability and difficulty were rated on a 7-point Likert scale, ranging from "Dislike extremely" to "Like extremely" and from "Very easy" to "Very hard."

The questions on focus and following instructions were rated on a 5-point Likert scale, ranging from “I could not focus on the task at all” to “I could focus completely on the task” and from “I could not follow the instructions at all” to “I could completely follow the instructions.”

Data Analyses

Prior to running analyses, participants who did not meet the eligibility criteria, did not complete all study measures, or did not provide reconsent were removed (n = 46). Two participants whose ages were outliers (± 3 SD) were also removed as AT tends to increase with age, and we were interested in examining emerging adults. A flow diagram documenting the number of participants included and reasons for removals can be found in Figure 1. For each variable, participants needed to complete at least 85% of the items to be included in the analyses Means were then calculated based on those items. Listwise deletion was used to omit missing data, and univariate outliers (± 3 SD) were removed. Skewness and kurtosis were calculated to confirm normality ($|Z| < 3.2$). Regression analyses were used to examine MM facets, LM, and self-compassion as predictors of AT (Objective 1). All assumptions for such analyses were met as there was homoscedasticity, no multivariate outliers, and no multicollinearity. Repeated measures ANOVAs were conducted to assess if induction was successful and to compare how participants’ state mindfulness changes across the experiment (Objective 2). A parametric approach was used as the data was normally distributed and we sought to compare levels of state mindfulness between conditions and across the three timepoints. A MANCOVA was conducted to assess the effect of condition on post-induction AT while controlling for baseline AT (Objective 3). This method was selected as we had two measures of post-induction AT and we were interested in comparing the different conditions. We also included baseline AT (as measured in Part 1) as a covariate given that it would likely impact post-induction AT. Finally,

Mann-Whitney U tests were conducted to examine participant perceptions of the mindfulness tasks (Objective 4). A non-parametric approach was used as likeability, difficulty, focus, and ability to follow instructions were each measured using a single item and on an ordinal scale. We were also interested in comparing participant perceptions across conditions. All analyses were conducted using IBM SPSS (Version 26).

Results

Objective 1: Regression Analyses

To address the first research objective, regression analyses were conducted. Mean values, standard deviations, and Pearson correlations for the main variables can be found in Table 2. All results of these analyses can be found in Table 3.

A multiple regression was conducted to examine the relationship between MM facets and AT. Statistically significant results with a medium effect size were found, $R^2 = 0.12$, $F(5,149) = 4.14$, $p = 0.001$, $f^2 = 0.14$. Of the facets, only *nonreactivity* had a statistically significant positive association with AT, $\beta = 0.30$, $t = 3.54$, $p < 0.001$. Furthermore, a series of linear regressions were conducted to examine the relationship between 1) LM and 2) self-compassion, and AT. Statistically significant results were found for LM with a medium to large effect size, $R^2 = 0.24$, $F(1,160) = 50.71$, $p < 0.001$, $f^2 = 0.32$, and self-compassion with a small to medium effect size, $R^2 = 0.06$, $F(1,159) = 9.35$, $p = 0.003$, $f^2 = 0.06$. Both LM ($\beta = 0.49$, $t = 7.12$, $p < 0.001$) and self-compassion ($\beta = 0.24$, $t = 3.06$, $p = 0.003$) had significantly positive associations with AT. In summary, students with higher *nonreactivity* to inner experiences, LM, and self-compassion also have greater AT.

A hierarchical multiple regression was then conducted to explore whether *nonreactivity* (the only significant association of the MM facets) and self-compassion add to the variation in

AT above and beyond LM (which was most strongly associated with AT). LM explained 23.6% of the variance in AT, $F(1, 154) = 47.67$, $p < 0.001$. While *nonreactivity* explained an incremental 3.2% of the variance, $F(1, 153) = 6.78$, $p = 0.01$, $f^2 = 0.045$, self-compassion did not significantly add to the amount of variance beyond what is attributable to LM and *nonreactivity*, $p = 0.97$.

Objective 2: Repeated Measure ANOVAs

Two repeated-measures ANOVAs were conducted to assess whether induction was successful for both meditative and Langer mindfulness. Prior to the comparison, participants who did not complete the full induction task (n = 21) or completed two induction tasks due to a technical error (n = 14) were omitted. In addition, participants in the mindfulness tasks (n = 17) who reported being unable to 1) follow task instructions for at least half the time or 2) at least somewhat focus on the tasks were removed. We expected that novice meditators may have difficulty focusing and following instructions throughout the whole task; however, we considered it necessary that they report some degree of engagement with the tasks. Thus, 113 participants were included in the final analysis (meditative = 33, Langer = 44, and mind-wandering control = 36). Means and standard deviations of the state mindfulness measures at the three timepoints (pre-induction, post-induction, and end-of-experiment) can be found in Table 4.

MM

State MM (as measured by the *decentering* and *curiosity* facets of the TMS) was compared at three timepoints for participants in the meditative condition and mind-wandering control. For both *decentering* and *curiosity,* the assumption of sphericity (Mauchly's test) and homogeneity of variance (Levene's test) across each timepoint were met ($p > .05$). There was a significant main effect of time with large effect size on *decentering*, $F(2,134) = 31.48$, $p < .001$,

partial $\eta^2 = 0.32$, and *curiosity,* $F(2,130) = 9.34$, $p < .001$, partial $\eta^2 = 0.13$, but no main effects for condition ($p = 0.18$ and $p = 0.07$ respectively). For *decentering,* there was a significant interaction effect between time and condition with a medium effect size, $F(2,134) = 4.92$, $p < .01$, partial $\eta^2 = 0.07$; indicating that *decentering* across time significantly differed between condition. To assess the interaction, contrasts were used. The interaction was significant when comparing baseline and post-induction with medium effect size, $F(1,67) = 5.07$, $p = 0.03$, partial $\eta^2 = 0.07$, as well as baseline and end-of-experiment with a medium to large effect size , $F(1,67) = 8.03$, $p = 0.006$, partial $\eta^2 = 0.107$. This suggests that the increased *decentering* at post-intervention and end-of-experiment compared to baseline are significantly greater in the meditative condition as opposed to the mind-wandering control. An interaction effect was not found for *curiosity* ($p = 0.62$).

LM

State LM (as measured by the sLMS) were compared at three timepoints for participants in the Langer condition and mind-wandering control. Mauchly's test indicated that the assumption of sphericity had been met ($p = 0.26$). However, Levene's test was significant only for post-induction ($p = 0.01$), indicating heterogeneity of variance. Although this is a limitation, ANOVAs are generally robust to heterogeneity when group sizes are similar (largest/smallest is less than 1.5; Stevens, 2002, pp. 268) which is the case for the current comparison. There was no significant main effect of time ($p = 0.09$) or condition ($p = 0.27$) on state LM. However, there was a significant interaction effect between time and condition with small to medium effect size, $F(2,154) = 4.32$, $p = 0.02$, partial $\eta^2 = 0.05$; indicating that state LM across time significantly differed between condition. To assess the interaction, contrasts were used. When comparing state LM levels at baseline and post-induction, the interaction was significant with medium effect size,

$F(1,77) = 6.18$, $p = 0.02$, partial $\eta^2 = 0.07$. This suggests that the increased mindfulness at post-induction compared to baseline is significantly greater in the Langer condition as opposed to the mind-wandering control. However, when comparing mindfulness levels at baseline and end-of-experiment, the contrast is not significant ($p = 0.90$).

Objective 3: MANCOVA

A MANCOVA was used to assess the impact of induction on post-induction AT and judgment certainty. Pre-induction AT (as measured in Part one) was used as the covariate. The adjusted means for the AT in the MM, LM, and mind-wandering conditions were: 4.38 (SE =.09), 4.36 (SE = 0.08), and 4.43 (SE = 0.09) respectively. For judgment certainty, the adjusted means in the MM, LM, and mind-wandering conditions were: 4.99 (SE = 0.12), 5.09 (SE = 0.10), and 4.94 (SE = 0.12) respectively. The assumption of homogeneity of regression slopes (assessed by the interaction term between the covariate and condition; $p = 0.83$) and covariance (assessed by Box's M test; $p = 0.99$) were met. After adjustment for pre-induction AT, no statistically significant difference was found between conditions on the dependent variables, $F(4,214) = 0.33$, $p = 0.85$, Wilks' $\Lambda = 0.99$, partial $\eta^2 = 0.01$.

Objective 4: Mann-Whitney U tests

Mann-Whitney U tests were used to compare post-induction feedback on the MM and LM tasks. Significant differences with small to medium effect sizes were found for participant perceptions on the difficulty of the induction tasks, $U = 479.50$, $p < .01$, $r = 0.30$, as well as their ability to focus, $U = 402.00$, $p < .001$, $r = 0.41$, and how long they could follow instructions, $U = 408.00$, $p < .001$, $r = 0.41$. There was no significant difference in task likeability, $U = 686.00$, $p = 0.67$, $r = 0.05$. For difficulty, the MM task (median = 3, "Somewhat easy") was perceived as easier than the LM task (median = 5, "Somewhat hard"). However, participants reported greater

ability to focus (median = 4, "I could mostly focus on the task") and follow instructions (median = 5, "I could completely follow instructions") on the LM task compared to MM (median = 4 for both, "I could mostly focus on the task" and "I could follow the instructions for about 10 minutes").

Discussion

The present study had four main objectives that were explored using both cross-sectional and controlled randomized experimental designs. Specifically, we sought to compare 1) trait MM facets, trait LM, and trait self-compassion as predictors of AT, 2) the impact of MM and LM induction on AT, 3) changes in participants' state mindfulness immediately post-induction and at the end of the experiment, and 4) participant perceptions of the two mindfulness tasks.

Objective 1: Mindfulness and self-compassion as predictors of AT

Previous studies have found that AT is positively correlated with trait MM (Robinson, 2019), trait LM (Ie et al., 2012), and trait self-compassion (Fulton, 2016). The current study supports these findings and indicates trait LM and trait self-compassion were positively associated with AT. Furthermore, this study extends past findings by examining specific MM facets and exploring how they account for variance in AT. Only the *nonreactivity* facet of MM had a unique positive association with AT; suggesting that those who are more readily able to detach from inner experiences (i.e., thoughts, emotions) and respond to them in an unbiased manner display greater AT (Baer et al., 2006). Of the three related constructs, LM accounted for the largest amount of variance in AT followed by *nonreactivity*.

These findings are conceptually in line with the definition of AT. Ambiguity is associated with significant anxiety and discomfort, and it is argued that individuals generally seek to keep it at a manageable level (Hirsh et al., 2012). Definitions of AT emphasize how an individual reacts

emotionally, cognitively, and behaviourally to ambiguity with strategies like avoidance, using rigid cognitive patterns, or seeking familiarity indicating lower tolerance. *Nonreactivity* and trait LM may support ambiguity management albeit in different ways. Individuals who have greater *nonreactivity* may allow the arising negative thought patterns or distressing emotions from ambiguity to come and go without being caught in them (Kalill et al., 2014). Perhaps the intensity of emotion felt during ambiguity may be managed through detachment which may also reduce the need to rigidly avoid ambiguous situations. Individuals with greater trait LM may cognitively manage ambiguity through a conscious process of being open to novelty and holding multiple and/or opposing perspectives (Gudykunst, 1998). LM definitions emphasize active engagement with external experiences in a manner that is curious, attentive to context, and challenges convention (Langer, 1989). There is creativity in this process; allowing for the development of new perspectives that would arguably oppose cognitive rigidity. Comparing these two constructs, *nonreactivity* perhaps plays a role in AT through reducing avoidance of ambiguous situations by managing distress; therefore, utilizing an emotional pathway to AT. On the other hand, LM may support approach towards ambiguity by enhancing creativity and openness; thus, likely utilizing a cognitive pathway.

This study offers some preliminary evidence that self-compassion may have a role in helping individuals tolerate ambiguity. However, self-compassion did not add to the variance above and beyond what is accounted for by *nonreactivity* and LM. As was found in the current study, previous research has noted that *nonreactivity* has the strongest significant correlation with self-compassion compared to the other MM facets (see e.g., Baer et al., 2006). The *mindfulness* component of self-compassion seems to relate well to *nonreactivity* as it involves a process of not avoiding or overidentifying with internal distress (Neff, 2003a). Perhaps, like

nonreactivity, self-compassion supports management of distress related to ambiguity and reduces avoidance.

In considering the relationship between mindfulness and AT, we might also consider how AT might moderate the effects of mindfulness training. Although MM and LM have practices that can help individuals enter mindful states (e.g., breathing meditation or considering paradoxes respectively), the experience of developing a mindfulness practice is inherently ambiguous. For example, a meditation script can include a message about nonjudgmentally observing thoughts but how that happens in the moment and how it is experienced can be unclear to the practitioner. Carson and Langer (2004) highlight how mindfulness enhancement does not follow specific rules and simply (but ambiguously) involves a willingness to seek novelty and explore different perspectives. Perhaps the ability to tolerate ambiguity impacts one's ability to engage with mindfulness, and reciprocally, engaging in mindfulness supports further tolerance. This aligns with a question being asked in the general personality literature; specifically, what is the role of personality in moderating the impact of mindfulness interventions. Several researchers identified those having higher neuroticism deriving more benefit from mindfulness training on psychological outcomes, and some also noted moderating effects of conscientiousness and openness (de Vibe et al., 2015; Krick & Felfe, 2020; Nyklíček & Irrmischer, 2017). Future researchers may be interested in examining AT as a personality variable that could impact the psychological and physiological outcomes of mindfulness intervention.

Objective 2: Persistence and trajectory of induction effects

The current study showed mindfulness was successfully induced by comparing the mindful conditions to the mind-wandering control. For state MM, only the *decentering* facet

showed an interaction effect such that it was greater than the control both at post-induction and at end-of-experiment timepoints. This is consistent with findings in some other studies (see e.g., Cleirigh & Greaney, 2015; Yusainy & Lawrence, 2015) with Erisman and Roemer (2010) suggesting a brief induction might not be enough to invoke all dimensions of mindfulness. However, some researchers have found the opposite effect where only the *curiosity* facet significantly differed at post-intervention (see e.g., Lancaster et al., 2016) while others found significant differences in both facets (see e.g., Adams et al., 2013; Johnson et al., 2015; Vinci et al., 2014). Understanding these differences is beyond the scope of this study, and we invite future researchers to examine the impact of factors like meditation and control type and length as well as meditator experience on state mindfulness dimensions. It is also important to note that the current study measured pre-induction state mindfulness while most studies only contrasted a post-induction measure of state mindfulness. Taking a pre-measure of state mindfulness may be important in controlling for group differences at baseline and in accurately reporting changes due to induction. Finally, similarly to Cleirigh and Greaney (2015) and Erisman and Roemer (2010), the current study observed there is longevity to the mindful effect such that it persisted until the end of the experiment. The current study is shorter in length (approximately 1 hour) than the previous studies (approximately 1.5 to 2.5 hours). Based on their methodology, we can approximate that the induced mindful effect can persist for at least an hour after induction even with intervening tasks. Future researchers might be interested in exploring this further by having participants complete a MM induction and then taking measures of state mindfulness at specific timepoints to further elucidate the trajectory of this effect.

For state LM, a significant interaction effect was found such that state LM was greater in the mindfulness condition compared to the control at post-induction. This suggested that the

manipulation was successful, and state mindfulness was induced. However, unlike MM, this effect did not persist until the end of the experiment. This preliminary finding points to a potential difference between MM and LM induction and is the first study to compare them directly. One caveat is that the state measure of LM has not been validated and was developed for this study. Its internal consistency is notably lower than the consistency of both the full LM and state MM measures. Development of a validated state LM scale and replication of this methodology to compare MM and LM is necessary.

Objective 3: Impact of MM and LM induction on AT

We hypothesized both MM and LM inductions would have a significant impact on AT and judgment certainty as compared to a mind-wandering control; however, a significant difference between conditions was not found when controlling for baseline AT. While there is the potential that our study lacked sufficient power to detect changes, examination of the relevant albeit limited literature suggests meditation alone may not be enough to increase AT. As noted by Brendel et al. (2016), benefit-consistent but insignificant change in ambiguity tolerance was found following an eight week meditation training. They suggested that the training may be too short to observe significant quantitative change. While there are qualitative studies that did indicate change in AT from mindfulness practice, their trainings involved other elements such as discussion and teaching and were much longer (Bohecker et al., 2016; Christopher & Maris, 2010). Reflecting on the general personality literature, traits can change through intervention; however, it may require more time than a single dose induction (e.g., ten weeks) and involves participants being motivated to change (see e.g., Stieger et al., 2021). For mindfulness interventions, several studies have found positive changes in personality (see review by Crescentini & Capurso, 2015). Compared to a control, significant changes were found in the

personality traits (i.e., increases in conscientiousness and reductions in neuroticism; Fabbro et al., 2020) and character scales (i.e., increases in self-directedness, cooperativeness, and self-transcendence; Campanella et al., 2014) of healthy individuals. Similarly in patients with multiple sclerosis, mindfulness training enhanced self-directedness, cooperativeness, and conscientiousness compared to a control (Crescentini et al., 2018). These studies tended to use an eight week training (two hours per session) that included didactic, discursive, and practical components, and Campanella et al. (2014) noted that amount meditative practice affected character change. Taken together, this highlights the possibility that a brief induction is not sufficient in increasing AT; rather a longer and more immersive weekly training is likely needed.

Furthermore, Sagioglou and Forstmann (2013) examined how priming participants with religious concepts changes AT and did find significant increases in intolerance following a brief manipulation. On other hand, our study sought to raise tolerance. Perhaps when promoting intolerance, a brief manipulation is enough to show significant change. However, to impact AT positively, induction may not be enough. Querengässer and Schindler (2014) examined differences in personality traits following an induction of emotional state (i.e., happiness or sadness). The authors noted that neuroticism substantially increased following the sadness induction but a predicted increase in extraversion following happiness was not found. This preliminary suggestion that induction may not be effective in increasing *more* desirable traits but is perhaps effective in enhancing *less* desirable traits, presents an interesting avenue of research.

It is also necessary to consider the impact of the induction task on the study findings. First, the induction task is only 15 minutes long and this might contribute to the lack of effect. While this length is comparable to other induction studies, researchers might consider increasing the duration (e.g., 20 to 30 minutes). Second, for MM, we used an open monitoring script which

emphasizes nonreactivity and nonjudgment of experience. Based on our regression analyses, this type of script would be a good fit as *nonreactivity* was the only facet that significantly contributed to variance in AT. However, there is some debate about the accessibility of such scripts with novice practitioners. On the other end of the meditation spectrum, there are focused attention meditations where meditators notice and detach from distractions (e.g., thoughts) and direct attention to a particular object (e.g., breath; Lutz et al., 2008). Some researchers suggest that open-monitoring scripts are harder than focused attention, and novice meditators begin with focused attention meditations before moving into open-monitoring (see e.g., Lutz et al., 2015). This suggestion has been critiqued by other researchers (see e.g., Brewer et al., 2013), and a recent meta-analysis of induction studies suggested it may actually be easier for novices to follow open-monitoring as opposed to focused attention scripts (Gill et al., 2020). Ultimately, it is necessary to consider that the type of induction script may have had an impact on study findings. As such, it would be interesting for future researchers to explore the effect of a focused attention induction (e.g., mindful breathing). Considering the cross-sectional findings suggest a combined MM and LM model significantly account for the variability in AT, it might also be of interest to examine how a combination of induction tasks might affect AT.

Objective 4: Comparing perceptions of MM and LM tasks

In comparing the two tasks, participants perceived the MM task as easier than the LM task but reported lower focus and ability to follow instructions. Differences were not found on the likeability of the tasks. It is interesting that participants found the MM task easier considering it has been suggested LM might be easier for non-meditators to grasp. Perhaps there is a need to further distinguish what participants found easy. Listening to instructions over headphones might seem easier than having to suggest novel and creative responses. However, the difficulty

participants report with focus and the length they could follow instructions suggest engaging in a meditation is harder than responding to the LM tasks. Retrospectively, it might have been of interest to include a question asking participants about their perceptions on whether they succeeded in completing the task and comparing it to the change in their pre-post state scores. We encourage other researchers to also obtain brief participant feedback on induction tasks to further elucidate the differences in perceptions of MM and LM.

Limitations and Future Directions

There are several key limitations that must be addressed in this study. First, there are issues with the generalizability of the sample as it is an undergraduate and predominantly female sample. These participants also do not have prior meditation experience or training. Future studies could examine a community sample of gender balanced emerging adults (including those not attending university) and explore the impact of meditation experience. If this study is replicated with undergraduate students, it might also be interesting to obtain information about participants' primary field of study. While all participants in this study were taking at least one psychology course, students could be from other departments. Different degrees perhaps require different levels of AT (e.g., psychology is inherently an ambiguous field), so it might be interesting to explore how this impacts findings.

Second, this study utilizes self-report measures which are subject to bias. The measures do demonstrate adequate internal consistency, and most are reliable and valid measures for undergraduate populations. Behavioural measures of mindfulness like breath counting may also be an important alternative to detecting mindfulness induction so as to not rely only on subjective measures (Levinson et al., 2014). For measuring AT, there are currently no state measures. This study sought to manipulate present-level AT through mindfulness; thus, AT

should have been measured at the state, not trait level. While we attempted to manage this limitation by including a behavioural measure of judgment certainty, the development of a state AT measure is necessary. For trait AT, future researchers may be interested in using the Multidimensional Attitude Toward Ambiguity Scale (Lauriola et al., 2016). It divides AT into three factors: 1) *discomfort with ambiguity* (an affective component), 2) *moral absolutism* (cognitive component), and 3) *need for complexity and novelty* (epistemic component). Exploring how trait MM, trait LM, and trait self-compassion are associated with each factor might elucidate the potential mechanisms through which they impact AT.

Third, it is not possible to make causal interpretations on the regression analyses as it uses a cross-sectional design. In addition, previous researchers have noted how examining incremental validity when using measurement-level variables and regression models can lead to greater Type-1 error (Westfall & Yarkoni, 2016). It would be of interest for future researchers to utilize a larger sample size of at least several hundred participants and structural equation modelling approaches. For the induction portion of the experiment, findings suggest that brief induction may not be sufficient in increasing AT. As previously noted, future researchers could examine the effects of both inductions and trainings that combine elements of MM and LM. An induction targeting self-compassion (e.g., Loving-Kindness Meditation) was not examined and might also be of interest given the significant relationship between self-compassion and AT.

Practical Implications

This study sought to examine both the associations between MM facets, LM, and self-compassion with AT and the impact of mindfulness induction on AT in undergraduate students. While there was no significant effect of induction, it appears that a model with both the *nonreactivity* facet of MM and LM account significantly for the variance in AT. These findings

offer practical guidance for educators and researchers who might be interested in strategies for enhancing AT in emerging adults. Mindfulness appears relevant, but a brief induction may not be enough. Further research is required to examine if an induction (e.g., 15-minute exercise) or shorter intervention (e.g., less than six sessions) can improve AT. However, given previous suggestions that a longer intervention may be more effective, emphasis could be placed on developing a more comprehensive training program (e.g., six to eight sessions of at least an hour duration). This program should combine didactic, discursive, and practical components drawing from both the MM and LM literature (see Khoury, 2018; Khoury et al., 2017 for a helpful framework). An effective training to increase AT would include both cognitive elements (e.g., practicing cognitive flexibility, engaging with paradoxes) and emotional elements (e.g., distress tolerance, nonreactivity towards internal experiences). Practical elements will be important as learning to engage with the complexities of mindfulness training itself may also be a way of enhancing AT. Similarly, motivation is an important factor on the effectiveness of interventions targeting personality change; thus, it would be advisable that AT is directly addressed within the program and highlighted as a goal.

This study also highlighted some potential differences between the longevity of the MM and LM induction effects as well as participant perceptions of the tasks. To our knowledge, this reflects one of the first efforts to directly compare MM and LM. These findings offer some important implications to mindfulness research methodology. If participants were asked to complete an intervening task between the LM induction and the AT measures, the mindful effect may have diminished such that there is no longer a difference between the LM and control conditions. Therefore, it is recommended that when conducting induction research, measurements of state mindfulness are taken prior to measuring key outcomes as well as at the

end of the experiment to determine if there was a persistence of the mindful effect. It is further suggested that researchers obtain subjective feedback on induction tasks as it can help determine participant's engagement in the tasks. For example, if participants report being unable to focus at all on the task, it may be important to exclude them from the analyses as they are indicating a substantial difficulty with task engagement.

Conclusion

Emerging adults are facing a rapidly changing world that is rife with economic, technological, and health-related uncertainty; highlighting the need for them to develop their ability to not only live but thrive in ambiguity. Despite the concept of AT being explored since the 1950s and the importance of it being noted in several different fields (e.g., business, education, medicine, psychology), the current literature is limited on how to support emerging adults in enhancing their ability to tolerate ambiguity. The present study highlights the relationship between both schools of Western mindfulness and AT. Future studies can certainly learn from and improve upon the current investigation and hopefully offer more practical recommendations for developing an integrated mindfulness training that targets AT cultivation.

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References

Adams, C. E., Benitez, L., Kinsaul, J., Apperson McVay, M., Barbry, A., Thibodeaux, A., & Copeland, A. L. (2013). Effects of brief mindfulness instructions on reactions to body image stimuli among female smokers: An experimental study. *Nicotine & Tobacco Research*, *15*(2), 376-384. https://doi.org/10.1093/ntr/nts133

Adorno, T. W., Frenkel-Brunswik, E. L., Levinson, D. J., & Sanford, R. N. (1950). *The Authoritarian Personality*. Harper & Brothers.

American College Health Association. (2019, May 10). *American College Health Association - National College Health Assessment II: Canadian reference group data report spring 2019*. http://www.acha-ncha.org/. Accessed 11 Aug 2021

Andersen, S. M., & Schwartz, A. H. (1992). Intolerance of ambiguity and sepression: A cognitive vulnerability factor linked to hopelessness. *Social Cognition*, *10*(3), 271. https://doi.org/10.1521/soco.1992.10.3.271

Arnett, J. J. (2007). Emerging adulthood: What is it, and what is it good for? *Child Development Perspectives*, *1*(2), 68-73. https://doi.org/10.1111/j.1750-8606.2007.00016.x

Arquero, J. L., Fernández-Polvillo, C., Hassall, T., & Joyce, J. (2017). Relationships between communication apprehension, ambiguity tolerance and learning styles in accounting students. *Revista de Contabilidad: Spanish Accounting Review*, *20*(1), 13-24. https://doi.org/10.1016/j.rcsar.2015.10.002

Babaei, K., Gholmohammadzade, S., Mohammadpur asl, a., & Sattari, M. (2021). Investigating the relationship between positive and negative affect experiences and resilience and tolerance of ambiguity among patients with HIV. *Journal of Advanced Biomedical Sciences*, *11*(1), 3741-3749.

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, *13*(1), 27-45. https://doi.org/10.1177%2F1073191105283504

Başöz, T. (2015). Exploring the relationship between tolerance of ambiguity of EFL learners and their vocabulary knowledge. *Journal of Language and Linguistic Studies*, *11*, 53-66.

Beitel, M., Ferrer, E., & Cecero, J. J. (2004). Psychological mindedness and cognitive style. *Journal of Clinincal Psychology*, *60*(6), 567-582. https://doi.org/10.1002/jclp.10258

Bentwich, M. E., & Gilbey, P. (2017). More than visual literacy: art and the enhancement of tolerance for ambiguity and empathy. *BMC Medical Education*, *17*(1), 200.

Bodner, T. E., & Langer, E. J. (2001). *Individual differences in mindfulness: The mindfulness/mindlessness scale* [Conference Presentation]. 13th Annual American Psychological Society Convention, Toronto, Ontario, Canada

Bohecker, L., Vereen, L. G., Wells, P. C., & Wathen, C. C. (2016). A mindfulness experiential small group to help students tolerate ambiguity. *Counselor Education and Supervision*, *55*(1), 16-30. https://doi.org/10.1002/ceas.12030

Brendel, W., Hankerson, S., Byun, S., & Cunningham, B. (2016). Cultivating leadership Dharma: Measuring the impact of regular mindfulness practice on creativity, resilience, tolerance for ambiguity, anxiety and stress. *Journal of Management Development*, *35*(8), 1056-1078. https://doi.org/10.1108/JMD-09-2015-0127

Brewer, J. A., Davis, J. H., & Goldstein, J. (2013). Why is it so hard to pay attention, or is it? Mindfulness, the factors of awakening and reward-based learning. *Mindfulness*, *4*(1), 75-80. https://doi.org/10.1007/s12671-012-0164-8

Budner, S. (1962). Intolerance of ambiguity as a personality variable. *Journal of Personality*, *30*(1), 29-50. https://doi.org/10.1111/j.1467-6494.1962.tb02303.x

Buhr, K., & Dugas, M. J. (2006). Investigating the construct validity of intolerance of uncertainty and its unique relationship with worry. *Journal of Anxiety Disorders*, *20*(2), 222-236. https://doi.org/10.1016/j.janxdis.2004.12.004

Burns, D., Dagnall, N., & Holt, M. (2020). Assessing the impact of the COVID-19 pandemic on student well-being at universities in the United Kingdom: A conceptual analysis [Conceptual Analysis]. *Frontiers in Education*, *5*(204). https://doi.org/10.3389/feduc.2020.582882

Campanella, F., Crescentini, C., Urgesi, C., & Fabbro, F. (2014). Mindfulness-oriented meditation improves self-related character scales in healthy individuals. *Comprehensive Psychiatry*, *55*(5), 1269-1278. https://doi.org/10.1016/j.comppsych.2014.03.009

Carson, S. H., & Langer, E. J. (2004). Mindful practice for clinicians and patients. In *Handbook of Primary Care Psychology.* (pp. 173-183). Oxford University Press.

Chanowitz, B., & Langer, E. J. (1981). Premature cognitive commitment. *Journal of Personality and Social Psychology*, *41*(6), 1051-1063.

Chen, C. C., & Hooijberg, R. (2000). Ambiguity intolerance and support for valuing-diversity interventions. *Journal of Applied Social Psychology*, *30*(11), 2392-2408. https://doi.org/10.1111/j.1559-1816.2000.tb02442.x

Chesley, J., & Wylson, A. (2016). Ambiguity: The emerging impact of mindfulness for change leaders. *Journal of Change Management*, *16*(4), 317-336. https://doi.org/10.1080/14697017.2016.1230334

Christoff, K., Gordon, A. M., Smallwood, J., Smith, R., & Schooler, J. W. (2009). Experience sampling during fMRI reveals default network and executive system contributions to mind wandering. *Proceedings of the National Academy of Sciences*, *106*(21), 8719. https://doi.org/10.1073/pnas.0900234106

Christopher, J. C., & Maris, J. A. (2010). Integrating mindfulness as self-care into counselling and psychotherapy training. *Counselling and Psychotherapy Research*, *10*(2), 114-125. https://doi.org/10.1080/14733141003750285

Chu, W.-H., Lin, D.-Y., Chen, T.-Y., Tsai, P.-S., & Wang, C.-H. (2015). The relationships between ambiguity tolerance, learning strategies, and learning Chinese as a second language. *System*, *49*, 1-16. https://doi.org/10.1016/j.system.2014.10.015

Cleirigh, D. O., & Greaney, J. (2015). Mindfulness and group performance: An exploratory investigation into the effects of brief mindfulness intervention on group task performance. *Mindfulness*, *6*(3), 601-609. https://doi.org/10.1007/s12671-014-0295-1

Colzato, L., Szapora, A., & Hommel, B. (2012). Meditate to create: The impact of focused-attention and open-monitoring training on convergent and divergent thinking. *Frontiers in Psychology*, *3*(116). https://doi.org/10.3389/fpsyg.2012.00116

Crescentini, C., & Capurso, V. (2015). Mindfulness meditation and explicit and implicit indicators of personality and self-concept changes. *Frontiers in Psychology*, *6*(44). https://doi.org/10.3389/fpsyg.2015.00044

Crescentini, C., Matiz, A., Cimenti, M., Pascoli, E., Eleopra, R., & Fabbro, F. (2018). Effect of mindfulness meditation on personality and psychological well-being in patients with multiple sclerosis. *International Journal of MS care*, *20*(3), 101-108. https://doi.org/10.7224/1537-2073.2016-093

Daudelin-Peltier, C., Forget, H., Blais, C., Deschênes, A., & Fiset, D. (2017). The effect of acute social stress on the recognition of facial expression of emotions. *Scientific reports*, *7*(1), 1-13. https://doi.org/10.1038/s41598-017-01053-3

de Vibe, M., Solhaug, I., Tyssen, R., Friborg, O., Rosenvinge, J. H., Sørlie, T., Halland, E., & Bjørndal, A. (2015). Does personality moderate the effects of mindfulness training for medical and psychology students? *Mindfulness*, *6*(2), 281-289. https://doi.org/10.1007/s12671-013-0258-y

DeRoma, V. M., Martin, K. M., & Kessler, M. L. (2003). The relationship between tolerance for ambiguity and need for course structure. *Journal of Instructional Psychology*, *30*(2), 104-109.

Endres, M. L., Camp, R., & Milner, M. (2015). Is ambiguity tolerance malleable? Experimental evidence with potential implications for future research. *Frontiers in Psychology*, *6*, 619-619. https://doi.org/10.3389/fpsyg.2015.00619

Endres, M. L., Chowdhury, S., & Milner, M. (2009). Ambiguity tolerance and accurate assessment of self-efficacy in a complex decision task. *Journal of Management & Organization*, *15*(1), 31-46. https://doi.org/10.5172/jmo.837.15.1.31

Erisman, S. M., & Roemer, L. (2010). A preliminary investigation of the effects of experimentally induced mindfulness on emotional responding to film clips. *Emotion*, *10*(1), 72-82. https://doi.org/10.1037/a0017162

Fabbro, A., Fabbro, F., Capurso, V., D'Antoni, F., & Crescentini, C. (2020). Effects of mindfulness training on school teachers' self-reported personality traits as well as stress and burnout levels. *Perceptual and Motor Skills*, *127*(3), 515-532. https://doi.org/10.1177/0031512520908708

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavavioural Research Methods*, *41*(4), 1149-1160. https://doi.org/10.3758/BRM.41.4.1149

Faul, F., Erdfelder, E., Lang, A. G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavioural Research Methods*, *39*(2), 175-191. https://doi.org/10.3758/bf03193146

Fulton, C. L. (2016). Mindfulness, self-compassion, and counselor characteristics and session variables. *Journal of Mental Health Counseling*, *38*(4), 360-374. https://doi.org/10.17744/mehc.38.4.06

Furnham, A., & Marks, J. (2013). Tolerance of ambiguity: A review of the recent literature. *Psychology*, *4*, 717-728. https://doi.org/10.4236/psych.2013.49102

Garland, E. L., Hanley, A., Farb, N. A., & Froeliger, B. E. (2015). State mindfulness during meditation predicts enhanced cognitive reappraisal. *Mindfulness*, *6*(2), 234-242. https://doi.org/10.1007/s12671-013-0250-6

Gärtner, J., Bußenius, L., Prediger, S., Vogel, D., & Harendza, S. (2020). Need for cognitive closure, tolerance for ambiguity, and perfectionism in medical school applicants. *BMC Medical Education*, *20*, 132. https://doi.org/10.1186/s12909-020-02043-2

Geller, G. (2013). Tolerance for ambiguity: An ethics-based criterion for medical student selection. *Academic Medicine*, *88*(5), 581-584. https://doi.org/10.1097/ACM.0b013e31828a4b8e

Geller, G., Faden, R. R., & Levine, D. M. (1990). Tolerance for ambiguity among medical students: Implications for their selection, training and practice. *Social Science and Medicine*, *31*(5), 619-624. https://doi.org/10.1016/0277-9536(90)90098-D

Geller, G., Grbic, D., Andolsek, K. M., Caulfield, M., & Roskovensky, L. (2021). Tolerance for ambiguity among medical students: Patterns of change during medical school and their implications for professional development. *Academic Medicine*, *96*(7), 1036-1042. https://doi.org/10.1097/acm.0000000000003820

Gill, L.-N., Renault, R., Campbell, E., Rainville, P., & Khoury, B. (2020). Mindfulness induction and cognition: A systematic review and meta-analysis. *Consciousness and Cognition*, *84*, 102991. https://doi.org/10.1016/j.concog.2020.102991

Greenberg, J., Reiner, K., & Meiran, N. (2012). "Mind the trap": Mindfulness practice reduces cognitive rigidity. *PLOS ONE*, *7*(5), e36206. https://doi.org/10.1371/journal.pone.0036206

Grenier, S., Barrette, A.-M., & Ladouceur, R. (2005). Intolerance of uncertainty and intolerance of ambiguity: Similarities and differences. *Personality and Individual Differences*, *39*(3), 593-600. https://doi.org/10.1016/j.paid.2005.02.014

Gudykunst, W. B. (1998). Applying anxiety/uncertainty management (AUM) theory to intercultural adjustment training. *International Journal of Intercultural Relations*, *22*(2), 227-250. https://doi.org/10.1016/S0147-1767(98)00005-4

Hafenbrack, A. C., Kinias, Z., & Barsade, S. G. (2014). Debiasing the mind through meditation: Mindfulness and the sunk-cost bias. *Psychological Science*, *25*(2), 369-376. https://doi.org/10.1177/0956797613503853

Haigh, E. A., Moore, M. T., Kashdan, T. B., & Fresco, D. M. (2011). Examination of the factor structure and concurrent validity of the Langer Mindfulness/Mindlessness Scale. *Assessment*, *18*(1), 11-26. https://doi.org/10.1177/1073191110386342

Hart, R., Ivtzan, I., & Hart, D. (2013). Mind the gap in mindfulness research: A comparative account of the leading schools of thought. *Review of General Psychology*, *17*(4), 453-466. https://doi.org/10.1037/a0035212

Hirsh, J. B., Mar, R. A., & Peterson, J. B. (2012). Psychological entropy: A framework for understanding uncertainty-related anxiety. *Psychological Review*, *119*(2), 304-320. https://doi.org/10.1037/a0026767

Hwang, T. J., & Choi, J. N. (2020). Different moods lead to different creativity: Mediating roles of ambiguity tolerance and team identification. *Creativity Research Journal*, *32*(2), 161-173. https://doi.org/10.1080/10400419.2020.1751542

Iannello, P., Mottini, A., Tirelli, S., Riva, S., & Antonietti, A. (2017). Ambiguity and uncertainty tolerance, need for cognition, and their association with stress. A study among Italian practicing physicians. *Medical Education Online*, *22*(1), 1270009. https://doi.org/10.1080/10872981.2016.1270009

Ie, A., Haller, C. S., Langer, E. J., & Courvoisier, D. S. (2012). Mindful multitasking: The relationship between mindful flexibility and media multitasking. *Computers in Human Behavior*, *28*(4), 1526-1532. https://doi.org/10.1016/j.chb.2012.03.022

Jach, H. K., & Smillie, L. D. (2019). To fear or fly to the unknown: Tolerance for ambiguity and Big Five personality traits. *Journal of Research in Personality*, *79*, 67-78. https://doi.org/10.1016/j.jrp.2019.02.003

Johnson, S., Gur, R. M., David, Z., & Currier, E. (2015). One-session mindfulness meditation: A randomized controlled study of effects on cognition and mood. *Mindfulness*, *6*(1), 88-98. https://doi.org/10.1007/s12671-013-0234-6

Kabat-Zinn, J. (1991). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain, and illness*. Dell Publishing.

Kabat-Zinn, J. (2003). Mindfulness-based interventions in context: Past, present, and future. *Clinical Psychology: Science and Practice*, *10*(2), 144-156. https://doi.org/10.1093/clipsy.bpg016

Kajs, L. T., & McCollum, D. L. (2009). Examining tolerance for ambiguity in the domain of educational leadership. *Academy of Entrepreneurship Journal*, *13*(2), 1-16.

Kalill, K. S., Treanor, M., & Roemer, L. (2014). The importance of non-reactivity to posttraumatic stress symptoms: A case for mindfulness. *Mindfulness*, *5*(3), 314-321. https://doi.org/10.1007/s12671-012-0182-6

Khoury, B. (2018). Mindfulness: Embodied and embedded. *Mindfulness*, *9*(4), 1037-1042. https://doi.org/10.1007/s12671-017-0858-z

Khoury, B. (2019). Compassion: Embodied and embedded. *Mindfulness*, *10*(11), 2363-2374. https://doi.org/10.1007/s12671-019-01211-w

Khoury, B., Knäuper, B., Pagnini, F., Trent, N., Chiesa, A., & Carrière, K. (2017). Embodied Mindfulness. *Mindfulness*, *8*(5), 1160-1171. https://doi.org/10.1007/s12671-017-0700-7

Knight, K., Kenny, A., & Endacott, R. (2016). From expert generalists to ambiguity masters: Using ambiguity tolerance theory to redefine the practice of rural nurses. *Journal of Clinical Nursing*, *25*(11-12), 1757-1765. https://doi.org/10.1111/jocn.13196

Krick, A., & Felfe, J. (2020). Who benefits from mindfulness? The moderating role of personality and social norms for the effectiveness on psychological and physiological outcomes among police officers. *Journal of Occupational Health Psychology*, *25*(2), 99-112. https://doi.org/10.1037/ocp0000159

Kwon, Y., Kim, J. Y., & Keane, A. (2020). The structural relationship among career-related mentoring, ambiguity tolerance, and job search effort and behavior of Korean college students. *Sustainability*, *12*(21), 8834. https://doi.org/10.3390/su12218834

Lancaster, S. L., Klein, K. P., & Knightly, W. (2016). Mindfulness and relaxation: A comparison of brief, laboratory-based interventions. *Mindfulness*, *7*(3), 614-621. https://doi.org/10.1007/s12671-016-0496-x

Langer, E. J. (1989). *Mindfulness*. Da Capo Press.

Langer, E. J. (2005). Well-being: Mindfulness versus positive evaluation. In C. R. Snyder & S. J. Lopez (Eds.), *Handbook of Positive Psychology* (pp. 214–230). Oxford University Press.

Langer, E. J. (2012). The mindless use of medical data. *Journal of Business Research*, *65*(11), 1651-1653. https://doi.org/10.1016/j.jbusres.2011.02.018

Langer, E. J., Hatem, M., Joss, J., & Howell, M. (1989). Conditional teaching and mindful learning. *Creativity Research Journal*, *2*(3), 139-150. https://doi.org/10.1080/10400418909534311

Lau, M. A., Bishop, S. R., Segal, Z. V., Buis, T., Anderson, N. D., Carlson, L., Shapiro, S., Carmody, J., Abbey, S., & Devins, G. (2006). The Toronto Mindfulness Scale: development and validation. *Journal of Clinical Psychology*, *62*(12), 1445-1467. https://doi.org/10.1002/jclp.20326

Lauriola, M., Foschi, R., Mosca, O., & Weller, J. (2016). Attitude toward ambiguity: Empirically robust factors in self-report personality scales. *Assessment*, *23*(3), 353-373. https://doi.org/10.1177/1073191115577188

Levinson, D. B., Stoll, E. L., Kindy, S. D., Merry, H. L., & Davidson, R. J. (2014). A mind you can count on: Validating breath counting as a behavioral measure of mindfulness. *Frontiers in Psychology*, *5*, 1202. https://doi.org/10.3389/fpsyg.2014.01202

Levitt, D. H., & Jacques, J. D. (2005). Promoting tolerance for ambiguity in counselor training programs. *Journal of Humanistic Counseling, Education and Development*, *44*(1), 46. https://doi.org/10.1002/j.2164-490X.2005.tb00055.x

Linden, B., Boyes, R., & Stuart, H. (2021). Cross-sectional trend analysis of the NCHA II survey data on Canadian post-secondary student mental health and well-being from 2013 to 2019. *BMC Public Health*, *21*(1), 590. https://doi.org/10.1186/s12889-021-10622-1

Lippelt, D. P., Hommel, B., & Colzato, L. S. (2014). Focused attention, open monitoring and loving kindness meditation: Effects on attention, conflict monitoring, and creativity - A review. *Frontiers in Psychology*, *5*(1083). https://doi.org/10.3389/fpsyg.2014.01083

Litman, J. A. (2010). Relationships between measures of I-and D-type curiosity, ambiguity tolerance, and need for closure: An initial test of the wanting-liking model of information-seeking. *Personality and Individual Differences*, *48*(4), 397-402. https://doi.org/10.1016/j.paid.2009.11.005

Lundqvist, D., Flykt, A., & Öhman, A. (1998). *The Karolinska directed emotional faces*. Karolinska Institute, Psychology section, Department of Clinical Neuroscience.

Luther, V. P., & Crandall, S. J. (2011). Commentary: ambiguity and uncertainty: Neglected elements of medical education curricula? *Academic Medicine*, *86*(7), 799-800. https://doi.org/10.1097/ACM.0b013e31821da915

Lutz, A., Jha, A. P., Dunne, J. D., & Saron, C. D. (2015). Investigating the phenomenological matrix of mindfulness-related practices from a neurocognitive perspective. *American Psychologist*, *70*(7), 632-658. https://doi.org/10.1037/a0039585

Lutz, A., Slagter, H. A., Dunne, J. D., & Davidson, R. J. (2008). Attention regulation and monitoring in meditation. *Trends in Cognitive Sciences*, *12*(4), 163-169. https://doi.org/10.1016/j.tics.2008.01.005

Lutz, J., Herwig, U., Opialla, S., Hittmeyer, A., Jäncke, L., Rufer, M., Grosse Holtforth, M., & Brühl, A. B. (2014). Mindfulness and emotion regulation--an fMRI study. *Social cognitive and affective neuroscience*, *9*(6), 776-785. https://doi.org/10.1093/scan/nst043

Mangione, S., Chakraborti, C., Staltari, G., Harrison, R., Tunkel, A. R., Liou, K. T., Cerceo, E., Voeller, M., Bedwell, W. L., Fletcher, K., & Kahn, M. J. (2018). Medical students' exposure to the humanities correlates with positive personal qualities and reduced burnout: A multi-institutional U.S. survey. *Journal of General Internal Medicine*, *33*(5), 628-634. https://doi.org/10.1007/s11606-017-4275-8

Mason, M. F., Norton, M. I., Van Horn, J. D., Wegner, D. M., Grafton, S. T., & Macrae, C. N. (2007). Wandering minds: The default network and stimulus-independent thought. *Science*, *315*(5810), 393-395. https://doi.org/10.1126/science.1131295

McLain, D. L. (1993). The MSTAT-I: A new measure of an individual's tolerance for ambiguity. *Educational and Psychological measurement*, *53*(1), 183-189.

McLain, D. L. (2009). Evidence of the properties of an ambiguity tolerance measure: The multiple stimulus types ambiguity tolerance scale–II (MSTAT–II). *Psychological Reports*, *105*(3), 975-988.

McLain, D. L., Kefallonitis, E., & Armani, K. (2015). Ambiguity tolerance in organizations: Definitional clarification and perspectives on future research. *Frontiers in Psychology*, *6*, 344. https://doi.org/10.3389/fpsyg.2015.00344

Merrotsy, P. (2013). Tolerance of ambiguity: A trait of the creative personality? *Creativity Research Journal*, *25*(2), 232-237. https://doi.org/10.1080/10400419.2013.783762

Ndoja, S., Chahine, S., Saklofske, D. H., & Lanting, B. (2020). The erosion of ambiguity tolerance and sustainment of perfectionism in undergraduate medical training: Results from multiple samplings of a single cohort. *BMC Medical Education*, *20*(1), 1-7. https://doi.org/10.1186/s12909-020-02345-5

Neff, K. (2003a). Self-compassion: An alternative conceptualization of a healthy attitude toward oneself. *Self and Identity*, *2*(2), 85-101. https://doi.org/10.1080/15298860309032

Neff, K. D. (2003b). The development and validation of a scale to measure self-compassion. *Self and Identity*, *2*, 223-250. https://doi.org/10.1080/15298860309027

Nevalainen, M. K., Mantyranta, T., & Pitkala, K. H. (2010). Facing uncertainty as a medical student - A qualitative study of their reflective learning diaries and writings on specific themes during the first clinical year. *Patient Education and Counseling*, *78*(2), 218-223. https://doi.org/10.1016/j.pec.2009.07.011

Nicolaidis, C., & Katsaros, K. (2011). Tolerance of ambiguity and emotional attitudes in a changing business environment: A case of Greek IT CEOs. *Journal of Strategy and Management*, *4*(1), 44-61. https://doi.org/10.1108/17554251111110113

Norton, R. W. (1975). Measurement of ambiguity tolerance. *Journal of personality assessment*, *39*(6), 607-619.

Nyklíček, I., & Irrmischer, M. (2017). For whom does mindfulness-based stress reduction work? Moderating effects of personality. *Mindfulness*, *8*(4), 1106-1116. https://doi.org/10.1007/s12671-017-0687-0

Paralkar, U. P. (2019). *Relationship between tolerance of ambiguity, tolerance of uncertainty, and coping with academic stress* (Publication No 13815318) [Master's thesis, Southern Illinois University Carbondale]. ProQuest Dissertations Publishing.

Park, S., Garrison, Y. L., & Liu, W. M. (2020). Career decision ambiguity tolerance of Asian men in the United States. *Journal of Career Development*, *47*(6), 642-656. https://doi.org/10.1177/0894845318811675

Querengässer, J., & Schindler, S. (2014). Sad but true? - How induced emotional states differentially bias self-rated Big Five personality traits. *BMC Psychology*, *2*(1), 14. https://doi.org/10.1186/2050-7283-2-14

Robinson, J. J. (2019). *Mindfulness, tolerance of ambiguty, and attitudes toward interracial relationships* (Publication No 13426037) [Doctoral dissertation, Alliant International University]. ProQuest Dissertations Publishing.

Robinson, J. R., Workman, J. E., & Freeburg, B. W. (2019). Creativity and tolerance of ambiguity in fashion design students. *International Journal of Fashion Design, Technology and Education*, *12*(1), 96-104. https://doi.org/10.1080/17543266.2018.1516807

Roemer, L., Williston, S. K., & Rollins, L. G. (2015). Mindfulness and emotion regulation. *Current Opinion in Psychology*, *3*, 52-57. https://doi.org/10.1016/j.copsyc.2015.02.006

Sagioglou, C., & Forstmann, M. (2013). Activating Christian religious concepts increases intolerance of ambiguity and judgment certainty. *Journal of Experimental Social Psychology*, *49*(5), 933-939. https://doi.org/10.1016/j.jesp.2013.05.003

Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of Clinical Psychology*, *62*(3), 373-386. https://doi.org/10.1002/jclp.20237

Siegling, A. B., & Petrides, K. V. (2014). Measures of trait mindfulness: Convergent validity, shared dimensionality, and linkages to the five-factor model. *Frontiers in Psychology*, *5*, 1164. https://doi.org/10.3389/fpsyg.2014.01164

Stevens, J. (2002). *Applied Multivariate Statistics for the Social Sciences* (4th ed.). Lawrence Erlbaum Associates, Inc.

Stieger, M., Flückiger, C., Rüegger, D., Kowatsch, T., Roberts, B. W., & Allemand, M. (2021). Changing personality traits with the help of a digital personality change intervention. *Proceedings of the National Academy of Sciences of the United States of America*, *118*(8). https://doi.org/10.1073/pnas.2017548118

Swami, V., Stieger, S., Pietschnig, J., & Voracek, M. (2010). The disinterested play of thought: Individual differences and preference for surrealist motion pictures. *Personality and Individual Differences*, *48*(7), 855-859. https://doi.org/10.1016/j.paid.2010.02.013

Van Hiel, A., Onraet, E., & De Pauw, S. (2010). The relationship between social-cultural attitudes and behavioral measures of cognitive style: A meta-analytic integration of studies. *Journal of Personality*, *78*(6), 1765-1799. https://doi.org/10.1111/j.1467-6494.2010.00669.x

Vinci, C., Peltier, M. R., Shah, S., Kinsaul, J., Waldo, K., McVay, M. A., & Copeland, A. L. (2014). Effects of a brief mindfulness intervention on negative affect and urge to drink

among college student drinkers. *Behaviour Research and Therapy*, *59*, 82-93. https://doi.org/10.1016/j.brat.2014.05.012

Westfall, J., & Yarkoni, T. (2016). Statistically controlling for confounding Constructs is harder than you think. *PLOS ONE*, *11*(3), e0152719. https://doi.org/10.1371/journal.pone.0152719

Wolfradt, U., Oubaid, V., Straube, E. R., Bischoff, N., & Mischo, J. (1999). Thinking styles, schizotypal traits and anomalous experiences. *Personality and Individual Differences*, *27*(5), 821-830. https://doi.org/10.1016/S0191-8869(99)00031-8

Xu, H., & Tracey, T. J. G. (2014). The role of ambiguity tolerance in career decision making. *Journal of Vocational Behavior*, *85*(1), 18-26. https://doi.org/10.1016/j.jvb.2014.04.001

Xu, H., & Tracey, T. J. G. (2015). Ambiguity tolerance with career indecision: An examination of the mediation effect of career decision-making self-efficacy. *Journal of Career Assessment*, *23*(4), 519-532. https://doi.org/10.1177/1069072714553073

Yusainy, C., & Lawrence, C. (2015). Brief mindfulness induction could reduce aggression after depletion. *Consciousness and Cognition*, *33*, 125-134. https://doi.org/10.1016/j.concog.2014.12.008

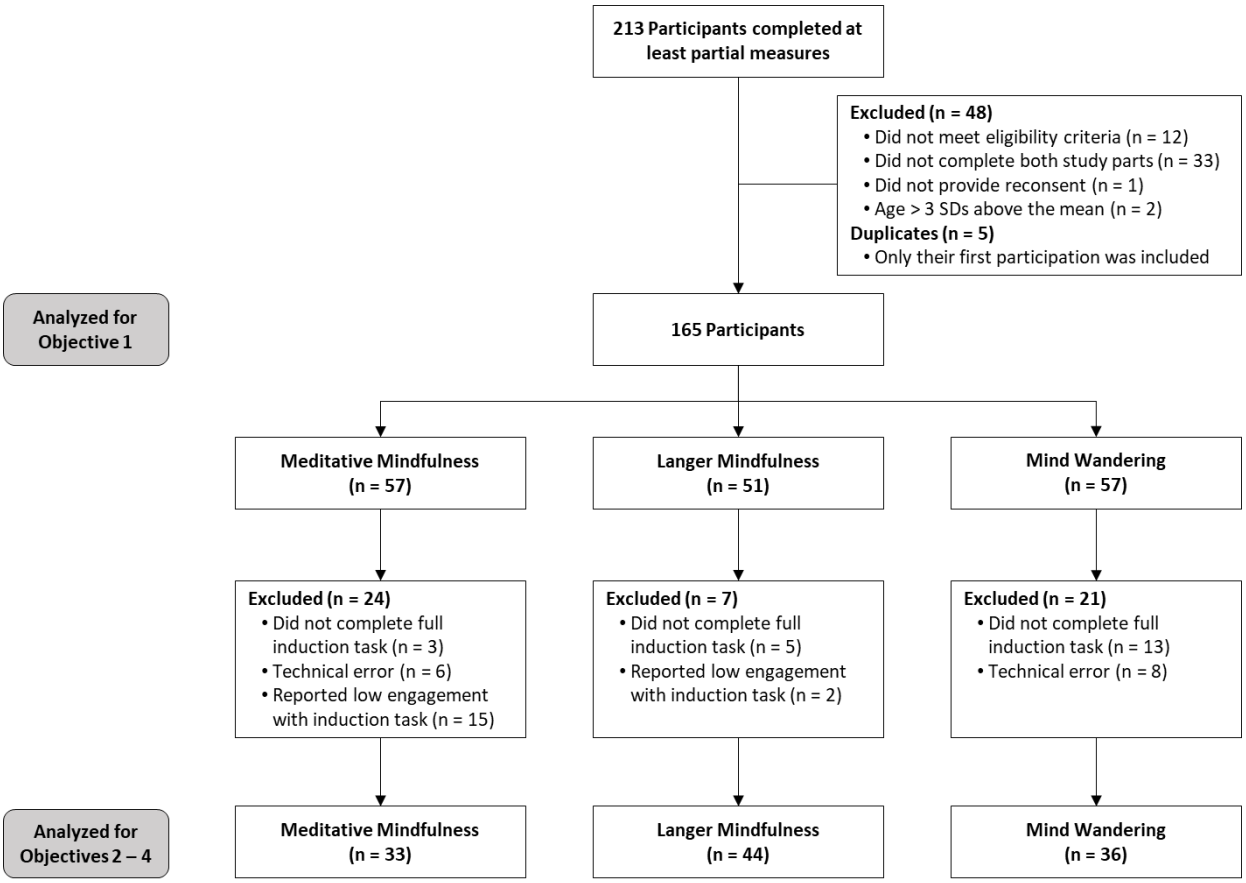
Table 1

Participant demographic information (n = 165).

	Participants (n)
Gender	
Woman	140
Man	23
Trans	1
Gender Variant or Non-Conforming	1
Ethnic Background	
White	89
Chinese	26
Mixed/Biracial	13
South Asian	10
Black	4
Latin American	4
Arab	4
West Asian	3
Korean	3
Filipino	2
Japanese	2
Southeast Asian	1
Indigenous Descent	1
Not listed above	2
Prefer not to answer	1
Birthplace in Canada	
Yes	80
No	84
Prefer not to answer	1
GPA	
1.70 – 2.69	9
2.70 – 3.69	96
3.70 and above	44
Prefer not to answer	16
Student Status	
Full-time	159
Part-time	6
First Generation (Yes)	25
Job Status	
Not employed	107
Part-time	58

Figure 1

Flow diagram illustrating the number of participants analyzed for each objective of the study and reasons for exclusion



Note. Technical error refers to participants who completed two induction tasks due to a program error. Low engagement with the induction task refers to participants who had reported being unable to follow the instructions for at least half the time and/or to at least somewhat focus on the tasks.

Table 2

Descriptive statistics for main variables of analysis in regression analyses

Variable	1	2	3	4	5	6	7	8
1. Ambiguity Tolerance	—							
2. Observing	0.07	—						
3. Describing	0.22**	0.25**	—					
4. Acting with awareness	0.15	0.18*	0.22**	—				
5. Nonjudging	0.07	-0.11	0.13	0.31**	—			
6. Nonreactivity	0.30**	0.09	0.26**	0.14	0.35**	—		
7. Langer mindfulness	0.49**	0.32**	0.37**	0.23**	0.07	0.29**	—	
8. Self-compassion	0.24**	0.14	0.31**	0.26**	0.51**	0.59**	0.24**	—
Mean	4.16	3.35	3.30	3.03	3.02	2.91	5.21	2.81
SD	0.86	0.66	0.82	0.69	0.82	0.67	0.63	0.64

*$p < .05$. **$p < .01$.

Table 3

Mindfulness facets, Langer mindfulness, and self-compassion regressed onto ambiguity tolerance

Predictor	Ambiguity Tolerance				
	b	**SE**	***β***	**t**	***p***
Observing	-0.05	0.11	-0.04	-0.46	0.65
Describing	0.12	0.09	0.11	1.37	0.17
Acting with awareness	0.16	0.10	0.13	1.51	0.13
Nonjudging	-0.11	0.09	-0.10	-1.22	0.23
Nonreactivity	0.39	0.11	0.30	3.54	<0.001
Langer mindfulness	0.67	0.09	0.49	7.12	<0.001
Self-compassion	0.32	0.10	0.24	3.06	0.003
	b	**SE**	***β***	**t**	***p***
Step One					
Langer Mindfulness	0.66	0.10	0.49	6.90	<0.001
Step Two					
Langer Mindfulness	0.59	0.10	0.44	6.12	<0.001
Nonreactivity	0.24	0.09	0.19	2.60	0.01
Step Three					
Langer Mindfulness	0.59	0.10	0.44	6.09	<0.001
Nonreactivity	0.24	0.11	0.19	2.12	0.04
Self-compassion	0.004	0.12	0.003	0.04	0.97

Note. β = standardized beta coefficient; b = unstandardized beta coefficient; SE = unstandardized standard error.

Table 4

Descriptive statistics of one-way repeated-measures ANOVA tests for state meditative (and its two facets) and Langer mindfulness. Means and standard deviations are listed.

Measure	Condition	Baseline *M (SD)*	Post-intervention *M (SD)*	Follow-up *M (SD)*
Decentering (TMS)	MM	1.74 (0.59)	2.58 (0.59)	2.34 (0.59)
	MW	1.85 (0.61)	2.36 (0.73)	1.93 (0.81)
Curiosity (TMS)	MM	2.33 (0.87)	2.79 (0.72)	2.47 (0.91)
	MW	2.08 (0.92)	2.47 (0.95)	2.01 (1.07)
sLMS	LM	4.89 (0.91)	5.35 (0.68)	5.04 (0.81)
	MW	4.87 (0.86)	4.84 (1.02)	5.04 (0.90)

Note. M = mean; MM = meditative mindfulness; LM = Langer mindfulness; *SD* = standard deviation; sLMS = State Langer Mindfulness Scale; TMS = Toronto Mindfulness Scale.

Bridge to Chapter 4

In Chapter 3, we examined the impact of meditative (MM) and Langer mindfulness (LM) inductions on ambiguity tolerance (AT) in undergraduate students using a randomized controlled design. We also explored the relationship between MM, LM, self-compassion, and AT using baseline measures. Although the inductions were found to be successful, we did not find a significant increase in AT following a mindfulness induction compared to a mind-wandering control. We did find that the *nonreactivity* facet of MM, LM, and self-compassion are all significantly associated with AT, and that only the *nonreactivity* facet adds to the variation in AT beyond what is accounted for by LM.

There are several important implications of these findings. First, a brief induction may not be sufficient in enhancing AT. This would be consistent with the larger personality literature where researchers suggest that longer and more immersive and intentional trainings are needed to change personality variables (e.g., Stieger et al., 2021) with amount of meditation potentially affecting character change (e.g., Campanella et al., 2014). Thus, efforts could be placed in developing a longer and more comprehensive program that combines didactic, discursive, and practical components. Second, the program should draw from both the MM and LM literatures as well as include cognitive exercises and meditations that emphasize nonreactivity. Although self-compassion did not add to the hierarchical model, its significant association with mindfulness suggests it could still be a helpful component to include in a training program. Furthermore, Conversano et al. (2020) proposed that integration of mindfulness and compassion in training programs could enhance the effect on outcomes for health-care professionals. Third, it is important for motivation to directly address AT and highlight the intervention's goal of cultivating AT.

Chapter 2 established evidence for the psychological benefits of mindfulness on trainees and methodological guidance for assessing mindfulness interventions. Chapter 3 highlighted the factors that should be accounted for when designing a training program targeting AT. Combining what was learned from both studies together, we developed a six-week mindfulness and compassion-based training that emphasizes enhancing AT and is specifically designed for counsellors-in-training (CITs). As the program needed to include both operationalizations of Western mindfulness, we decided it was important to include compassion towards self and others due to its benefits on self-care, Thus, we elected to develop the training using the Embodied and Embedded Mindfulness and Compassion Framework which offers a novel, unified model that draws on Buddhist, MM, LM, and compassion literatures (Khoury, 2018; Khoury, 2019; Khoury & Dionne, 2020; Khoury et al., 2020; Khoury et al., 2017a).

Mindfulness and compassion are conceptualized to have embodied (intrapersonal) and embedded (interpersonal) dimensions. The theory of embodiment emphasizes how the body holds experience and knowledge and the bidirectional relationships between affect, cognition, behaviour, and the body (Lakoff & Johnson, 1999; Niedenthal et al., 2005). More specifically, perception, action, as well as affective, cognitive, and motivational experience are grounded in the brain's sensory, motor, and introspective systems respectively. Embodied mindfulness is a skill involving the self-regulation of attention and awareness as well as the acceptance of one's present internal (i.e., emotions, cognitions, sensations) and external environments (Khoury et al., 2017a). The dimensions underlying this skill include learning to 1) decenter or detach from automatic thoughts, 2) be aware of sensations in the body, 3) feel connected to the body, 4) be aware of bidirectional links between the mind and body, and 5) accept one's feelings and sensations (Khoury et al., 2021). Embodied compassion manages distress and suffering by

directing compassion towards oneself and is composed of affective, cognitive, behavioural, and interpersonal dimensions (Khoury, 2019; Khoury & Dionne, 2020). It is a skill in which one learns to 1) develop a healthy self-love and self-kindness that is grounded in physical experience (affective dimension), 2) think about oneself in a compassionate, nonjudgmental, and validating manner (cognitive dimension), and 3) cultivate a practice of concrete actions that support self-care (behavioural dimension).

Embedded mindfulness and compassion refer to the interpersonal components of these constructs (Khoury, 2018; Khoury, 2019; Khoury & Dionne, 2020; Khoury et al., 2020). Mindfulness has interpersonal implications (e.g., mindful parenting, therapy), and embedded mindfulness refers to a set of skills in which one can 1) detach from the mind to be fully present and aware of the body during interpersonal interactions and 2) interact with others in a way that is mindful (i.e., nonjudgmental, nonreactive, open, curious, etc.) and attentive to and aware of the other person's state (Khoury et al., 2022). Some definitions of compassion have an embedded component; for example, Neff (2003a) included the concept of common humanity. Embedded compassion (or compassion towards others) is a skill that requires feeling, thinking, and acting compassionately as well as both accepting compassion from others and offering it to others in a way that is empathetic, nonjudgmental, and sensitive.

The framework had been previously used to develop a group treatment for non-suicidal self-injury by Dr. Bassam Khoury. This program was adapted to emphasize ambiguity tolerance and to reflect the experience of counsellors-in-training. We focused the program on students completing their first clinical practicum as it is a process rife with ambiguity which can contribute greatly to student stress (Levitt & Jacques, 2005; Pica, 1998; Skovholt & Rønnestad, 2003). Although the program was initially designed to be in person, we moved it online due to

the pandemic. This created an opportunity to examine electronic delivery of mindfulness training and to recruit students from graduate programs across Canada.

Thus, Chapter 4 addresses the development of this program and describes a pilot study conducted to assess its acceptability and feasibility. We examined 1) the changes in AT as well as measures of process (i.e., mindfulness and self-compassion), distress (e.g., stress), and well-being (e.g., life satisfaction) from baseline to post-training and three-month follow-up, 2) the changes in how participants perceived and practiced mindfulness and compassion from baseline to three-month follow-up, and 3) participants' feedback on their experience in the training (i.e., what they learned, liked, and would change).

Chapter 4: Enhancing Ambiguity Tolerance in Counsellors-in-training: A Pilot Program

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Abstract

The inherent ambiguity of therapy is a significant source of stress for novice counsellors-in-training. As such, developing their ability to tolerate ambiguity is an important task within their clinical development. We sought to examine the effects of a novel six-week mindfulness and compassion program on ambiguity tolerance and well-being measures in counsellors-in-training working with clients for the first time. Twenty-three counsellors-in-training from across Canada completed measures of ambiguity tolerance, mindfulness, self-compassion, psychological distress, and life and work satisfaction at baseline, post-training, and three-month follow-up. Participants also provided brief written feedback on the program to assess its feasibility and acceptability. Nonparametric analyses revealed significant increases in the epistemic dimension of ambiguity tolerance, overall meditative mindfulness, self-warmth, and life satisfaction at post-training and follow-up. All participants recommended this training to other students and reported increased knowledge of mindfulness, compassion, and ambiguity tolerance. Future studies should assess this program using a controlled design.

Keywords: ambiguity tolerance, meditative mindfulness, Langer mindfulness, compassion, training program, novice counsellors

Introduction

Counsellors-in-training (CITs) are critical to the mental health care system. Not only will they fill roles as professionals and leaders in the future, but they also help manage the growing and urgent demand for accessible therapy by providing services as part of their training. However, the nature of clinical training is immensely challenging, and the literature highlights its impacts on distress (e.g., burnout, compassion fatigue, depression, stress; Kumary & Baker, 2008; Pakenham & Stafford-Brown, 2012; Richardson et al., 2020) and the need for CITs to engage in self-care (Maranzan et al., 2018; Posluns & Gall, 2020; Thériault et al., 2015). When examining what might contribute to distress in CITs, the ambiguity of clinical work emerges as an important factor (Levitt & Jacques, 2005; Pica, 1998; Skovholt & Rønnestad, 2003).

Conceptualizations of ambiguity are not ubiquitous, but a common definition is that it reflects situations that are novel, complex, insoluble, and/or incomplete (Budner, 1962; McLain et al., 2015). They might be unfamiliar, difficult to characterize, open to interpretation, containing contradictory cues, and/or require more information for resolution. Given this definition, it becomes clear how the mental health profession is inherently ambiguous: 1) every client is unique, 2) there are many active variables within a session such that it can be confusing and hard to navigate, 3) many ethical and effective methods exist for providing care, and 4) information is gathered and revealed over time such that clinicians often work with incomplete histories. While mental health professionals often have the confidence and experience to manage ambiguity, CITs are developing such tolerance and are often unprepared for this process (Pica, 1998). They also face additional ambiguity as they try to simultaneously obtain and apply clinical knowledge and skills, manage their reactions, and develop their professional identity (Jahn & Smith-Adcock, 2017; Skovholt & Rønnestad, 2003).

How CITs respond to ambiguity is predicted by their ambiguity tolerance (AT; McLain et al., 2015). There are many definitions of AT (see reviews by Furnham & Marks, 2013; McLain et al., 2015), but most simply, it is series of reactions towards ambiguity that can range from attraction to rejection within the emotional (e.g., distress, excitement), cognitive (e.g., rigid thinking patterns, multiple perspectives), and behavioural (e.g., avoidance, approach) domains (Grenier et al., 2005). Lauriola et al. (2016) developed a measure of AT that identified three distinct dimensions of AT: 1) *affective*, 2) *cognitive*, and 3) *epistemic*. The *affective* dimension refers to one's discomfort with ambiguity and the level of anxiety and distress one might feel to an ambiguous situation. The *cognitive* dimension refers to one's level of rigidity and the use of moral absolutism, perspective narrowing, premature closure, or splitting in managing the *cognitive* complexity of ambiguity. Finally, the *epistemic* dimension refers to one's approach towards novelty and complexity as well as acceptance of ambiguity.

AT is considered characteristic of master therapists, with higher AT correlating with lower perfectionism and greater work satisfaction (Wittenberg & Norcross, 2001). It is also considered to be helpful in maintaining a stance of curiosity, openness, and flexibility towards clients which may support more effective and ethical clinical interventions (Jennings et al., 2005). CITs' AT positively correlates with effective communication (Brams, 1961) and communication of empathy and respect (Jones, 1974). Furthermore, educators rated those with higher AT as being more encouraging and effective in communicating with clients (Gruberg, 1969). Developing the ability to manage ambiguity can also be exciting and brings feelings of hope (Jahn & Smith-Adcock, 2017). On the other hand, when the ambiguity becomes intolerable, CITs can become overwhelmed, and this may lead to anger, anxiety, confusion, fear, and self-doubt. CITs with lower tolerance may also experience greater anxiety when facing ambiguity

and could reduce it through using more directive techniques (e.g., advising) in session and emphasizing a single perspective (Gruberg, 1969; McAuliffe & Lovell, 2006). In turn, this can impact how well CITs attend to their clients (Maguen, 1993; Pica, 1998).

The development of AT is a critical task of CITs and should be supported in clinical training (Levitt & Jacques, 2005). Some qualitative research on this subject points to the importance of acceptance, engagement, and self-awareness. Jahn and Smith-Adcock (2017) found CITs coped with ambiguity by exploring multiple perspectives, engaging in positive self-talk, developing self-awareness, normalizing and preparing for ambiguity, as well as taking risks. Engaging and attending to ambiguity can also bring acceptance, meaning, and confidence (Boss, 2006). Other researchers have pointed to the importance of educators and supervisors addressing ambiguity by predicting and normalizing it in group discussions, sharing their experiences, and offering empathy, as well as encouraging reflective writing, student mentorship, and personal therapy (Jahn & Smith-Adcock, 2017; Levitt & Jacques, 2005; Pica, 1998; Skovholt & Rønnestad, 2003; Winborn & Martinson, 1965).

Mindfulness and Compassion

Mindfulness and self-compassion (SC) have also emerged as promising strategies for cultivating AT (Bohecker et al., 2016; Christopher & Maris, 2010). In general, mindfulness and compassion training programs are known to support trainees' self-care and well-being (see reviews by Rudaz et al., 2017; Spinelli et al., 2019). This is especially important for Canadian CITs as self-care is a professional responsibility highlighted in the Canadian Code of Ethics for Psychologists (Canadian Psychological Association, 2017). However, self-care remains to be insufficiently emphasized in graduate programs, and there is a need for resources specific to the training context and to proactively teach students about self-care (Maranzan et al., 2018).

Definitions of mindfulness vary (see Khoury et al., 2017), but Western conceptualizations of mindfulness generally fall into two schools. First, meditative mindfulness (MM) developed from Buddhist traditions and refers to a nonjudgmental and purposeful manner of being alert, attentive, and aware of the present (Kabat-Zinn, 1991). Baer et al. (2006) offered a five-facet conceptualization that includes: 1) observation of the present internal (e.g., thoughts, feelings, sensations) and external environments, 2) description of the present with words, 3) awareness of one's actions in the present, 4) nonjudgment of thoughts and feelings, and 5) nonreaction towards thoughts and feelings through detachment. Meditation is used to develop a mindful practice, and it can be learned on its own or through programs that combine practice, teaching, and discussion. Second, Langer mindfulness (LM) is a socio-cognitive ability where one is actively and effortfully attending to the present, being open to novelty, creating new categories or perspectives, and being flexible towards the present by holding and shifting between multiple perspectives (Langer, 1989). LM tends to be induced through brief tasks that target one of its key components (e.g., producing novelty). For clinicians, Carson and Langer (2004) suggested methods to enhance mindfulness like using conditional language, considering paradoxes, and viewing a problem from different perspectives.

Definitions of compassion are also subject to debate due to shortcomings with its current conceptualization, the inclusion of mindfulness in its definitions, and unclear delineation between compassion towards the self versus others (see Khoury, 2019). Neff (2003a) described SC to be composed of three facets: 1) self-kindness (i.e., offering oneself understanding in the face of inadequacy), 2) common humanity (i.e., recognizing suffering is a shared experience), and 3) mindfulness (i.e., attending to distressing emotions and cognitions without avoidance and overidentification). There are specific practices that cultivate SC (e.g., self-compassion break,

loving-kindness meditation), and, like MM, it has been taught through training programs.

Given the equivocal definitions and conceptualizations of both mindfulness and compassion, Khoury and colleagues (2017, 2018, 2019, 2020) developed the Embodied and Embedded Mindfulness and Compassion (EEMC) framework. This unified model conceptualizes mindfulness and compassion as having embodied (intrapersonal) and embedded (interpersonal) dimensions. Embodiment refers to the theory that there is a bidirectional relationship between affect, cognition, behaviour, and the body where knowledge and experience are grounded in the body. Embodied mindfulness refers to self-regulated attention, awareness, and acceptance of present internal (i.e., emotions, cognitions, sensations) and external states (Khoury et al., 2017) while embodied compassion refers to compassion towards oneself as a way of alleviating distress and suffering (Khoury, 2019). Embedded extends the definition of mindfulness and compassion into the interpersonal realm (Khoury, 2018; 2019). Mindfulness definitions do not generally focus on the social context; however, research shows that mindfulness has interpersonal implications (e.g., mindful parenting). Embedded compassion refers to compassion towards others and is a skill in which one learns to both accept compassion from others and to offer compassion through affective, cognitive, and behavioral elements (e.g., acting in an empathetic and nonjudgmental manner).

Mindfulness and compassion are skills that can be taught and practiced, making them important avenues for enhancing AT. Conceptually, they could impact each of the aforementioned dimensions of AT (Lauriola et al., 2016). For the *affective* dimension, when ambiguity is experienced as anxiety provoking, learning to mindfully detach from and accept one's emotional experience as well as offering kindness towards oneself can help manage distress. Furthermore, in learning to stay with these emotions and experiencing how their

intensity diminishes over time, one can learn they do not need to avoid ambiguity. For the *cognitive* dimension, intolerance towards ambiguity is characterized by adopting a rigid and dichotomous framework. In opposition, mindfulness and compassion support detachment from thoughts, thinking about oneself and others nonjudgmentally, learning to hold and accept different perspectives, and staying open to novelty. Finally, for the *epistemic* dimension, mindfulness involves curiosity and seeking novelty and complexity. The common humanity component of compassion may also support seeing ambiguity as part of the human experience and a way of connecting to others. Perhaps this can also facilitate acceptance of ambiguity.

There is some empirical research supporting the proposed links between AT, mindfulness, and compassion. Cross-sectional research suggests that MM, LM, and SC are significantly and positively correlated with AT (Fulton, 2016; Hitsuwari & Nomura, 2021; Ie et al., 2012; Spinelli et al., 2022). Qualitative research by Christopher and Maris (2010) highlighted the impact of an elective mindfulness course on counselling trainees' ability to manage emotional ambiguity (e.g., when experiencing many different emotions at one time). Participants noted becoming more open and flexible towards their experience and reported a greater ability to observe their inner states (i.e., emotions and thoughts). By creating space between observation and reaction, this increased AT and SC. Furthermore, Bohecker et al. (2016) described the qualitative effects of an eight-week mindfulness-based experiential group designed for CITs on increasing their ability to navigate ambiguity. They suggested a five-dimensional model for how participants learned to manage ambiguity through the group process; specifically, they 1) experienced *fear* and not knowing what would happen in the group, 2) *learned* new mindfulness skills, 3) *practiced* mindfulness, 4) intentionally *integrated* mindful concepts into their way of being, and 5) *translated* their learned skills outside of the group.

These studies point to the potential for applying mindfulness towards AT development. However, more empirical evidence is clearly needed, and there are some important limitations to the current programs. The training described by Christopher and Maris (2010) is a full semester course which may not be accessible for many graduate students. Bohecker et al. (2016) appeared to focus more on intrapersonal mindfulness, and their program description did not include any references to interpersonal mindfulness or discussion of compassion. Integration of mindfulness and compassion in training programs has been recommended as it may enhance intervention effects (Conversano et al., 2020). In addition, the proposed methods of increasing AT suggest the importance of naming and discussing how ambiguity manifests in clinical work and training. It is unclear if this was directly addressed in either program.

Thus, we developed a six-week training program based on the EEMC framework that directly addresses the experience of ambiguity in Canadian CITs. This pilot study sought to assess the feasibility and acceptability of this program by 1) exploring the impact of the training on the primary outcome (AT), process outcomes (MM, LM, and SC), distress related outcomes (anxiety, depression, stress), and well-being related outcomes (life and work satisfaction) at post-training and three-month follow-up, 2) examining changes in participants' perceptions and practice of mindfulness and compassion from baseline to three-month follow-up, and 3) summarizing participant feedback post-training.

Methods

Participants

Twenty-seven students self-selected to participate in the study. They were eligible if they were 1) enrolled in a Canadian graduate program to become a licensed counsellor/therapist and 2) providing services to clients for the first time that school year. Four participants responded to

baseline measures but withdrew before the training began (n = 3) or after the first session (n = 1). This left 23 participants who completed the study. All participants were offered pro-rated monetary compensation (up to $100).

Recruitment

Participants were recruited from universities across Canada through advertisements on social media (e.g., Facebook), emails sent via university resources (e.g., program Listservs), as well as brief presentations. The study was initially approved by the authors' university Research Ethics Board (REB). Other university REBs were contacted to request approval/acknowledgment for recruitment. Once obtained, relevant programs were emailed about sharing recruitment materials. Interested students emailed the researchers who confirmed their eligibility.

Mindfulness and Compassion Training Program

The program aimed to enhance AT in novice clinicians through mindfulness and compassion training as conceptualized by the EEMC framework. The first and third authors collaborated on the design and tailored it for CITs. Feedback was also provided by two psychologists with significant supervision experience. The six-week program (90 minutes each session) was initially designed to be in person but moved online due to the global pandemic. Three groups were held across two semesters and were facilitated by the first author on Zoom.

The main goals of the program were to 1) teach and encourage participants to practice mindfulness and compassion, 2) discuss ambiguity in the field of counselling and in their daily lives, 3) provide a space to discuss and reflect on participants experiences as new counsellors, and 4) discuss the practical and clinical applications of mindfulness and compassion-based practices. A brief description of the six-week syllabus can be found in Table 1. Between sessions, participants were encouraged but not required to engage in daily at-home mindfulness

exercises (e.g., breathing meditations) as well as complete reflections and readings. They were provided a reflective journal that contained a weekly suggested reading, reflective writing prompts (used to guide in-session discussions), links to meditations, and other relevant resources. Between the post-training and the three-month follow-up, three emails (once per month) were sent to participants containing additional mindfulness resources.

Procedure

Participants provided informed consent and were asked to complete self-report outcome measures at baseline, post-training, and at a three-month follow-up. The primary, process, distress, and well-being outcomes were assessed at all time-points. Information on socio-demographics and supervision experiences were obtained at baseline. They also responded to questions about their mindfulness experience at baseline and follow-up and provided reports of their weekly practice. Finally, participants evaluated the program by providing brief feedback at baseline and post-training. All data were collected using LimeSurvey.

Measures

Socio-demographics

This measure collected information on age, gender, ethnic background, education level, occupation, and living situation.

Supervision Experience

This measure collected information on supervision experience (e.g., number of supervisors, level of exposure/discussion of AT, mindfulness, compassion, and self-care).

Mindfulness Experience

This measure collected information on mindfulness experience; including level of knowledge, practice of mindfulness, and importance mindfulness has in their daily life.

Weekly Mindfulness Log

Collected information weekly on daily at-home mindfulness practice during the program. Participants were asked to record the duration and type of practice.

Program Evaluation

Collected information on knowledge of AT, mindfulness, and compassion as well as their comfort using mindfulness and compassion with clients at baseline and post-training. Five items were measured on a 5-point Likert scale ranging from 1 ("Not very knowledgeable/comfortable) to 5 ("Very knowledge/comfortable). At post-training, participants were asked to provide brief written feedback on the program (e.g., what they learned, liked, and would change). They also rated the engagement of the facilitator on a 5-point Likert scale ranging from 1 ("Not engaging at all") to 5 ("Very engaging") and stated whether they would recommend the program.

Primary Outcome

The three dimensions of AT was measured using the Multidimensional Attitudes towards Ambiguity Scale which consists of 30 items (Lauriola et al., 2016). Participants rated their agreement with statements pertaining to how they respond when confronted with ambiguous situations on a 7-point Likert scale, ranging from 1 ("I strongly disagree") and 7 ("I strongly agree"). A sample item is "It intensely disturbs me when I am uncertain of how my actions will affect others." It had adequate to good internal consistency across timepoints for each dimension: *affective* ($\alpha = .79$ to $\alpha = .84$), *cognitive* ($\alpha = .79$ to $\alpha = .83$), and *epistemic* ($\alpha = .63$ to $\alpha = .74$).

Process Outcomes

Meditative mindfulness (and its five facets) was measured using the Five Facet Mindfulness Questionnaire-15 which consists of 15 items (Baer et al., 2008; Gu et al., 2016). Participants rated how true they find statements pertaining to mindfulness on a 5-point Likert

scale, ranging from 1 (“Never or Very rarely true”) to 5 (“Very often or Always true”). A sample item is “I find myself doing things without paying attention.” It had adequate to good internal consistency across timepoints for each facet: *observing* (α = .58 to α = .65), *describing* (α = .75 to α = .91), *acting with awareness* (α = .68 to α = .88), *non-judgment* (α = .71 to α = .86), and *nonreactivity* (α = .58 to α = .82).

Langer mindfulness was measured using the Langer Mindfulness Scale which consists of 14 items (Bodner & Langer, 2001; Pirson et al., 2012). Participants rated their agreement with items pertaining to novelty seeking, novelty producing, and engagement on a 7-point Likert scale, ranging from 1 (“Strongly disagree”) and 7 (“Strongly agree”). A sample item is “I like to investigate things.” It had good internal consistency across timepoints (α = .70 to α = .82).

Self-compassion was measured using the Self-Compassion Scale which consists of 26 items (Neff, 2003b). While the original scale uses a single factor model, researchers now suggest utilizing a two-composite model (Gilbert et al., 2011; Per et al., 2021). Participants rated how often they behave in a way that is reflective of self-warmth (comprised of the self-kindness, common humanity, and mindfulness subscales) and self-coldness (comprised of the self-judgment, isolation, and over-identification subscales) on a 5-point Likert scale, ranging from 1 (“Almost never”) to 5 (“Almost always”). A sample item is “I try to see my failings as part of the human condition.” It had good internal consistency across timepoints for each composite: *self-warmth* (α = .89 to α = .90) and *self-coldness* (α = .86 to α = .89).

Participants also completed four measures based on the EEMC framework (Embodied Mindfulness Questionnaire, Interpersonal Mindfulness Questionnaire, Compassion towards Self and Others Questionnaires). As these measures are undergoing validation, their results are presented in other manuscripts (e.g., Khoury et al., 2021).

Distress Outcomes

Anxiety, depression, and stress were measured using the Depression, Anxiety and Stress Scale-21 which consists of 21 items (Lovibond & Lovibond, 1995). Participants rated how much statements about their physical and emotional state applied to them over the past week on a 4-point Likert Scale, ranging from 0 ("Did not apply to me") to 3 ("Applied to me very much, or most of the time"). A sample item is "I couldn't seem to experience any positive feeling at all." Anxiety had adequate internal consistency across timepoints ($\alpha = .56$ to $\alpha = .65$). Depression ($\alpha = .62$ to $\alpha = .89$) and stress ($\alpha = .68$ to $\alpha = .80$) had adequate to good internal consistency.

Well-being Outcomes

Satisfaction with life was measured using the Satisfaction with Life Scale which consists of five items (Diener et al., 1985). Participants rated their agreement with statements about their life on a 7-point Likert scale, ranging from 1 ("Strongly disagree") to 7 ("Strongly agree"). A sample item is "In most ways my life is close to my ideal." It had good internal consistency across timepoints ($\alpha = .80$ to $\alpha = .87$).

Job satisfaction was measured using the Job Satisfaction Survey (Spector, 1985). Two of the nine dimensions were included and modified; specifically, *supervision* and *nature of work*. For *supervision,* participants first rated their agreement with four statements pertaining to their perception of their primary clinical supervisor. The items were then repeated, but participants rated them based on their research supervisor (if they had one). For *nature of work*, participants rated their agreement with statements about their enjoyment of work. The four items originally used the word "job" which were replaced with "work as a clinician." The 12-items were rated on a 6-point Likert Scale, ranging from 1 ("Disagree very much") and 6 ("Agree very much"). A sample item is "My clinical supervisor is quite competent in doing his/her job." They had good

internal consistency across timepoints: c*linical supervision* (α = .81 to α = .88), *research supervision* (α = .91 to α = .96), and *nature of work* (α = .74 to α = .75).

Data Analyses

Means were calculated such that those who did not complete at least 80% of the items within each variable were excluded. Listwise deletion was used to omit missing data, and univariate outliers (± 3.5 SD) were removed. Normality was measured by the Shapiro-Wilk's test, and the outcomes were inconsistent in conforming to this assumption across timepoints. This is unsurprising as the outcomes being measured are trainable skills or distress measures that can produce skewed distributions. Combined with the small sample size, we elected to use a nonparametric approach. All quantitative analyses comparing post-training and follow-up to baseline were performed using Wilcoxon signed-rank tests. The methodological process of summarizing brief participant feedback generally lacks clarity in the literature (Decorte et al., 2019). Our process was guided by the steps of a thematic analysis approach (Clarke & Braun, 2013). The first and second authors familiarized themselves with the participants' brief written statements and then separated each sentence. They then used an open, inductive process to code each line and then grouped the codes into key themes/topics. These were reviewed several times to ensure the statements were accurately described. They then noted the number of times each code appeared across participants. Analyses were conducted using IBM SPSS (Version 27).

Results

Descriptive Statistics

Participants (22 women and 1 man) were between the ages of 23 and 44 years old (M = 29.04, SD = 6.46). Most participants identified as White (n = 13), unemployed (n = 16), and reported always or mostly having enough money to meet basic needs (n = 20). English was the

mother tongue of most participants (n = 18), and most reported being able to speak another language (n = 13). Participants were attending eleven different universities in six Canadian provinces (Alberta, British Columbia, New Brunswick, Ontario, Quebec, Saskatchewan) to complete either a Master's degree (n = 19) or doctoral program (n = 4) in counselling psychology (n = 18) or clinical psychology (n = 5). All participants had completed less than two years of their program with the majority being in their first year (n = 19).

With regards to their baseline mindfulness experience, most participants had experience practicing mindfulness, meditation, or yoga (n = 19). Most reported having previously tried it and they found it hard to do (n = 11), found it helpful (n = 7), found it very helpful (n = 2), or found it had changed their lives (n = 3). Some participants reported having started their practice in the past year (n = 8), others in the last five years (n = 8), and some between five and ten years ago (n = 3). A few participants had never tried it but thought it was interesting (n = 3).

As part of their clinical training, all participants received supervision. Of the 30 different supervision experiences (19 group and 11 individual), participants reported the supervision involved assigned readings (n = 13), reflective writing on clinical development (n = 8), mindfulness practice (n = 3), self-care (n = 6), and discussion of topics beyond clinical work (n = 10). Some participants reported supervisors addressed AT (n = 11), mindfulness (n = 15), SC (n = 14), compassion towards others (n = 14), and/or self-care (n = 19). Most supervisions involved at least brief discussions on the topic of self-care (n = 21). However, approximately half of them did not involve discussion of AT (n = 17), mindfulness (n = 15), SC (n = 14), and compassion towards others (n = 14).

Program effects on main outcomes

Wilcoxon signed-rank tests were used to assess changes in the measured outcomes from baseline to post-training and baseline to follow-up. Mean values and standard deviations for all outcomes at each timepoint as well as the Wilcoxon signed-rank test statistics and non-parametric effect sizes (rank-biserial correlation; *r*) can be found in Table 2. Alpha level was set at 0.025 after a Bonferroni correction was applied to account for the two comparisons.

Primary outcome

Significant increases were found at post-training ($Z = -2.40$, $p = 0.017$, $r = 0.35$) and follow-up ($Z = -2.98$, $p = 0.003$, $r = 0.44$) with a medium to large effect sizes for the *epistemic* dimension of AT. A decreasing trend was also found at post-training ($Z = -2.21$, $p = 0.027$, $r = 0.33$) and follow-up ($Z = -2.14$, $p = 0.032$, $r = 0.32$) for the *cognitive* dimension. No significant changes were found for the *affective* dimension.

Process outcomes

The three process outcomes (MM, LM, and SC) showed benefit consistent increases post-training; with effects persisting to follow-up. Of the five facets of MM, only *describe* did not show a significant change at either timepoint. Significant increases were found for both the *observing* facet at post-training ($Z = -2.83$, $p = 0.005$, $r = 0.42$) and follow-up ($Z = -3.14$, $p = 0.002$, $r = 0.46$) and the *acting with awareness* facet at post-training ($Z = -2.28$, $p = 0.023$, $r = 0.34$) and follow-up ($Z = -2.25$, $p = 0.024$, $r = 0.33$) with medium to large effect sizes. *Nonjudging* and *nonreactivity* showed benefit consistent trends at post-training but significant increases at follow-up with medium to large effect sizes (*nonjudging:* $Z = -2.65$, $p = 0.008$, $r = 0.39$; *nonreactivity:* $Z = -2.87$, $p = 0.004$, $r = 0.42$). LM showed an increasing trend at follow-up ($Z = -2.15$, $p = 0.032$, $r = 0.32$). Finally, both dimensions of SC showed significant benefit

consistent changes at post-training (*self-warmth:* Z = -2.73, $p = 0.006$, $r = 0.40$; *self-coldness:* Z = -2.96, $p = 0.003$, $r = 0.44$) and follow-up (*self-warmth:* Z = -2.84, $p = 0.004$, $r = 0.42$; *self-coldness:* Z = -3.64, $p < .001$, $r = 0.54$) with medium to large effect sizes.

Distress Outcomes

A decreasing trend was found for stress at post-training (Z = -2.22, $p = 0.027$, $r = 0.33$), and there was a significant decrease with a medium effect size at follow-up (Z = -2.50, $p = 0.012$, $r = 0.37$). No significant changes were found on anxiety and depression.

Well-being Outcomes

Significant increases in satisfaction with life were found at post-training (Z = -3.31, $p < .001$, $r = 0.49$) and follow-up (Z = -3.46, $p < .001$, $r = 0.51$) with large effect sizes. No significant changes were found on the three subscales of job satisfaction.

Program effects on participants' mindfulness practice

Prior to participating in the program, most participants reported practicing mindfulness less than once per week (n = 12). Some reported practicing one to three times per week (n = 6) or more than once daily (n = 1). Duration of each practice varied with some practicing for under ten minutes (n = 11), others for 10 to 25 minutes (n = 4), 25 to 40 minutes (n = 3) or over an hour (n = 1). When asked how important mindfulness is in their daily life, half reported it had little to no role (n = 12), while some found it to be somewhat important (n = 8) or important (n = 3).

During the program, participants were asked to report their daily mindfulness practice. On average, participants practiced 9.85 minutes/day (SD = 10.93, range = 2.22 to 48.89). Participants reported engaging in various meditations (e.g., breathing, body scan, gratitude), SC practices (e.g., loving-kindness, soothing touch), and movement-based meditations (e.g., walking

meditation, yoga). Some participants also reported engaging in informal practice (e.g., during driving or teeth brushing).

At follow-up, many participants reported using mindfulness (n = 17) and compassion (n = 20) with clients as well as practicing mindfulness in their own lives (n = 19). Of the 19 participants who reported continued practice of mindfulness, over half reported practicing one to three times per week (n = 12). Some practiced four to six times per week (n = 2) or more than once daily (n = 3). Two reported practicing less than once per week. The duration of their practice exercises varied with some practicing for five to ten minutes (n = 8) each time and others for 10 to 25 minutes (n = 10) or 40 to 60 minutes (n = 1). When asked about the importance of mindfulness in their daily lives, most reported some level of importance; specifically, somewhat important (n = 11), important (n = 6), and very important (n = 2). Finally, 13 participants took part in another mindfulness training after the program.

Program Evaluation

All participants recommended the program and found the facilitator engaging (M = 4.70 SD = 0.56 on a 5-point Likert scale). Wilcoxon signed-rank tests were used to assess changes from baseline to post-training. Mean values and standard deviations at each timepoint as well as test statistics and effect sizes can be found in Table 3. Significant increases with medium to large effect sizes were found as participants reported greater knowledge of AT ($Z = -3.99$, $p < .001$, $r = 0.59$), mindfulness ($Z = -3.80$, $p < .001$, $r = 0.56$), and compassion ($Z = -3.23$, $p = 0.001$, $r = 0.48$) along with more comfort using mindfulness ($Z = -3.84$, $p = < .001$, $r = 0.58$) and compassion ($Z = -2.77$, $p = 0.006$, $r = 0.42$) with clients.

Participants were asked to note three things they took away from the training. These can be summarized into four key themes: 1) ambiguity, 2) mindfulness and compassion, 3) clinical

work, and 4) personal impact. First, 18 participants noted learning about ambiguity (n = 8), understanding that ambiguity is normal and there is a need to accept/tolerate it (n = 7), and learning how to accept and tolerate ambiguity (n = 6). Second, 20 participants commented on learning about mindfulness and compassion. They shared learning about their key concepts (n = 9), their benefits and importance (n = 4), different types of meditations (n = 4), and how mindfulness can be incorporated in everyday life (n = 3). Four participants also noted how they gained new exercises and resources. Third, nine participants wrote about clinical work. They noted how their training and engagement in mindfulness and self-care can impact the therapeutic relationship, efficacy, and presence with clients (n = 4). Five participants also shared how the program positively impacted their discussion and use of mindfulness and compassion with clients. Finally, 12 participants described how the training impacted them on a personal level. Participants noted becoming more accepting and compassionate towards themselves (n = 6), and they discussed their personal use and experience of different meditations (n = 8).

In examining what participants liked about the program, they addressed four topics: 1) the program organization, 2) learning about mindfulness, 3) the facilitator, 4) the group. First, participants shared they liked the program materials (i.e., readings and journal; n = 3), the organization of the topics (n = 2), and the manageable time commitment (n = 2). Second, 12 participants wrote about mindfulness and compassion. They described that they liked learning about the topics (n = 9), being exposed to different exercises and resources (n = 5) and having the time to practice the exercises in session (n = 3). Third, eight participants shared they found the facilitator knowledgeable, open, and engaging. Finally, 19 participants wrote about liking different aspects of the group experience. They commented on the cohesiveness, supportiveness, and/or safety of the group (n = 6) as well as being able to connect with a community of other

graduate students (n = 8). This was noted to help validate and normalize the counsellor-in-training experience (n = 5). Participants further noted liking the group discussions and being able to share and hear different perspectives (n = 11).

With regards to what they would change, three participants suggested changing the length of the program (either making it an hour per week or having fewer sessions) and three participants noted difficulty connecting and focusing over Zoom. Three participants highlighted difficulties with keeping up with the weekly reading, and a suggestion was made to include summaries at the start of the session. Six participants offered feedback on session activities; noting they wanted more exposure to other types of meditation and greater in-session mindfulness practice (n = 3) as well as more activities that can support understanding how to use mindfulness with clients and how to combine it with other approaches (n = 3).

Discussion

Program effects on main outcomes

With regards to the primary outcome of AT, participants had significantly greater need for complexity and novelty following training and showed a trend towards reduction in moral absolutism and splitting. In the qualitative studies examining mindfulness training and AT, reduction of reactivity and need to impose structure as well as greater openness and curiosity were noted by participants (Christopher et al., 2011; Christopher & Maris, 2010). Furthermore, Jahn and Smith-Adcock (2017) conducted a phenomenological study of how CITs experience ambiguity and highlighted how they learn to manage ambiguity through accepting and valuing it as well as practicing cognitive reframing and viewing ambiguity as flexible. These statements are more reflective of the *cognitive* and *epistemic* dimensions.

The insignificant findings for the *affective* dimension perhaps reflect the idea that feelings of discomfort are 1) more difficult to change and 2) not meant to be changed from a mindfulness perspective. Ambiguity is anxiety provoking, and there may always be some level of fear associated with it (Hirsh et al., 2012). Jahn and Smith-Adcock (2017) highlighted how CITs' described ambiguity with strong language (e.g., "torture"). Even when discussing positive emotions associated with ambiguity, they tended to be mixed with more distressing ones (e.g., feeling both intimidated and excited). From a mindfulness perspective, the goal would not be to change or remove these feelings; rather to see them as transient, to observe them from a nonreactive and nonjudgmental lens, and to accept them. Perhaps with the attention paid to such reactions, one might also become even more aware of how threatening ambiguity can feel. Although this is beyond the scope of the current study, we propose that enhancing the other dimensions of AT may eventually have an impact of the *affective* dimension. As individuals develop greater awareness of the positive emotions that can also accompany ambiguity and have more rewarding experiences with ambiguity through seeking it, perhaps this will reduce the threat of ambiguity. It would be interesting to explore changes in dimension scores as this could elucidate a framework for how AT develops in CITs over the course of their training.

To our knowledge, there had been one other quantitative study that examined the impact of a mindfulness training program on AT. Brendel et al. (2016) conducted a quasi-experimental study where business leaders who participated in an eight-week mindfulness meditation training (45 minutes per week) were compared to a convenience sample control. They did not find a significant change in AT and suggested the training may have been too short. However, another important difference lies in the program design. Studies showing AT enhancement through

mindfulness utilize a more comprehensive program so perhaps meditation alone is not enough. Future RCTs could compare the current program to meditation-only and control conditions.

As the training program sought to teach and cultivate a practice of mindfulness and compassion, it was necessary to assess whether participants experienced changes in these process outcomes. Immediately following training, participants appear to have been better able to attend to their present internal and external states (*observing*) and not respond or behave in an automatic manner (*acting with awareness*), as well as be more compassionate in how they respond to themselves (*self-warmth*) and less critical in their self-response (*self-coldness*). Over time, they also became more accepting of inner experiences (*nonjudging*) and better able to detach from them and respond in an unbiased manner (*nonreactivity*).

Taken together, there is support that the program was successful in increasing mindfulness and compassion. These findings are consistent with other studies (e.g., Aggs & Bambling, 2010; Chan et al., 2021; de Vibe et al., 2018; Shapiro et al., 2007). It is important to note that our program is shorter than many reported in the literature. Programs based on the highly prevalent Mindfulness Based Stress Reduction program (Kabat-Zinn et al., 1985) as well as the Mindful SC program (Neff & Germer, 2013) tend to be eight weeks long with two hours sessions and a retreat (amounting to over 20 hours of training). Our training is only nine hours in total, and like other studies with shorter trainings (e.g., Swift et al., 2017), there were still significant changes on process outcomes. This suggests that shorter trainings may still be beneficial while also being practical for student schedules.

Regarding distress and well-being related variables, a significant reduction in stress was found along with a significant increase in satisfaction with life. These are consistent with findings in other studies examining a mental health trainee sample (e.g., Collard et al., 2008;

Hopkins & Proeve, 2013; Shapiro et al., 2007) and what has been found in meta-analyses (e.g., Spinelli et al., 2019). This suggests that the current training is comparable to other mindfulness-based interventions; even though the primary focus was on enhancing AT. The variables examined in this study are standard, and future studies may be interested in exploring other important aspects of well-being (e.g., basic psychological needs satisfaction, eudemonic well-being, happiness, emotion regulation). It would also be of interest to explore how this program impacts clinical work; for example, assessing the effects of the training on empathic listening as well as therapeutic presence and alliance from the perspectives of both trainees and their clients. There has been some research examining how therapist's mindful practices impact clients; (Grepmair et al., 2007; Swift et al., 2017); however, findings are equivocal and further research is needed (Davis & Hayes, 2011).

Program effects on participants' mindfulness practice

As the training focused on mindfulness and compassion, it was necessary to examine its effects on participants' practices. There were some important shifts noted from baseline to the three-month follow-up. First, participants reported practicing mindfulness more often and for longer durations. Second, while half of participants reported mindfulness having little to no role in their lives at baseline, most were now reporting that mindfulness had at least some level of importance to their daily lives. Third, over half of participants attended additional training after the program was completed. This suggests the program had some impact on participants perceptions and practice of mindfulness.

During the program, participants had an average practice of about ten minutes per day. While this is similar to reports from other intervention studies (e.g., Shapiro et al., 2007), it is much less than requirements of standard mindfulness programs (usually 30 to 45 minutes daily).

Small but significant associations between home practice and outcome have been found (see review by Parsons et al., 2017); however, we did not emphasize a specific amount for home practice. Considering trainees are very busy, specifying homework may put more pressure on them and perhaps even increase self-judgment for not completing the exercises. Rather, we hoped practice would develop organically through encouragement from the facilitator and from the other participants sharing their experiences. Given most participants continued to practice mindfulness and seek additional training, this approach may be more suitable for this population in the long-term. It may be interesting to explore the impact of specifying homework and how it affects both study outcomes and long-term cultivation of a mindful and compassion practice.

Program Evaluation

The participants' feedback about the program suggest it succeeded in its main objectives. First, the training sought to teach and encourage participants to practice mindfulness and compassion. Quantitatively, participants perceived themselves to have greater knowledge of both concepts compared to baseline. Many participants also highlighted learning about mindfulness and compassion and the personal impact of meditation practice as a key takeaway from the training and something they enjoyed. Second, the training sought to increase discussion of ambiguity and its impact on counselling and daily life. Participants reported greater knowledge of AT post-training and highlighted learning about ambiguity and understanding the importance of learning to tolerate it as key takeaways from the training. Third, the training sought to offer a space for participants to reflect on their experiences as graduate students and clinical trainees. Participants discussed how the group experience normalized their experience and that they felt safe and connected with other graduate students. Finally, the training aimed to open discussion about the clinical applications of mindfulness and compassion. Participants quantitatively

reported greater comfort with using mindfulness and compassion with clients and wrote about how the training positively impacted their exploration of mindfulness and compassion with clients. They further noted learning about how their practice of mindfulness can impact therapy. Taken together, the program appears to be feasible and acceptable to participants.

Limitations and Future Directions

There are several important limitations to this pilot study, first the sample is small and predominantly female which impacts generalizability of these findings. One strength of the study is that we included students across Canada; it would be advisable to continue cross-country recruitment in future studies. Second, there is an increase in the familywise error rate due to the multiple statistical analyses. We did not control for this due to the small sample and preliminary nature of the study. Third, the measures were largely self-report and were not specific to the population or training framework. Given that CITs' experience of ambiguity is unique, it would be important to develop a measure that is specific to this population. Hancock et al. (2015) developed a measure of AT for medical students, and this has been further adapted for veterinary students (Hammond et al., 2017). Perhaps this measure can be adapted for counselling trainees.

The training also used a novel framework of mindfulness and compassion for which specific measures are currently being validated. Participants did respond to these measures, and the findings will be presented in other articles detailing the psychometric properties of these measures (e.g., Khoury et al., 2021). Future studies can also include behavioural measures of mindfulness (e.g., breath counting; Levinson et al., 2014) and AT (e.g., judging ambiguous faces; Sagioglou & Forstmann, 2013). State measures before and after each weekly session could also help assess whether participants were more mindful during the session. Fourth, an uncontrolled design was used, and we were not able to control for cofounding factors. We would

expect that AT increases over the course of clinical training and most participants reported participating in additional mindfulness training between post-training and follow-up. Conducting a randomized control trial may help to account for these issues, and further analyses could examine the impact of additional training.

Impacts and Conclusion

The current study examined a novel framework of mindfulness and compassion and explored its application to cultivating AT in CITs across Canada. This program is creative in its design, directly addresses ambiguity in clinical training and focuses on the experience of CITs. The importance of this work is highlighted by participants reporting AT not being addressed or discussed within their supervisions. Furthermore, the impact of this program on stress and life satisfaction and the observation that many participants persisting in their mindfulness practice suggest it can be an avenue for promoting self-care. Reflecting on participant responses about supervision, only six of 30 included self-care as a component of the course and 13% reported discussing self-care often in supervision. This highlights the need for programs that help CITs proactively engage in self-care. Preliminary quantitative findings are supported by remarks by participants who highlighted the impact of their training on their knowledge of AT, mindfulness, and compassion as well as on feeling validated and supported by their peers in their experience as students. The program appears to be a feasible addition to student schedule, and it seems to have aided participants in their clinical work. Ambiguity tolerance was first discussed in the 1950s and the impact of it on CITs was first established in the literature in the 1960s; suggesting there has been a long-awaited need for empirical studies on AT enhancement strategies. Although further research is required, this pilot study is another step in answering this call.

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References

Aggs, C., & Bambling, M. (2010). Teaching mindfulness to psychotherapists in clinical practice: The mindful therapy programme. *Counselling and Psychotherapy Research*, *10*(4), 278-286. https://doi.org/10.1080/14733145.2010.485690

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, *13*(1), 27-45. https://doi.org/10.1177%2F1073191105283504

Baer, R. A., Smith, G. T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., Walsh, E., Duggan, D., & Williams, J. M. G. (2008). Construct validity of the Five Facet Mindfulness Questionnaire in meditating and nonmeditating samples. *Assessment*, *15*(3), 329-342. https://doi.org/10.1177/1073191107313003

Bodner, T. E., & Langer, E. J. (2001). *Individual differences in mindfulness: The mindfulness/mindlessness scale* [Conference Presentation]. 13th Annual American Psychological Society Convention, Toronto, Ontario, Canada

Bohecker, L., Vereen, L. G., Wells, P. C., & Wathen, C. C. (2016). A mindfulness experiential small group to help students tolerate ambiguity. *Counselor Education and Supervision*, *55*(1), 16-30. https://doi.org/10.1002/ceas.12030

Boss, P. (2006). Ambiguous loss: Preventive interventions for family professionals. *Journal of Family and Consumer Sciences*, *98*(2), 8-10.

Brams, J. M. (1961). Counselor characteristics and effective communication in counseling. *Journal of Counseling Psychology*, *8*(1), 25-30. https://doi.org/10.1037/h0047997

Brendel, W., Hankerson, S., Byun, S., & Cunningham, B. (2016). Cultivating leadership Dharma: Measuring the impact of regular mindfulness practice on creativity, resilience,

tolerance for ambiguity, anxiety and stress. *Journal of Management Development*, *35*(8), 1056-1078. https://doi.org/10.1108/JMD-09-2015-0127

Budner, S. (1962). Intolerance of ambiguity as a personality variable. *Journal of Personality*, *30*(1), 29-50. https://doi.org/10.1111/j.1467-6494.1962.tb02303.x

Canadian Psychological Association (2017). *Canadian code of ethics for psychologists* (4th ed.).

Carson, S. H., & Langer, E. J. (2004). Mindful practice for clinicians and patients. In *Handbook of primary care psychology* (pp. 173-183). Oxford University Press.

Chan, S. H. W., Yu, C. K.-C., & Li, A. W. O. (2021). Impact of mindfulness-based cognitive therapy on counseling self-efficacy: A randomized controlled crossover trial. *Patient Education and Counseling*, *104*(2), 360-368. https://doi.org/10.1016/j.pec.2020.07.022

Christopher, J., Chrisman, J., Trotter-Mathison, M., Schure, M., Dahlen, P., & Christopher, S. (2011). Perceptions of the long-term influence of mindfulness training on counselors and psychotherapists: A qualitative inquiry. *Journal of Humanistic Psychology*, *51*(3), 318-349. https://doi.org/10.1177%2F0022167810381471

Christopher, J. C., & Maris, J. A. (2010). Integrating mindfulness as self-care into counselling and psychotherapy training. *Counselling and Psychotherapy Research*, *10*(2), 114-125. https://doi.org/10.1080/14733141003750285

Clarke, V., & Braun, V. (2013). Teaching thematic analysis: Overcoming challenges and developing strategies for effective learning. *The Psychologist*, *26*(2), 120-123.

Collard, P., Avny, N., & Boniwell, I. (2008). Teaching Mindfulness Based Cognitive Therapy (MBCT) to students: The effects of MBCT on the levels of mindfulness and subjective well-being. *Counselling Psychology Quarterly*, *21*(4), 323-336. https://doi.org/10.1080/09515070802602112

Conversano, C., Ciacchini, R., Orrù, G., Di Giuseppe, M., Gemignani, A., & Poli, A. (2020). Mindfulness, compassion, and self-compassion among health care professionals: What's new? A systematic review. *Frontiers in Psychology*, *11*(1683). https://doi.org/10.3389/fpsyg.2020.01683

Davis, D. M., & Hayes, J. A. (2011). What are the benefits of mindfulness? A practice review of psychotherapy-related research. *Psychotherapy*, *48*(2), 198-208. https://doi.org/10.1037/a0022062

de Vibe, M., Solhaug, I., Rosenvinge, J. H., Tyssen, R., Hanley, A., & Garland, E. (2018). Six-year positive effects of a mindfulness-based intervention on mindfulness, coping and well-being in medical and psychology students; Results from a randomized controlled trial. *PLoS ONE*, *13*(4), e0196053. https://doi.org/10.1371/journal.pone.0196053

Decorte, T., Malm, A., Sznitman, S. R., Hakkarainen, P., Barratt, M. J., Potter, G. R., Werse, B., Kamphausen, G., Lenton, S., & Asmussen Frank, V. (2019). The challenges and benefits of analyzing feedback comments in surveys: Lessons from a cross-national online survey of small-scale cannabis growers. *Methodological Innovations*, *12*(1), 2059799119825606. https://doi.org/10.1177/2059799119825606

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The satisfaction with life scale. *Journal of Personality Assessment*, *49*(1), 71-75. https://doi.org/10.1207/s15327752jpa4901_13

Fulton, C. L. (2016). Mindfulness, self-compassion, and counselor characteristics and session variables. *Journal of Mental Health Counseling*, *38*(4), 360-374. https://doi.org/10.17744/mehc.38.4.06

Furnham, A., & Marks, J. (2013). Tolerance of ambiguity: A review of the recent literature. *Psychology*, *4*, 717-728. https://doi.org/10.4236/psych.2013.49102

Gilbert, P., McEwan, K., Matos, M., & Rivis, A. (2011). Fears of compassion: Development of three self-report measures. *Psychology and Psychotherapy: Theory, Research and Practice*, *84*(3), 239-255. https://doi.org/10.1348/147608310x526511

Grenier, S., Barrette, A.-M., & Ladouceur, R. (2005). Intolerance of uncertainty and intolerance of ambiguity: Similarities and differences. *Personality and Individual Differences*, *39*(3), 593-600. https://doi.org/10.1016/j.paid.2005.02.014

Grepmair, L., Mitterlehner, F., Loew, T., Bachler, E., Rother, W., & Nickel, M. (2007). Promoting mindfulness in psychotherapists in training influences the treatment results of their patients: A randomized, double-blind, controlled study. *Psychotherapy and Psychosomatics*, *76*(6), 332-338. https://doi.org/10.1159/000107560

Gruberg, R. (1969). A significant counselor personality characteristic: Tolerance of ambiguity. *Counselor Education and Supervision*, *8*(2), 119-124. https://doi.org/10.1002/j.1556-6978.1969.tb01312.x

Gu, J., Strauss, C., Crane, C., Barnhofer, T., Karl, A., Cavanagh, K., & Kuyken, W. (2016). Examining the factor structure of the 39-item and 15-item versions of the Five Facet Mindfulness Questionnaire before and after mindfulness-based cognitive therapy for people with recurrent depression. *Psychological Assessment*, *28*(7), 791-802. https://doi.org/10.1037/pas0000263

Hammond, J. A., Hancock, J., Martin, M. S., Jamieson, S., & Mellor, D. J. (2017). Development of a new scale to measure ambiguity tolerance in veterinary students. *Journal of Veterinary Medical Education*, *44*(1), 38-49. https://doi.org/10.3138/jvme.0216-040R

Hancock, J., Roberts, M., Monrouxe, L., & Mattick, K. (2015). Medical student and junior doctors' tolerance of ambiguity: Development of a new scale. *Advances in Health Sciences Education: Theory and Practice*, *20*(1), 113-130. https://doi.org/10.1007/s10459-014-9510-z

Hirsh, J. B., Mar, R. A., & Peterson, J. B. (2012). Psychological entropy: A framework for understanding uncertainty-related anxiety. *Psychological Review*, *119*(2), 304-320. https://doi.org/10.1037/a0026767

Hitsuwari, J., & Nomura, M. (2021). Developing and validating a Japanese version of the Multidimensional Attitude toward Ambiguity Scale (MAAS). *Psychology*, *12*(4), 477-497. https://doi.org/10.4236/psych.2021.124030

Hopkins, A., & Proeve, M. (2013). Teaching mindfulness-based cognitive therapy to trainee psychologists: Qualitative and quantitative effects. *Counselling Psychology Quarterly*, *26*(2), 115-130. https://doi.org/10.1080/09515070.2013.792998

Ie, A., Haller, C. S., Langer, E. J., & Courvoisier, D. S. (2012). Mindful multitasking: The relationship between mindful flexibility and media multitasking. *Computers in Human Behavior*, *28*(4), 1526-1532. https://doi.org/10.1016/j.chb.2012.03.022

Jahn, S. A., & Smith-Adcock, S. (2017). A phenomenological study of counseling students' experiences with ambiguity. *The Journal of Counselor Preparation and Supervision*, *10*(1).

Jennings, L., Sovereign, A., Bottorff, N., Mussell, M. P., & Vye, C. (2005). Nine ethical values of master therapists. *Journal of Mental Health Counseling*, *27*(1), 32-47. https://doi.org/10.17744/mehc.27.1.lmm8vmdujgev2qhp

Jones, L. K. (1974). Toward more adequate selection criteria: Correlates of empathy, genuineness, and respect. *Counselor Education and Supervision*, *14*(1), 13-21. https://doi.org/10.1002/j.1556-6978.1974.tb01988.x

Kabat-Zinn, J. (1991). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain, and illness*. Dell Publishing.

Kabat-Zinn, J., Lipworth, L., & Burney, R. (1985). The clinical use of mindfulness meditation for the self-regulation of chronic pain. *Journal of Behavioral Medicine*, *8*(2), 163-190. https://doi.org/10.1007/BF00845519

Khoury, B. (2018). Mindfulness: Embodied and embedded. *Mindfulness*, *9*(4), 1037-1042. https://doi.org/10.1007/s12671-017-0858-z

Khoury, B. (2019). Compassion: Embodied and embedded. *Mindfulness*, *10*(11), 2363-2374. https://doi.org/10.1007/s12671-019-01211-w

Khoury, B., & Dionne, F. (2020). Les dimensions incarnée et interpersonnelle de la compassion. *Annales Médico-psychologiques, revue psychiatrique* https://doi.org/10.1016/j.amp.2020.11.018

Khoury, B., Knäuper, B., Pagnini, F., Trent, N., Chiesa, A., & Carrière, K. (2017). Embodied Mindfulness. *Mindfulness*, *8*(5), 1160-1171. https://doi.org/10.1007/s12671-017-0700-7

Khoury, B., Vergara, R. C., Sadowski, I., & Spinelli, C. (2021). Embodied Mindfulness Questionnaire: Scale development and validation. *Assessment.* https://doi.org/10.1177/10731911211059856

Kumary, A., & Baker, M. (2008). Stresses reported by UK trainee counselling psychologists. *Counselling Psychology Quarterly*, *21*(1), 19-28. https://doi.org/10.1080/09515070801895626

Langer, E. J. (1989). *Mindfulness*. Da Capo Press.

Lauriola, M., Foschi, R., Mosca, O., & Weller, J. (2016). Attitude toward ambiguity: Empirically robust factors in self-report personality scales. *Assessment*, *23*(3), 353-373. https://doi.org/10.1177/1073191115577188

Levinson, D. B., Stoll, E. L., Kindy, S. D., Merry, H. L., & Davidson, R. J. (2014). A mind you can count on: Validating breath counting as a behavioral measure of mindfulness. *Frontiers in Psychology*, *5*, 1202. https://doi.org/10.3389/fpsyg.2014.01202

Levitt, D. H., & Jacques, J. D. (2005). Promoting tolerance for ambiguity in counselor training programs. *Journal of Humanistic Counseling, Education and Development*, *44*(1), 46. https://doi.org/10.1002/j.2164-490X.2005.tb00055.x

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, *33*(3), 335-343. https://doi.org/10.1016/0005-7967(94)00075-u

Maguen, T. (1993). *The impact of tolerance-intolerance of ambiguity on the therapeutic interaction* (Publication No DP20858) [Doctoral dissertation, The Chicago School of Professional Psychology]. ProQuest Dissertations Publishing.

Maranzan, K. A., Kowatch, K. R., Mascioli, B. A., McGeown, L., Popowich, A. D., & Spiroiu, F. (2018). Self-care and the Canadian Code of Ethics: Implications for training in professional psychology. *Canadian Psychology/Psychologie canadienne*, *59*(4), 361-368. https://doi.org/10.1037/cap0000153

McAuliffe, G., & Lovell, C. (2006). The influence of counselor epistemology on the helping interview: A qualitative study. *Journal of Counseling & Development*, *84*(3), 308-317. https://doi.org/10.1002/j.1556-6678.2006.tb00410.x

McLain, D. L., Kefallonitis, E., & Armani, K. (2015). Ambiguity tolerance in organizations: Definitional clarification and perspectives on future research. *Frontiers in Psychology*, *6*, 344. https://doi.org/10.3389/fpsyg.2015.00344

Neff, K. (2003a). Self-compassion: An alternative conceptualization of a healthy attitude toward oneself. *Self and Identity*, *2*(2), 85-101. https://doi.org/10.1080/15298860309032

Neff, K. D. (2003b). The development and validation of a scale to measure self-compassion. *Self and Identity*, *2*, 223-250. https://doi.org/10.1080/15298860309027

Neff, K. D., & Germer, C. K. (2013). A pilot study and randomized controlled trial of the mindful self-compassion program. *Journal of Clinical Psychology*, *69*(1), 28-44. https://doi.org/10.1002/jclp.21923

Pakenham, K. I., & Stafford-Brown, J. (2012). Stress in clinical psychology trainees: Current research status and future directions. *Australian Psychologist*, *47*(3), 147-155. https://doi.org/10.1111/j.1742-9544.2012.00070.x

Parsons, C. E., Crane, C., Parsons, L. J., Fjorback, L. O., & Kuyken, W. (2017). Home practice in mindfulness-based cognitive therapy and mindfulness-based stress reduction: A systematic review and meta-analysis of participants' mindfulness practice and its association with outcomes. *Behaviour Research and Therapy*, *95*, 29-41. https://doi.org/10.1016/j.brat.2017.05.004

Per, M., Simundic, A., Argento, A., Khoury, B., & Heath, N. (2021). Examining the relationship between mindfulness, self-compassion, and emotion regulation in self- injury. *Archives of Suicide Research* https://doi.org/10.1080/13811118.2021.1885534

Pica, M. (1998). The ambiguous nature of clinical training and its impact on the development of student clinicians. *Psychotherapy: Theory, Research, Practice, Training*, *35*(3), 361. https://psycnet.apa.org/doi/10.1037/h0087840

Pirson, M., Langer, E. J., Bodner, T., & Zilcha-Mano, S. (2012). The development and validation of the Langer Mindfulness Scale - Enabling a socio-cognitive perspective of mindfulness in organizational contexts. *Fordham University Schools of Business Research Paper* https://dx.doi.org/10.2139/ssrn.2158921

Posluns, K., & Gall, T. L. (2020). Dear mental health practitioners, take care of yourselves: A literature review on self-care. *International Journal for the Advancement of Counselling, 42*(1), 1-20. https://doi.org/10.1007/s10447-019-09382-w

Richardson, C. M. E., Trusty, W. T., & George, K. A. (2020). Trainee wellness: Self-critical perfectionism, self-compassion, depression, and burnout among doctoral trainees in psychology. *Counselling Psychology Quarterly*, *33*(2), 187-198. https://doi.org/10.1080/09515070.2018.1509839

Sagioglou, C., & Forstmann, M. (2013). Activating Christian religious concepts increases intolerance of ambiguity and judgment certainty. *Journal of Experimental Social Psychology*, *49*(5), 933-939. https://doi.org/10.1016/j.jesp.2013.05.003

Shapiro, S. L., Brown, K. W., & Biegel, G. M. (2007). Teaching self-care to caregivers: Effects of mindfulness-based stress reduction on the mental health of therapists in training.

Training and Education in Professional Psychology, *1*(2), 105-115. https://doi.org/10.1037/1931-3918.1.2.105

Skovholt, T. M., & Rønnestad, M. H. (2003). Struggles of the novice counselor and therapist. *Journal of Career Development*, *30*(1), 45-58. https://doi.org/10.1177/089484530303000103

Spector, P. E. (1985). Measurement of human service staff satisfaction: Development of the Job Satisfaction Survey. *American Journal of Community Psychology*, *13*(6), 693-713. https://doi.org/10.1007/BF00929796

Spinelli, C., Ibrahim, M., & Khoury, B. (2022). Cultivating ambiguity tolerance through mindfulness: An induction randomized controlled trial. *Current Psychology* https://doi.org/10.1007/s12144-021-02597-4

Spinelli, C., Wisener, M., & Khoury, B. (2019). Mindfulness training for healthcare professionals and trainees: A meta-analysis of randomized controlled trials. *Journal of Psychosomatic Research*, *120*, 29-38. https://doi.org/10.1016/j.jpsychores.2019.03.003

Swift, J. K., Callahan, J. L., Dunn, R., Brecht, K., & Ivanovic, M. (2017). A randomized-controlled crossover trial of mindfulness for student psychotherapists. *Training and Education in Professional Psychology*, *11*(4), 235-242. https://doi.org/10.1037/tep0000154

Thériault, A., Gazzola, N., Isenor, J., & Pascal, L. (2015). Imparting self-care practices to therapists: What the experts recommend. *Canadian Journal of Counselling and Psychotherapy*, *49*(4).

Winborn, B. B., & Martinson, W. D. (1965). The use of ambiguity as a technique in counselor education. *Counselor Education and Supervision*, *5*(1), 35-39. https://doi.org/10.1002/j.1556-6978.1965.tb00418.x

Wittenberg, K. J., & Norcross, J. C. (2001). Practitioner perfectionism: Relationship to ambiguity tolerance and work satisfaction. *Journal of Clinical Psychology*, *57*(12), 1543-1550. https://doi.org/10.1002/jclp.1116

Table 1

Description of the weekly activities in the mindfulness training program. Sessions began with a discussion about participants' daily practice and the assigned reading. Each week centered on a core concept explored through discussion and meditations. There were at least two meditations per session (see examples below).

Week 1:	**Introduction to ambiguity tolerance, mindfulness, and compassion** **Emotions - Their nature and functions:** *Developing skills to manage and accept difficult or distressing emotions.* **Guiding Questions:** When you think of your experience as a graduate student and counsellor-in-training, what emotions come up for you? How do you identify and manage your emotions? **Exercise:** Breathing meditation.
Week 2:	**Embodied mindfulness:** *Developing awareness of the mind-body connection and towards one's internal/external states.* **Guiding Questions:** What is my experience of ambiguity in graduate school? When I think about such experiences, how do I feel? How do I react? **Exercise:** Observing thoughts nonjudgmentally.
Week 3:	**Embodied compassion:** *Developing a pattern of self-kindness, nonjudgmental and compassionate thinking, and self-care.* **Guiding Questions:** What expectations do I hold for myself as counsellor-in-training? What expectations do I hold as a graduate student? How do I feel when considering these expectations? **Exercise:** Loving-kindness meditation.
Week 4:	**Mindfulness and Compassion in Interpersonal Relationships:** *Developing skills to be anchored in the body during interactions as well as to give and receive compassion.* **Guiding Questions:** How do I feel about working with clients? What counseling qualities and skills do I have? What skills do I anticipate wanting to develop? **Exercise:** Walking meditation.

Week 5:	**Mindfulness and Compassion in the Environment and Self-transcendence:** *Developing a flexible professional identity, fostering common humanity, and practicing gratitude towards the external environment.* **Guiding Questions:** How do I define myself? What do I value? **Exercise:** Gratitude through the five senses.
Week 6:	**Summarizing activities and concepts from previous weeks.** **Guiding Questions:** Reflecting on these past weeks, what have I learned about mindfulness and compassion? What have I learned about managing ambiguity? What questions do I still have? **Exercise:** Meditation for times of transition and change.

Table 2

Statistics of the Wilcoxon signed-ranked tests for all outcomes. Range of internal consistencies (Cronbach's alpha), means, SDs, Z, p-values, and rank-biserial correlation (r) are listed.

Outcomes	n	Baseline	Post-training	Follow-up	Baseline to Post-training			Baseline to Follow-up		
		Mean (SD)	Mean (SD)	Mean (SD)	Z	*p* value	Effect size (*r*)	Z	*p* value	Effect size (*r*)
Affective	23	4.59 (1.00)	4.37 (.83)	4.29 (.80)	-1.32	.188	.19	-1.61	.107	.24
Cognitive	23	2.67 (.79)	2.43 (.73)	2.46 (.78)	-2.21	.027	.33	-2.14	.032	.32
Epistemic	23	4.49 (.64)	4.73 (.62)	4.84 (.66)	-2.40	.017*	.35	-2.98	.003*	.44
Observing	23	3.10 (.66)	3.48 (.69)	3.52 (.59)	-2.83	.005*	.42	-3.14	.002*	.46
Describing	23	3.54 (.81)	3.72 (.66)	3.74 (.82)	-1.21	.227	.18	-1.06	.290	.16
Acting with awareness	23	2.72 (.72)	3.04 (.58)	3.06 (.63)	-2.28	.023*	.34	-2.25	.024*	.33
Nonjudging	23	3.78 (.58)	4.03 (.63)	4.20 (.63)	-2.00	.046	.29	-2.65	.008*	.39
Nonreactivity	23	2.86 (.66)	3.16 (.50)	3.33 (.55)	-1.99	.046	.29	-2.87	.004*	.42
Meditative mindfulness	23	3.20 (.38)	3.49 (.33)	3.57 (.36)	-3.35	.001*	.49	3.81	<.001*	.56
Langer mindfulness	23	5.24 (.51)	5.39 (.66)	5.43 (.64)	-1.67	.094	.25	-2.15	.032	.32
Self-warmth	23	3.13 (.65)	3.51 (.66)	3.52 (.63)	-2.73	.006*	.40	-2.84	.004*	.42
Self-coldness	23	3.20 (.68)	2.89 (.62)	2.65 (.63)	-2.96	.003*	.44	-3.64	< .001*	.54
Anxiety	23	.51 (.40)	.43 (.33)	.44 (.34)	-1.08	.282	.16	-.94	.348	.14
Depression	23	.66 (.59)	.50 (.45)	.48 (.31)	-1.60	.110	.24	-1.13	.259	.17
Stress	23	.97 (.60)	.70 (.45)	.73 (.39)	-2.22	.027	.33	-2.50	.012*	.37
Satisfaction with life	23	4.39 (1.27)	5.21 (.97)	5.21 (1.16)	-3.31	< .001*	.49	-3.46	< .001*	.51
Clinical supervision	22	5.67 (.57)	5.44 (.89)	5.47 (.91)	-1.94	.053	.29	-1.38	.166	.20
Research supervision	10	5.10 (1.39)	4.98 (1.53)	4.95 (1.54)	-1.41	.157	.21	-.96	.336	.14
Nature of Work	21	5.26 (.64)	5.30 (.71)	5.39 (.65)	-.18	.857	.03	-1.46	.145	.22

Note: *$p < .025$. A small effect size (r) is .1, medium is .3, and a large is .5.

Table 3

Statistics of the Wilcoxon signed-ranked tests for participants perceptions of their knowledge of ambiguity tolerance, mindfulness, and compassion and their comfort using mindfulness and compassion with clients. Means, SDs, Z, p-values, and rank-biserial correlation (r) are listed.

			Baseline	Post-training	Baseline to Post-training		
Participant perceptions of their:		**n**	**Mean (SD)**	**Mean (SD)**	**Z**	***p* value**	**Effect size (*r*)**
Knowledge	**Ambiguity Tolerance**	23	2.13 (.97)	3.78 (.52)	-3.99	< .001*	.59
	Mindfulness	23	2.61 (.94)	3.70 (.56)	-3.80	< .001*	.56
	Compassion	23	3.04 (.83)	3.74 (.69)	-3.23	.001*	.48
Comfort using it with clients	**Mindfulness**	22	1.95 (.95)	3.45 (.67)	-3.84	< .001*	.58
	Compassion	22	2.91 (1.31)	3.68 (.78)	-2.77	.006*	.42

Note: *$p < .05$. A small effect size (r) is .1, medium is .3, and a large is .5.

Chapter 5: General Discussion

Mental health care accessibility is a growing concern within Canada that is exacerbated by both the aging population and the current global pandemic (Canadian Mental Health Association, 2018, 2020). Statistics Canada (2019) previously reported that one in five Canadians needed mental health care and approximately 1.1 million described not having their needs met. The pandemic has likely worsened the mental health of those already vulnerable and has led essential workers (including those in healthcare) to face greater job risk and strain on their mental and physical health (Canadian Mental Health Association, 2020). The social, economic, and political effects of the pandemic will likely be felt by Canadians for many years, and this raises the concern of how strain on the mental healthcare system will impact those providing services. This is why self-care (i.e., the proactive engagement in activities that promote physical and mental wellness) is an ethical standard within The Canadian Code of Ethics for Psychologists (Canadian Psychological Association, 2017).

To support self-care, developing mindfulness and compassion appear to be important avenues. Research into their applications on improving well-being and reducing distress has been growing over the past few decades; with successful results found across a variety of populations and outcomes (e.g., Khoury et al., 2013a). Importantly, benefits have been demonstrated not only for mental health care professionals, but trainees as well. Counsellors-in-training (CITs) are perhaps more susceptible to psychological consequences of clinical work (e.g., burnout, compassion fatigue, occupational stress) due to their unique position as both student and practitioner (Shapiro et al., 2007). However, self-care remains insufficiently emphasized in training (Maranzan et al., 2018) despite being a buffer against stress (Zahniser et al., 2017).

When considering how to help CITs develop their self-care, it would also be relevant to

focus on a major catalyst of their stress, specifically, ambiguity (Skovholt & Rønnestad, 2003). Although research on clinical development has emphasized the importance of promoting ambiguity tolerance (AT) in CITs, empirical research on the methods of doing so remains lacking (Levitt & Jacques, 2005; Pica, 1998). While there is qualitative research pointing to the benefits of mindfulness training with CITs (Bohecker et al., 2016; Christopher & Maris, 2010), the literature on AT and its relationship with mindfulness/compassion is limited by the lack of consensus on defining AT, the differing measures of AT, as well as the small number of studies and their equivocal findings. Thus, this program of research sought to bring together two fields primarily to examine the potential use of mindfulness and compassion in cultivating AT and ultimately to apply the findings with CITs. Secondarily, this research program sought to address methodological issues in the mindfulness literature by clarifying differences between the two Western forms of mindfulness, meditative mindfulness (MM) and Langer mindfulness (LM), creating strategies for improving induction research, and applying a novel approach to mindfulness and compassion based on an embodied and embedded perspective (Khoury, 2018; Khoury, 2019; Khoury & Dionne, 2020; Khoury et al., 2020; Khoury et al., 2017a).

These objectives were met through the three presented studies. The first study built on the pre-existing mindfulness literature by assessing the effectiveness of meditation and mindfulness training on healthcare professionals and trainees. Previous reviews and meta-analyses were limited by the number and quality of studies, their narrow examination of population, outcomes, and intervention type. This meta-analysis addressed these limitations while also focusing on randomized controlled trials (RCT) to better account for confounding factors and provide more conservative effect sizes, examining subgroups and moderators, and highlighting methodological concerns to guide future study development. Mindfulness training appears to be effective in

reducing anxiety, burnout, depression, psychological distress, and stress as well as increasing mindfulness and well-being. Benefits also persisted to follow-up for stress, mindfulness, and well-being. Furthermore, the results highlighted the value of modifying interventions for the target population (e.g., professionals versus trainees), the feasibility of electronic delivery, the need for a wider range of outcome variables (e.g., addressing physical health and clinical work), and the tendency for researchers to not include measures of process outcomes (i.e., mindfulness, compassion) and utilize inactive control groups (e.g., waitlist). These findings established the value of pursuing mindfulness training as an avenue for self-care in CITs and were used to guide the development of Study 2 and 3.

Despite the noted importance of AT across healthcare professions (e.g., doctors, nurses, psychologists), none of the studies included in Study 1 measured it quantitatively (Geller, 2013; Knight et al., 2016; Pica, 1998). There has been some correlational and theoretical support for the relationship between AT, mindfulness, and compassion. To further elucidate these relationships, Study 2 used both cross-sectional and RCT designs. Regression analyses identified the *nonreactivity* facet of MM, LM, and self-compassion as significant predictors of AT. *Nonreactivity* and LM were also significant predictors in the hierarchical model. However, no significant differences were found on AT following a MM or LM induction compared to an active control (i.e., mind-wandering), suggesting a brief induction may not be sufficient to enhance AT and the need for a longer, more comprehensive training that combines both MM and LM. Differences between MM and LM were also elucidated (e.g., difficulty, persistence of the induction effect), and methodological recommendations were made to improve induction research (e.g., asking about participants' experience of the induction, completing state measures).

Finally, Study 3 assessed a novel mindfulness and compassion training program that is designed to support cultivation of AT in CITs. Importantly, the training was developed based on the embodied and embedded framework; a model of mindfulness and compassion that highlights both their intrapersonal and interpersonal components and brings together Buddhist principles and both Western conceptualizations of mindfulness. The training was conducted online, and participants from training programs across Canada were represented in the sample. Quantitative results suggest participants had greater AT, mindfulness, self-compassion, and satisfaction with life as well as decreased stress post-training and follow-up. The feedback was also positive; with all participants recommending the program for other students. This pilot study demonstrated the feasibility and acceptability of this training as well as its benefits in facilitating participants' personal mindfulness and compassion practice in the long-term.

There are a couple important themes emerging across these studies. Mindfulness and self-compassion appear to have positive relationships with AT, and there is preliminary evidence that developing one's ability to be mindful and compassionate can further cultivate AT. Conceptually, both forms of Western mindfulness should impact AT, albeit in different ways. While it is expected both MM and LM impact the three aforementioned dimensions of AT, MM may be more strongly related to the *affective* dimension while LM is more strongly related to the *cognitive* and *epistemic* dimensions. For example, Gudykunst (1998) highlighted meditation as a method for emotion regulation whereas LM appears more related to the cognitive management of ambiguity. MM and LM also differ in how MM addresses more directly the internal responses (i.e., affect, cognitions, physical sensations) to the present and has greater emphasis on introspection and acceptance compared to LM which is more concerned with the external environment, creative engagement, and seeking novelty (Hart et al., 2013). Compassion (with its

strong connection to MM) likely also relates more strongly to the *affective* dimension; helping individuals better regulate shame that might arise from failing to manage ambiguity well (Fulton, 2016) and recognizing ambiguity as a common human experience.

Previously, Hitsuwari and Nomura (2021) found significant correlations between total MM and the *affective* dimension (moderate negative correlation) and the *epistemic* dimension (small to moderate positive correlation), but they found no significant correlation with the *cognitive* dimension. Ie et al. (2012) found a significant negative and moderately-sized correlation between LM and intolerance of ambiguity using a measure by Budner (1962) that is conceptually similar to the *epistemic* dimension (Lauriola et al., 2016). Similarly, Fulton (2016) found a moderate to large correlation between self-compassion and AT using the Multiple Stimulus Types Ambiguity Tolerance Scale - II (MSTAT-II) by McLain (2009) whose predecessor (MSTAT-I) is notably similar to the *epistemic* dimension (Lauriola et al., 2016). Taken together, the *epistemic* dimension seems to be correlated with MM, LM, and self-compassion. Support for this was found in Study 2 (also using the MSTAT-II), as both MM and LM significantly predicted the *epistemic* dimension with LM doing so more strongly. While a correlation was found for self-compassion, it did not significantly add to the predictive model. Thus, the abilities to be nonreactive to one's internal responses towards ambiguous stimuli and to engage with the stimuli in an open and flexible manner may be how individuals manage ambiguity and be more willing to approach it. Furthermore, in Study 3, the intervention combines MM and LM, and only the *epistemic* dimension showed significant increases in post-training and follow-up. Taken together, there seems to be stronger evidence of the relationship between MM, LM, and the *epistemic* dimension where the *epistemic* dimension is both predicted by a combination of MM and LM (albeit more strongly by LM) and affected by training.

Study 3 also showed benefit-consistent trends in the *cognitive* dimension which offers very tentative support for the impact of training. The lack of significance may be due to several factors including the small sample size, the scores being already quite low (less than 3 points on a 7-point scale where 3 is "I mildly disagree"), and the need for more emphasis on LM in the training (changes in LM also only showed benefit-consistent trends). No changes were found in the *affective* dimension. While initially surprising, this result is also potentially reflective of the idea that mindfulness does not aim to change feelings of discomfort, rather to help manage them differently. The sample in Study 3 also already has quite mild discomfort (less than 5 points on a 7-point scale where 5 is "I mildly agree"). Ultimately, more research on the *affective* and *cognitive* dimensions is required; for example, one could cross-sectionally examine the relationship between MM, LM, compassion as well as the AT dimensions. Additionally, it would be interesting to revisit the induction experiment in Study 2. The measure used only reflected the *epistemic* dimension, and so it is possible that while induction might not substantially increase the *epistemic* dimension, it could perhaps decrease another. Inductions could also be compared in their effect on each dimension; for example, LM inductions might decrease intolerance on the *cognitive* dimension while MM and compassion-based inductions affect the *affective* dimension.

When empirically examining these hypotheses, researchers should be cognizant of cultural and occupational contexts. In Study 1, most of the studies examining the effects of mindfulness in healthcare professionals and trainees were conducted in Western countries, limiting the generalizability of findings. Furthermore, Hitsuwari and Nomura (2021) highlighted cross-cultural differences in dimension scores between their Japanese sample and the Italian sample in Lauriola et al. (2016). Study 3's CIT sample also appears to have greater tolerance across dimensions compared to the Japanese sample, in the *cognitive* dimension compared to the

Italian sample, and in the *epistemic* dimension compared to the undergraduate students in Study 2. These differences in AT due to culture and profession may also require differences in implementing mindfulness and compassion interventions and the mechanisms through which these skills affect AT.

Another important theme emerging from the three studies relates to the use of mindfulness and compassion induction versus comprehensive training. One of the key issues for students is time; their schedules are often so busy that finding additional time to engage in another training may be difficult. While Study 3 showed that a briefer intervention (i.e., six 90-minute sessions compared to eight 2-hour sessions in traditional mindfulness programs) can still be effective, some participants still noted finding it to be too long. These are individuals who self-selected to attend and are motivated to learn about mindfulness and compassion, which begs the question of how feasible can adding training programs be for the larger student population that includes individuals who might not be motivated or interested. Therefore, examining the effect of induction and meditation-only trainings would be important as there is less of a time commitment, and it could still develop trait mindfulness as students continue to engage in the brief exercises. There is some support for the effects of mindfulness induction for therapists; for example, therapists who engaged in a brief mindfulness induction prior to session (compared to a control) perceived themselves as more present in session and their clients also perceived the sessions as more effective (Dunn et al., 2013). Furthermore, Gill et al. (2020) noted that mindfulness induction significantly affects higher-order cognitive functions (i.e., verbal reasoning, judgment and decision making, creativity) which would be important in therapy and are implicated in AT. Study 2 did not find a significant effect of induction on AT; however, there is a need for more research to examine AT dimensions separately and to explore different types

of induction exercises. In addition, Study 1 found meditation-only training was effective in increasing mindfulness and well-being related outcomes, suggesting that comprehensive training programs may not be necessary for enhancing all outcomes. While Study 3 did show changes in AT from a comprehensive training program, future studies should compare it to a meditation-only condition. More research is necessary to examine how mindfulness and compassion can benefit CITs' self-care and AT, and it will be important for researchers to consider time constraints when developing novel trainings.

Limitations and Future Directions

In addition to what has been outlined in each chapter, there are several important limitations that emerge across studies. First, sample sizes are small and predominantly female. This is not uncommon in psychology research given the tendency for gender imbalance in undergraduate psychology pools and in clinical/counselling graduate programs (e.g., Dickinson et al., 2012; Johnson et al., 2020). There has been some equivocal research on gender differences in AT in second language learning with some studies suggesting no difference (e.g., Başöz, 2015; Kamran, 2011) and others finding a greater intolerance in female-identifying students (e.g., Erten & Topkaya, 2009; Marzban et al., 2012). Similarly, there is some evidence for gender differences in response to meditative training (e.g., Kang et al., 2018; Rojiani et al., 2017), while others have not found such differences (e.g., Shapiro et al., 2007). Study 1 also noted a weak but significant moderating effect of gender on overall outcome (i.e., studies with a larger percentage of females had a greater effect). Ultimately, it would be of interest to examine a larger gender-balanced sample to further elucidate the relationship between mindfulness, compassion, and AT using structural equation modelling approaches and examine any gender differences that might require adaptation of training strategies.

Second, as previously noted, AT is a difficult construct to define especially because of its conceptual and empirical relationship with intolerance of uncertainty. Studies 2 and 3 did not include a measure of intolerance of uncertainty. Assessing its relationship with mindfulness and compassion as well as how it might be impacted by training could further elucidate similarities and differences to AT. For example, Paralkar and Knutson (2021) found that students' AT (and not intolerance of uncertainty) were significantly predictive of approach coping strategies to cope with academic stress. Approach strategies involve focusing on the present to manage the stressor, and mindfulness positively correlates with adaptive coping strategies (e.g., Pidgeon & Pickett, 2017). Examining which facets of MM, LM, and compassion are predictive of the dimensions of AT and of intolerance of uncertainty could further add to the understanding of the mechanisms through which mindfulness and compassion might impact these constructs; in turn, this could drive the design of future trainings.

Third, there is a need for further development of self-report and behavioural measures of AT, mindfulness, and compassion. There are state measures of MM (e.g., Lau et al., 2006) and self-compassion (Neff et al., 2021), but such measures have not been validated for AT and LM. Developing such measures would be very important when conducting induction research to accurately assess for manipulation success. Furthermore, there is a need to develop a measure of AT that is specific for CITs. It is expected that CITs would have a greater AT than the general population due to the nature of the clinical field. Even among medical students, AT was significantly greater in specialities like psychiatry as compared to surgery (e.g., Geller et al., 1990). CITs also experience different types of ambiguous situations compared to the general population or other professions; thus, a specific measure should be developed to accurately assess AT. This can then be used as well in longitudinal studies to assess how AT changes over

the course of training and whether programs are successfully supporting students in learning to manage ambiguity. Furthermore, given that the program is based on an embodied and embedded framework, new measures based on this conceptualization should be utilized. Publications are upcoming and can be included in future studies (e.g., Khoury et al., 2021; Khoury et al., 2022).

Finally, there is a need to extend the breadth of personal and interpersonal measures examined in mindfulness and compassion training studies. As noted in Study 1, measures tend to focus on distress-related symptoms (e.g., anxiety, burnout, depression, stress). It would be interesting to further explore correlates of well-being (e.g., empathy, job and life satisfaction, happiness, social connectedness), aspects of physical health (e.g., blood pressure, heart rate), effects on organizational functioning (e.g., employee cohesiveness, staff turnover, workplace safety), and impacts on clinical/interpersonal tasks (e.g., client satisfaction, clinical skills, working alliance). The latter is of particular importance for CITs, and researchers should seek to understand how their development of AT impacts their experience with clients both from their own perspective and from the perspectives of their clients. Study designs could be modelled on Grepmair et al. (2007) and Dunn et al. (2013) who assessed the effect of a mindfulness training program and pre-session mindfulness induction respectively on both therapist and clients.

Practical Implications

CITs are the most important stakeholders of this research program. This dissertation offers additional support to the use of mindfulness and compassion training with CITs; particularly in developing their practice of self-care and their ability to tolerate ambiguity. With the growing availability of mindfulness and compassion training within universities (e.g., many university counselling centres offer mindfulness workshops) and in the community, CITs may want to seek these opportunities. When doing so, it would be important for them to acknowledge

the multi-faceted benefits of such training. It supports their own self-care and mental health and can impact the way they approach clients; particularly, their comfort using mindfulness and compassion skills with clients. Perhaps building a personal mindfulness practice can also support understanding and compassion for the struggle clients will have developing their own practice.

Previous scholars have highlighted the importance of within-program mentorship in supporting self-care and AT; our study extends this suggestion by helping students connect across programs in Canada. Doing so can help further validate the commonality of struggles faced by CITs as well as foster a supportive professional network. Furthermore, a source of ambiguity for CITs is the multiple roles they occupy within training programs and amongst their peers (e.g., friends, research collaborators, supervisees, competitors). For some, it might be hard to talk about their struggles with ambiguity and clinical training because of how peers might respond. Having an external group who can still understand such struggles but is also not directly related to their work may offer a safer space to be honest and to express themselves. Perhaps programs can also do more to connect students and facilitate initiatives for peer support both within and between clinical programs.

For educators, it is important that discussion of AT and self-care are infused in courses and supervision. While the number of participants in Study 3 is small, they do reflect eleven programs and thirty supervision experiences. In general, they expressed high satisfaction with their clinical and research supervisors. However, their descriptions of what supervision involves highlight inconsistencies between programs and an unexpectedly low inclusion of self-care as a mandatory part of training and low discussion of AT. Understandably, not all educators will be strict mindfulness and compassion practitioners; however, mindfulness, self-compassion, and compassion towards others are all strongly connected to clinical work regardless of one's clinical

frame. Assigning readings about these topics, engaging students in reflective activities on the impact of ambiguity on their clinical development, and infusing actual practice of self-care (e.g., meditation, self-compassion break) in supervision and courses are some avenues for supporting students. Furthermore, by identifying, normalizing, and exploring the thoughts, feelings, and sensations that can arise when engaging in such discussions and activities, educators can also demonstrate and facilitate a mindful and compassionate approach. Appendix A contains a reflective workbook developed for the training program in Study 3 that might be helpful for educators and students.

For researchers, developing programs that are CIT-oriented as well as feasible and acceptable for their intense schedule is possible. Shorter and fewer training sessions still show effectiveness, and the use of online trainings may help to ease the stress of scheduling as well as support generalizability by including participants from different training programs. Furthermore, training programs can effectively integrate and teach both mindfulness and compassion using the embodied and embedded framework. Including process measures (i.e., trait and state measures of mindfulness and compassion) is very important when designing studies as they are often overlooked. Furthermore, getting qualitative feedback from participants on their experience of both inductions and trainings can be helpful in assessing the success of the manipulation effect and the extent to which mindfulness and compassion contribute to changes in outcome measures as compared to other components like discussion.

Conclusion and Summary

Research on the effects of mindfulness and compassion training on counsellors-in-training (CITs) continues to grow, and there is support for its benefits on self-care, clinical work, and professional development. It is particularly helpful in cultivating skills that are harder to teach, and this dissertation focused on one such quality – ambiguity tolerance (AT). CITs are facing a growing experience of ambiguity in their work with clients, as graduate students, and as human beings navigating a post-pandemic world. Understanding how to cultivate AT is more important than ever, and this dissertation sought to examine how mindfulness and compassion might be strategies in fostering tolerance alongside supporting self-care. Study 1 highlighted the benefits of both meditative training and more comprehensive mindfulness programs in managing self-care for both healthcare professionals and trainees. Study 2 found the *epistemic* dimension of AT may be most affected by fostering *nonreactivity* and Langer mindfulness as well as highlighted how a brief induction may not be sufficient to enhance AT. Finally, Study 3 built on both Study 1 and 2 to develop a comprehensive training program that is based on a novel framework for mindfulness and compassion (emphasizing both embodied and interpersonal components), is sensitive to the needs of CITs, and directly addresses AT. This program was found to be feasible, acceptable, and effective with benefit-consistent changes found in AT, mindfulness, self-compassion, stress, and life satisfaction.

AT was first identified in psychological literature in the 1950s and then brought into the counselling literature in the 1960s. Mindfulness and compassion research has also grown exponentially in the last few decades. While these fields were conceptually linked in the 1990s, research empirically examining their intersections remains in its infancy. This dissertation represents a small step in understanding their conceptual and empirical relationships and the

mechanisms through which mindfulness and compassion might affect AT. These studies individually and collectively update and add to both the mindfulness and compassion as well as AT literatures, offering important methodological suggestions, practical implications for students, educators, and researchers, as well as directions for future research endeavours.

Bibliography

Aggs, C., & Bambling, M. (2010). Teaching mindfulness to psychotherapists in clinical practice: The mindful therapy programme. *Counselling and Psychotherapy Research*, *10*(4), 278-286. https://doi.org/10.1080/14733145.2010.485690

Alexander, C. N., Langer, E. J., Newman, R. I., Chandler, H. M., & Davies, J. L. (1989). Transcendental meditation, mindfulness, and longevity: An experimental study with the elderly. *Journal of Personality and Social Psychology*, *57*(6), 950-964. https://doi.org/10.1037/0022-3514.57.6.950

Anand, L., Sadowski, I., Per, M., & Khoury, B. (2021). Mindful parenting: A meta-analytic review of intrapersonal and interpersonal parental outcomes. *Current Psychology* https://doi.org/10.1007/s12144-021-02111-w

Anglin, L. P., Pirson, M., & Langer, E. (2008). Mindful Learning: A Moderator of Gender Differences in Mathematics Performance. *Journal of Adult Development*, *15*(3), 132-139. https://doi.org/10.1007/s10804-008-9043-x

Arch, J. J., & Craske, M. G. (2006). Mechanisms of mindfulness: Emotion regulation following a focused breathing induction. *Behaviour Research and Therapy*, *44*(12), 1849-1858. https://doi.org/10.1016/j.brat.2005.12.007

Arimitsu, K. (2016). The effects of a program to enhance self-compassion in Japanese individuals: A randomized controlled pilot study. *The Journal of Positive Psychology*, *11*(6), 559-571. https://doi.org/10.1080/17439760.2016.1152593

Atanes, A. C. M., Andreoni, S., Hirayama, M. S., Montero-Marin, J., Barros, V. V., Ronzani, T. M., Kozasa, E. H., Soler, J., Cebolla, A., Garcia-Campayo, J., & Demarzo, M. M. P. (2015). Mindfulness, perceived stress, and subjective well-being: A correlational study in

primary care health professionals. *BMC Complementary and Alternative Medicine*, *15*, 303-303. https://doi.org/10.1186/s12906-015-0823-0

Babaei, K., Gholmohammadzade, S., Mohammadpur asl, a., & Sattari, M. (2021). Investigating the relationship between positive and negative affect experiences and resilience and tolerance of ambiguity among patients with HIV. *Journal of Advanced Biomedical Sciences*, *11*(1), 3741-3749.

Baer, R. A. (2003). Mindfulness training as a clinical intervention: A conceptual and empirical review. *Clinical Psychology: Science and Practice*, *10*(2), 125-143. https://doi.org/10.1093/clipsy.bpg015

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment*, *13*(1), 27-45. https://doi.org/10.1177%2F1073191105283504

Baer, R. A., Smith, G. T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., Walsh, E., Duggan, D., & Williams, J. M. G. (2008). Construct validity of the Five Facet Mindfulness Questionnaire in meditating and nonmeditating samples. *Assessment*, *15*(3), 329-342. https://doi.org/10.1177/1073191107313003

Banning, K. C. (2003). The effect of the case method on tolerance for ambiguity. *Journal of Management Education*, *27*(5), 556-567. https://doi.org/10.1177/1052562903252652

Başöz, T. (2015). Exploring the relationship between tolerance of ambiguity of EFL learners and their vocabulary knowledge. *Journal of Language and Linguistic Studies*, *11*, 53-66.

Beaumont, E., Durkin, M., Hollins Martin, C. J., & Carson, J. (2016). Measuring relationships between self-compassion, compassion fatigue, burnout and well-being in student counsellors and student cognitive behavioural psychotherapists: A quantitative survey.

Counselling and Psychotherapy Research, *16*(1), 15-23. https://doi.org/10.1002/capr.12054

Beaumont, E., & Hollins Martin, C. J. (2016). A proposal to support student therapists to develop compassion for self and others through Compassionate Mind Training. *The Arts in Psychotherapy*, *50*, 111-118. https://doi.org/10.1016/j.aip.2016.06.005

Beaumont, E., Rayner, G., Durkin, M., & Bowling, G. (2017). The effects of compassionate mind training on student psychotherapists. *The Journal of Mental Health Training, Education and Practice*, *12*(5), 300-312. https://doi.org/10.1108/JMHTEP-06-2016-0030

Beitel, M., Ferrer, E., & Cecero, J. J. (2004). Psychological mindedness and cognitive style. *Journal of Clinincal Psychology*, *60*(6), 567-582. https://doi.org/10.1002/jclp.10258

Bell, T., Dixon, A., & Kolts, R. (2017). Developing a compassionate internal supervisor: Compassion-focused therapy for trainee therapists. *Clinical Psychology & Psychotherapy*, *24*(3), 632-648. https://doi.org/10.1002/cpp.2031

Bentwich, M. E., & Gilbey, P. (2017). More than visual literacy: Art and the enhancement of tolerance for ambiguity and empathy. *BMC Medical Education*, *17*(1), 200.

Bhushan, L. I., & Amal, S. B. (1986). A situational test of intolerance of ambiguity. *Psychologia: An International Journal of Psychology in the Orient*, *29*(4), 254-261.

Bianco, S., Barilaro, P., & Palmieri, A. (2016). Traditional meditation, mindfulness and psychodynamic approach: An integrative perspective. *Frontiers in Psychology*, *7*, 552-552. https://doi.org/10.3389/fpsyg.2016.00552

Bibeau, M., Dionne, F., & Leblanc, J. (2016). Can compassion meditation contribute to the development of psychotherapists' empathy? A review. *Mindfulness*, *7*(1), 255-263. https://doi.org/10.1007/s12671-015-0439-y

Birrell, J., Meares, K., Wilkinson, A., & Freeston, M. (2011). Toward a definition of intolerance of uncertainty: A review of factor analytical studies of the Intolerance of Uncertainty Scale. *Clinical Psychology Review*, *31*(7), 1198-1208. https://doi.org/10.1016/j.cpr.2011.07.009

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., Segal, Z. V., Abbey, S., Speca, M., & Velting, D. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice*, *11*(3), 230-241. https://doi.org/10.1093/clipsy.bph077

Bodhi, B. (1994). *The noble eightfold path: Way to the end of suffering*. Buddhist Publication Society.

Bodner, T. E., & Langer, E. J. (2001). *Individual differences in mindfulness: The mindfulness/mindlessness scale* [Conference Presentation]. 13th Annual American Psychological Society Convention, Toronto, Ontario, Canada

Boellinghaus, I., Jones, F. W., & Hutton, J. (2012). The role of mindfulness and loving-kindness meditation in cultivating self-compassion and other-focused concern in health care professionals. *Mindfulness*, *5*(2), 129-138. https://doi.org/10.1007/s12671-012-0158-6

Bohecker, L., Vereen, L. G., Wells, P. C., & Wathen, C. C. (2016). A mindfulness experiential small group to help students tolerate ambiguity. *Counselor Education and Supervision*, *55*(1), 16-30. https://doi.org/10.1002/ceas.12030

Bordin, E. S. (1955). Ambiguity as a therapeutic variable. *Journal of Consulting Psychology*, *19*(1), 9-15. https://doi.org/10.1037/h0047986

Boss, P. (2006). Ambiguous loss: Preventive interventions for family professionals. *Journal of Family and Consumer Sciences*, *98*(2), 8-10.

Brams, J. M. (1961). Counselor characteristics and effective communication in counseling. *Journal of Counseling Psychology*, *8*(1), 25-30. https://doi.org/10.1037/h0047997

Breines, J. G., & Chen, S. (2012). Self-compassion increases self-improvement motivation. *Personality and Social Psychology Bulletin*, *38*(9), 1133-1143. https://doi.org/10.1177/0146167212445599

Brendel, W., Hankerson, S., Byun, S., & Cunningham, B. (2016). Cultivating leadership Dharma: Measuring the impact of regular mindfulness practice on creativity, resilience, tolerance for ambiguity, anxiety and stress. *Journal of Management Development*, *35*(8), 1056-1078. https://doi.org/10.1108/JMD-09-2015-0127

Brockman, R., Ciarrochi, J., Parker, P., & Kashdan, T. (2017). Emotion regulation strategies in daily life: Mindfulness, cognitive reappraisal and emotion suppression. *Cognitive Behaviour Therapy*, *46*(2), 91-113. https://doi.org/10.1080/16506073.2016.1218926

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*(4), 822-848. https://doi.org/10.1037/0022-3514.84.4.822

Bruce, N. G., Manber, R., Shapiro, S. L., & Constantino, M. J. (2010). Psychotherapist mindfulness and the psychotherapy process. *Psychotherapy: Theory, Research, Practice, Training*, *47*(1), 83-97. https://doi.org/10.1037/a0018842

Budner, S. (1962). Intolerance of ambiguity as a personality variable. *Journal of Personality*, *30*(1), 29-50. https://doi.org/10.1111/j.1467-6494.1962.tb02303.x

Buhr, K., & Dugas, M. J. (2006). Investigating the construct validity of intolerance of uncertainty and its unique relationship with worry. *Journal of Anxiety Disorders*, *20*(2), 222-236. https://doi.org/10.1016/j.janxdis.2004.12.004

Burpee, L. C., & Langer, E. J. (2005). Mindfulness and marital satisfaction. *Journal of Adult Development*, *12*(1), 43-51. https://doi.org/10.1007/s10804-005-1281-6

Butts, C. M., & Gutierrez, D. (2018). Dispositional mindfulness and personal distress as predictors of counseling self-efficacy. *Counselor Education and Supervision*, *57*(4), 271-284. https://doi.org/10.1002/ceas.12116

Campanella, F., Crescentini, C., Urgesi, C., & Fabbro, F. (2014). Mindfulness-oriented meditation improves self-related character scales in healthy individuals. *Comprehensive Psychiatry*, *55*(5), 1269-1278. https://doi.org/10.1016/j.comppsych.2014.03.009

Campbell, J. C., & Christopher, J. C. (2012). Teaching mindfulness to create effective counselors. *Journal of Mental Health Counseling*, *34*(3), 213-226. https://doi.org/10.17744/mehc.34.3.j756585201572581

Canadian Mental Health Association. (2018). *Mental health in the balance: Ending the health care disparity in Canada*. https://cmha.ca/brochure/mental-health-in-the-balance-ending-the-health-care-disparity-in-canada/

Canadian Mental Health Association. (2020). *COVID-19 and mental health: Heading off an echo pandemic*. https://cmha.ca/brochure/covid-19-and-mental-health-heading-off-an-echo-pandemic/

Canadian Psychological Association (2017). *Canadian code of ethics for psychologists* (4th ed.) https://doi.org/https://cpa.ca/docs/File/Ethics/CPA_Code_2017_4thEd.pdf

Carleton, R. N. (2012). The intolerance of uncertainty construct in the context of anxiety disorders: Theoretical and practical perspectives. *Expert Review of Neurotherapeutics*, *12*(8), 937-947. https://doi.org/10.1586/ern.12.82

Carrière, K., Khoury, B., Günak, M. M., & Knäuper, B. (2018). Mindfulness-based interventions for weight loss: A systematic review and meta-analysis. *Obesity Reviews*, *19*(2), 164-177. https://doi.org/10.1111/obr.12623

Carsley, D., Khoury, B., & Heath, N. L. (2018). Effectiveness of mindfulness interventions for mental health in schools: A comprehensive meta-analysis. *Mindfulness*, *9*(3), 693-707. https://doi.org/10.1007/s12671-017-0839-2

Carson, S. H., & Langer, E. J. (2004). Mindful practice for clinicians and patients. In *Handbook of primary care psychology* (pp. 173-183). Oxford University Press.

Carson, S. H., & Langer, E. J. (2006). Mindfulness and self-acceptance. *Journal of Rational-Emotive and Cognitive-Behavior Therapy*, *24*(1), 29-43. https://doi.org/10.1007/s10942-006-0022-5

Chen, Y., Yang, X., Wang, L., & Zhang, X. (2013). A randomized controlled trial of the effects of brief mindfulness meditation on anxiety symptoms and systolic blood pressure in Chinese nursing students. *Nurse Education Today*, *33*(10), 1166-1172. https://doi.org/10.1016/j.nedt.2012.11.014

Chesley, J., & Wylson, A. (2016). Ambiguity: The emerging impact of mindfulness for change leaders. *Journal of Change Management*, *16*(4), 317-336. https://doi.org/10.1080/14697017.2016.1230334

Chiesa, A., Calati, R., & Serretti, A. (2011). Does mindfulness training improve cognitive abilities? A systematic review of neuropsychological findings. *Clinical Psychology Review*, *31*(3), 449-464. https://doi.org/10.1016/j.cpr.2010.11.003

Chiesa, A., & Serretti, A. (2009). Mindfulness-based stress reduction for stress management in healthy people: A review and meta-analysis. *Journal of Alternative and Complementary Medicine*, *15*(5), 593-600. https://doi.org/10.1089/acm.2008.0495

Chiesa, A., & Serretti, A. (2011). Mindfulness based cognitive therapy for psychiatric disorders: A systematic review and meta-analysis. *Psychiatry Research*, *187*(3), 441-453. https://doi.org/10.1016/j.psychres.2010.08.011

Chrisman, J. A., Christopher, J. C., & Lichtenstein, S. J. (2009). Qigong as a mindfulness practice for counseling students: A qualitative study. *Journal of Humanistic Psychology*, *49*(2), 236-257. https://doi.org/10.1177/0022167808327750

Christoff, K., Gordon, A. M., Smallwood, J., Smith, R., & Schooler, J. W. (2009). Experience sampling during fMRI reveals default network and executive system contributions to mind wandering. *Proceedings of the National Academy of Sciences*, *106*(21), 8719. https://doi.org/10.1073/pnas.0900234106

Christopher, J., Chrisman, J., Trotter-Mathison, M., Schure, M., Dahlen, P., & Christopher, S. (2011). Perceptions of the long-term influence of mindfulness training on counselors and psychotherapists: A qualitative inquiry. *Journal of Humanistic Psychology*, *51*(3), 318-349. https://doi.org/10.1177%2F0022167810381471

Christopher, J. C., Christopher, S., Dunnagan, T., & Schure, M. (2006). Teaching self-care through mindfulness practices: The application of yoga, meditation, and qigong to counselor training. *Journal of Humanistic Psychology*, *46*(4), 494-509. https://doi.org/10.1177/0022167806290215

Christopher, J. C., & Maris, J. A. (2010). Integrating mindfulness as self-care into counselling and psychotherapy training. *Counselling and Psychotherapy Research*, *10*(2), 114-125. https://doi.org/10.1080/14733141003750285

Cohen, K., & Collens, P. (2013). The impact of trauma work on trauma workers: A metasynthesis on vicarious trauma and vicarious posttraumatic growth. *Psychological Trauma: Theory, Research, Practice, and Policy*, *5*(6), 570-580. https://doi.org/10.1037/a0030388

Conversano, C., Ciacchini, R., Orrù, G., Di Giuseppe, M., Gemignani, A., & Poli, A. (2020). Mindfulness, compassion, and self-compassion among health care professionals: What's new? A systematic review. *Frontiers in Psychology*, *11*(1683) https://doi.org/10.3389/fpsyg.2020.01683

Cushway, D. (1992). Stress in clinical psychology trainees. *The British Journal of Clinical Psychology*, *31*(2), 169-179. https://doi.org/10.1111/j.2044-8260.1992.tb00981.x

de Vibe, M., Solhaug, I., Rosenvinge, J. H., Tyssen, R., Hanley, A., & Garland, E. (2018). Six-year positive effects of a mindfulness-based intervention on mindfulness, coping and well-being in medical and psychology students; Results from a randomized controlled trial. *PLoS ONE*, *13*(4), e0196053. https://doi.org/10.1371/journal.pone.0196053

de Vibe, M., Solhaug, I., Tyssen, R., Friborg, O., Rosenvinge, J. H., Sorlie, T., & Bjorndal, A. (2013). Mindfulness training for stress management: A randomised controlled study of medical and psychology students. *BMC Medical Education*, *13*, 107. https://doi.org/10.1186/1472-6920-13-107

Dickinson, E. R., Adelson, J. L., & Owen, J. (2012). Gender balance, representativeness, and statistical power in sexuality research using undergraduate student samples. *Archives of Sexual Behavior*, *41*(2), 325-327. https://doi.org/10.1007/s10508-011-9887-1

Djikic, M., Langer, E. J., & Stapleton, S. F. (2008). Reducing stereotyping through mindfulness: Effects on automatic stereotype-activated behaviors. *Journal of Adult Development*, *15*(2), 106-111. https://doi.org/10.1007/s10804-008-9040-0

Dong, S., Miles, L., Abell, N., & Martinez, J. (2018). Development of professional identity for counseling professionals: A mindfulness-based perspective. *International Journal for the Advancement of Counselling*, *40*(4), 469-480. https://doi.org/10.1007/s10447-018-9338-y

Dreisoerner, A., Junker, N. M., & van Dick, R. (2020). The relationship among the components of self-compassion: A pilot study using a compassionate writing intervention to enhance self-kindness, common humanity, and mindfulness. *Journal of Happiness Studies*, *22*, 21-47. https://doi.org/10.1007/s10902-019-00217-4

Dugas, M. J., Buhr, K., & Ladouceur, R. (2004). The role of intolerance of uncertainty in the etiology and maintenance of generalized anxiety disorder. In R. G. Heimberg, C. L. Turk, & D. S. Mennin (Eds.), *Generalized anxiety disorder: Advances in research and practice* (pp. 143-163). Guilford Press.

Dugas, M. J., Gagnon, F., Ladouceur, R., & Freeston, M. H. (1998). Generalized anxiety disorder: A preliminary test of a conceptual model. *Behaviour Research and Therapy*, *36*(2), 215-226. https://doi.org/10.1016/s0005-7967(97)00070-3

Dunn, R., Callahan, J. L., Swift, J. K., & Ivanovic, M. (2013). Effects of pre-session centering for therapists on session presence and effectiveness. *Psychotherapy Research*, *23*(1), 78-85. https://doi.org/10.1080/10503307.2012.731713

Dunne, J. D. (2011). Toward an understanding of non-dual mindfulness. *Contemporary Buddhism*, *12*(1), 71-88. https://doi.org/10.1080/14639947.2011.564820

Dunne, J. D. (2015). Buddhist styles of mindfulness: A heuristic approach. In B. R. Ostafin & B. P. Meier (Eds.), *Handbook of mindfulness and self-regulation*. Springer.

Durrheim, K., & Foster, D. (1997). Tolerance of ambiguity as a content specific construct. *Personality and Individual Differences*, *22*(5), 741-750.

El-Ghoroury, N. H., Galper, D. I., Sawaqdeh, A., & Bufka, L. F. (2012). Stress, coping, and barriers to wellness among psychology graduate students. *Training and Education in Professional Psychology*, *6*(2), 122-134. https://doi.org/10.1037/a0028768

Endres, M. L., Camp, R., & Milner, M. (2015). Is ambiguity tolerance malleable? Experimental evidence with potential implications for future research. *Frontiers in Psychology*, *6*, 619-619. https://doi.org/10.3389/fpsyg.2015.00619

Eriksen, K. P., & McAuliffe, G. J. (2006). Constructive Development and Counselor Competence. *Counselor Education and Supervision*, *45*(3), 180-192.

Erisman, S. M., & Roemer, L. (2010). A preliminary investigation of the effects of experimentally induced mindfulness on emotional responding to film clips. *Emotion*, *10*(1), 72-82. https://doi.org/10.1037/a0017162

Erten, I. h., & Topkaya, E. (2009). Understanding tolerance of ambiguity of EFL learners in reading classes at tertiary level. *Novitas-ROYAL*, *3*(1), 29-44.

Fatemi, S. M., & Langer, E. (2018). Langerian mindfulness and its psychotherapeutic implications: Recomposing/decomposing mindlessly constructed life stories. In B. Kirkcaldy (Ed.), *Psychotherapy, literature and the visual and performing art* (pp. 43-52). Palgrave Macmillan. https://doi.org/https://doi.org/10.1007/978-3-319-75423-9_3

Fauth, J., Gates, S., Vinca, M. A., Boles, S., & Hayes, J. A. (2007). Big ideas for psychotherapy training. *Psychotherapy: Theory, Research, Practice, Training*, *44*(4), 384-391. https://doi.org/10.1037/0033-3204.44.4.384 (Psychotherapy Training: Effective Elements and New Directions)

Fehse, K., Silveira, S., Elvers, K., & Blautzik, J. (2015). Compassion, guilt and innocence: An fMRI study of responses to victims who are responsible for their fate. *Social Neuroscience*, *10*(3), 243-252. https://doi.org/10.1080/17470919.2014.980587

Felton, T. M., Coates, L., & Christopher, J. C. (2015). Impact of mindfulness training on counseling students' perceptions of stress. *Mindfulness*, *6*(2), 159-169. https://doi.org/10.1007/s12671-013-0240-8

Ferrari, M., Hunt, C., Harrysunker, A., Abbott, M. J., Beath, A. P., & Einstein, D. A. (2019). Self-compassion interventions and psychosocial outcomes: A meta-analysis of RCTs. *Mindfulness*, *10*(8), 1455-1473. https://doi.org/10.1007/s12671-019-01134-6

Figley, C. R. (2002a). Compassion fatigue: Psychotherapists' chronic lack of self care. *Journal of Clinical Psychology*, *58*(11), 1433-1441. https://doi.org/10.1002/jclp.10090

Figley, C. R. (2002b). *Treating compassion fatigue*. Brunner-Routledge.

Finlay-Jones, A., Kane, R., & Rees, C. (2017). Self-compassion online: A pilot study of an internet-based self-compassion cultivation program for psychology trainees. *Journal of Clinical Psychology*, *73*(7), 797-816. https://doi.org/10.1002/jclp.22375

Finlay-Jones, A. L., Rees, C. S., & Kane, R. T. (2015). Self-compassion, emotion regulation and stress among Australian psychologists: Testing an emotion regulation model of self-compassion using structural equation modeling. *PLoS One*, *10*(7), e0133481. https://doi.org/10.1371/journal.pone.0133481

Foote, M., Davis, W. L., & Marks, S. E. (1975). Tolerance of ambiguity: A variable in client and counsellor pairing. *Canadian Journal of Counselling and Psychotherapy/Revue canadienne de counseling et de psychothérapie*, *9*(1)

Freeston, M. H., Rhéaume, J., Letarte, H., Dugas, M. J., & Ladouceur, R. (1994). Why do people worry? *Personality and Individual Differences*, *17*(6), 791-802. https://doi.org/10.1016/0191-8869(94)90048-5

Frenkel-Brunswik, E. (1949). Intolerance of ambiguity as an emotional and perceptual personality variable. *Journal of Personality*, *18*(1), 108-143. https://doi.org/10.1111/j.1467-6494.1949.tb01236.x

Fulton, C. L. (2016). Mindfulness, self-compassion, and counselor characteristics and session variables. *Journal of Mental Health Counseling*, *38*(4), 360-374. https://doi.org/10.17744/mehc.38.4.06

Furnham, A., & Marks, J. (2013). Tolerance of ambiguity: A review of the recent literature. *Psychology*, *4*, 717-728. https://doi.org/10.4236/psych.2013.49102

Gambrel, L. E., & Keeling, M. L. (2010). Relational aspects of mindfulness: Implications for the practice of marriage and family therapy. *Contemporary Family Therapy*, *32*(4), 412-426. https://doi.org/10.1007/s10591-010-9129-z

Garrison, K. A., Zeffiro, T. A., Scheinost, D., Constable, R. T., & Brewer, J. A. (2015). Meditation leads to reduced default mode network activity beyond an active task. *Cognitive, Affective & Behavioral Neuroscience*, *15*(3), 712-720. https://doi.org/10.3758/s13415-015-0358-3

Gärtner, J., Bußenius, L., Prediger, S., Vogel, D., & Harendza, S. (2020). Need for cognitive closure, tolerance for ambiguity, and perfectionism in medical school applicants. *BMC Medical Education*, *20*, 132. https://doi.org/10.1186/s12909-020-02043-2

Geller, G. (2013). Tolerance for ambiguity: An ethics-based criterion for medical student selection. *Academic Medicine*, *88*(5), 581-584. https://doi.org/10.1097/ACM.0b013e31828a4b8e

Geller, G., Faden, R. R., & Levine, D. M. (1990). Tolerance for ambiguity among medical students: Implications for their selection, training and practice. *Social Science and Medicine*, *31*(5), 619-624. https://doi.org/10.1016/0277-9536(90)90098-D

Geller, G., Grbic, D., Andolsek, K. M., Caulfield, M., & Roskovensky, L. (2021). Tolerance for ambiguity among medical students: Patterns of change during medical school and their implications for professional development. *Academic Medicine*, *96*(7), 1036-1042. https://doi.org/10.1097/acm.0000000000003820

Gilbert, P. (2006). *Compassion: Conceptualizations, research and use in psychotherapy*. Routledge.

Gilbert, P. (2009a). *The compassionate mind: A new approach to the challenges of life*. Constable & Robinson.

Gilbert, P. (2009b). Introducing compassion-focused therapy. *Advances in Psychiatric Treatment*, *15*(3), 199-208. https://doi.org/10.1192/apt.bp.107.005264

Gilbert, P. (2010). *Compassion focused therapy: Distinctive features*. Routledge.

Gilbert, P., McEwan, K., Matos, M., & Rivis, A. (2011). Fears of compassion: Development of three self-report measures. *Psychology and Psychotherapy: Theory, Research and Practice*, *84*(3), 239-255. https://doi.org/10.1348/147608310x526511

Gilbert, P., & Procter, S. (2006). Compassionate mind training for people with high shame and self-criticism: Overview and pilot study of a group therapy approach. *Clinical Psychology & Psychotherapy*, *13*(6), 353-379. https://doi.org/10.1002/cpp.507

Gill, L.-N., Renault, R., Campbell, E., Rainville, P., & Khoury, B. (2020). Mindfulness induction and cognition: A systematic review and meta-analysis. *Consciousness and Cognition*, *84*, 102991. https://doi.org/10.1016/j.concog.2020.102991

Gockel, A. (2010). The promise of mindfulness for clinical practice education. *Smith College Studies in Social Work*, *80*(2-3), 248-268. https://doi.org/10.1080/00377311003784184

Godfrin, K. A., & van Heeringen, C. (2010). The effects of mindfulness-based cognitive therapy on recurrence of depressive episodes, mental health and quality of life: A randomized controlled study. *Behaviour Research and Therapy*, *48*(8), 738-746. https://doi.org/10.1016/j.brat.2010.04.006

Goldin, P. R., & Gross, J. J. (2010). Effects of mindfulness-based stress reduction (MBSR) on emotion regulation in social anxiety disorder. *Emotion*, *10*(1), 83-91. https://doi.org/10.1037/a0018441

Grant, A. M., Langer, E. J., Falk, E., & Capodilupo, C. (2004). Mindful creativity: Drawing to draw distinctions. *Creativity Research Journal*, *16*(2-3), 261-265. https://doi.org/10.1080/10400419.2004.9651457

Grenier, S., Barrette, A.-M., & Ladouceur, R. (2005). Intolerance of uncertainty and intolerance of ambiguity: Similarities and differences. *Personality and Individual Differences*, *39*(3), 593-600. https://doi.org/10.1016/j.paid.2005.02.014

Grepmair, L., Mitterlehner, F., Loew, T., Bachler, E., Rother, W., & Nickel, M. (2007). Promoting mindfulness in psychotherapists in training influences the treatment results of

their patients: A randomized, double-blind, controlled study. *Psychotherapy and Psychosomatics*, *76*(6), 332-338. https://doi.org/10.1159/000107560

Grossman, P., Niemann, L., Schmidt, S., & Walach, H. (2004). Mindfulness-based stress reduction and health benefits: A meta-analysis. *Journal of Psychosomatic Research*, *57*(1), 35-43. https://doi.org/10.1016/S0022-3999(03)00573-7

Gruberg, R. (1969). A significant counselor personality characteristic: Tolerance of ambiguity. *Counselor Education and Supervision*, *8*(2), 119-124. https://doi.org/10.1002/j.1556-6978.1969.tb01312.x

Gruberger, M., Simon, E., Levkovitz, Y., Zangen, A., & Hendler, T. (2011). Towards a neuroscience of mind-wandering. *Frontiers in Human Neuroscience*, *5*(56) https://doi.org/10.3389/fnhum.2011.00056

Gu, J., Baer, R., Cavanagh, K., Kuyken, W., & Strauss, C. (2020). Development and psychometric properties of the Sussex-Oxford Compassion Scales (SOCS). *Assessment*, *27*(1), 3-20. https://doi.org/10.1177/1073191119860911

Gu, J., Strauss, C., Bond, R., & Cavanagh, K. (2015). How do mindfulness-based cognitive therapy and mindfulness-based stress reduction improve mental health and wellbeing? A systematic review and meta-analysis of mediation studies. *Clinical Psychology Review*, *37*, 1-12. https://doi.org/10.1016/j.cpr.2015.01.006

Gudykunst, W. B. (1998). Applying anxiety/uncertainty management (AUM) theory to intercultural adjustment training. *International Journal of Intercultural Relations*, *22*(2), 227-250. https://doi.org/10.1016/S0147-1767(98)00005-4

Hafenbrack, A. C., Cameron, L. D., Spreitzer, G. M., Zhang, C., Noval, L. J., & Shaffakat, S. (2020). Helping people by being in the present: Mindfulness increases prosocial

behavior. *Organizational Behavior and Human Decision Processes*, *159*, 21-38. https://doi.org/10.1016/j.obhdp.2019.08.005

Hafenbrack, A. C., Kinias, Z., & Barsade, S. G. (2014). Debiasing the mind through meditation: Mindfulness and the sunk-cost bias. *Psychological Science*, *25*(2), 369-376. https://doi.org/10.1177/0956797613503853

Haigh, E. A., Moore, M. T., Kashdan, T. B., & Fresco, D. M. (2011). Examination of the factor structure and concurrent validity of the Langer Mindfulness/Mindlessness Scale. *Assessment*, *18*(1), 11-26. https://doi.org/10.1177/1073191110386342

Hammond, J. A., Hancock, J., Martin, M. S., Jamieson, S., & Mellor, D. J. (2017). Development of a new scale to measure ambiguity tolerance in veterinary students. *Journal of Veterinary Medical Education*, *44*(1), 38-49. https://doi.org/10.3138/jvme.0216-040R

Hancock, J., Roberts, M., Monrouxe, L., & Mattick, K. (2015). Medical student and junior doctors' tolerance of ambiguity: Development of a new scale. *Advances in Health Sciences Education: Theory and Practice*, *20*(1), 113-130. https://doi.org/10.1007/s10459-014-9510-z

Harris, W. (2013). Mindfulness-based existential therapy: Connecting mindfulness and existential therapy. *Journal of Creativity in Mental Health*, *8*(4), 349-362. https://doi.org/10.1080/15401383.2013.844655

Hart, R., Ivtzan, I., & Hart, D. (2013). Mind the gap in mindfulness research: A comparative account of the leading schools of thought. *Review of General Psychology*, *17*(4), 453-466. https://doi.org/10.1037/a0035212

Hassannejad Emamchay, M., & Zabihi, R. (2021). The effect of mindfulness-based stress reducing program on tolerance of ambiguity, rumination, and metacognitive awareness in

infertile women. *British Journal of Guidance & Counselling* https://doi.org/10.1080/03069885.2021.1961209

Helson, R., & Wink, P. (1992). Personality change in women from the early 40s to the early 50s. *Psychology and Aging*, *7*(1), 46-55. https://doi.org/10.1037//0882-7974.7.1.46

Hemanth, P., & Fisher, P. (2015). Clinical psychology trainees' experiences of mindfulness: An interpretive phenomenological analysis. *Mindfulness*, *6*(5), 1143-1152. https://doi.org/10.1007/s12671-014-0365-4

Herman, J., Stevens, M., Bird, A., Mendenhall, M., & Oddou, G. (2010). The Tolerance for Ambiguity Scale: Towards a more refined measure for international management research. *International Journal of Intercultural Relations*, *34*, 58-65. https://doi.org/10.1016/j.ijintrel.2009.09.004

Hillen, M. A., Gutheil, C. M., Strout, T. D., Smets, E. M. A., & Han, P. K. J. (2017). Tolerance of uncertainty: Conceptual analysis, integrative model, and implications for healthcare. *Social Science & Medicine*, *180*, 62-75. https://doi.org/10.1016/j.socscimed.2017.03.024

Hitsuwari, J., & Nomura, M. (2021). Developing and validating a Japanese version of the Multidimensional Attitude toward Ambiguity Scale (MAAS). *Psychology*, *12*(4), 477-497. https://doi.org/10.4236/psych.2021.124030

Hofmann, S. G., Grossman, P., & Hinton, D. E. (2011). Loving-kindness and compassion meditation: Potential for psychological interventions. *Clinical Psychology Review*, *31*(7), 1126-1132. https://doi.org/10.1016/j.cpr.2011.07.003

Hölzel, B. K., Lazar, S. W., Gard, T., Schuman-Olivier, Z., Vago, D. R., & Ott, U. (2011). How does mindfulness meditation work? Proposing mechanisms of action from a conceptual

and neural perspective. *Perspectives on Psychological Science*, *6*(6), 537-559. https://doi.org/10.1177/1745691611419671

Hou, X., Allen, T. A., Wei, D., Huang, H., Wang, K., DeYoung, C. G., & Qiu, J. (2017). Trait compassion is associated with the neural substrate of empathy. *Cognitive, Affective, & Behavioral Neuroscience*, *17*(5), 1018-1027. https://doi.org/10.3758/s13415-017-0529-5

Howells, K., Tennant, A., Day, A., & Elmer, R. (2010). Mindfulness in forensic mental health: Does it have a role? *Mindfulness*, *1*(1), 4-9. https://doi.org/10.1007/s12671-009-0001-x

Hwang, T. J., & Choi, J. N. (2020). Different moods lead to different creativity: Mediating roles of ambiguity tolerance and team identification. *Creativity Research Journal*, *32*(2), 161-173. https://doi.org/10.1080/10400419.2020.1751542

Iannello, P., Mottini, A., Tirelli, S., Riva, S., & Antonietti, A. (2017). Ambiguity and uncertainty tolerance, need for cognition, and their association with stress. A study among Italian practicing physicians. *Medical Education Online*, *22*(1), 1270009. https://doi.org/10.1080/10872981.2016.1270009

Ie, A., Haller, C. S., Langer, E. J., & Courvoisier, D. S. (2012). Mindful multitasking: The relationship between mindful flexibility and media multitasking. *Computers in Human Behavior*, *28*(4), 1526-1532. https://doi.org/10.1016/j.chb.2012.03.022

Inwood, E., & Ferrari, M. (2018). Mechanisms of change in the relationship between self-compassion, emotion regulation, and mental health: A systematic review. *Applied Psychology: Health and Well-Being*, *10*(2), 215-235. https://doi.org/10.1111/aphw.12127

Jach, H. K., & Smillie, L. D. (2019). To fear or fly to the unknown: Tolerance for ambiguity and Big Five personality traits. *Journal of Research in Personality*, *79*, 67-78. https://doi.org/10.1016/j.jrp.2019.02.003

Jackson, M., & Thompson, C. L. (1971). Effective counselor: Characteristics and attitudes. *Journal of Counseling Psychology*, *18*(3), 249-254. https://doi.org/10.1037/h0030862

Jahn, S. A., & Smith-Adcock, S. (2017). A phenomenological study of counseling students' experiences with ambiguity. *The Journal of Counselor Preparation and Supervision*, *10*(1).

Jazaieri, H., Jinpa, G. T., McGonigal, K., Rosenberg, E. L., Finkelstein, J., Simon-Thomas, E., Cullen, M., Doty, J. R., Gross, J. J., & Goldin, P. R. (2013). Enhancing compassion: A randomized controlled trial of a compassion cultivation training program. *Journal of Happiness Studies*, *14*(4), 1113-1126. https://doi.org/10.1007/s10902-012-9373-z

Jazaieri, H., Lee, I. A., McGonigal, K., Jinpa, T., Doty, J. R., Gross, J. J., & Goldin, P. R. (2016). A wandering mind is a less caring mind: Daily experience sampling during compassion meditation training. *The Journal of Positive Psychology*, *11*(1), 37-50. https://doi.org/10.1080/17439760.2015.1025418

Jazaieri, H., McGonigal, K., Lee, I. A., Jinpa, T., Doty, J. R., Gross, J. J., & Goldin, P. R. (2018). Altering the trajectory of affect and affect regulation: The impact of compassion training. *Mindfulness*, *9*(1), 283-293. https://doi.org/10.1007/s12671-017-0773-3

Jennings, L., Sovereign, A., Bottorff, N., Mussell, M. P., & Vye, C. (2005). Nine ethical values of master therapists. *Journal of Mental Health Counseling*, *27*(1), 32-47. https://doi.org/10.17744/mehc.27.1.lmm8vmdujgev2qhp

Johnson, D. A. (2018). The relationship between state mindfulness and working alliance among counselors-in-training. *The Journal of Humanistic Counseling*, *57*(1), 31-50. https://doi.org/10.1002/johc.12065

Johnson, D. A., Frazee, M., Bourn, N. S., & Ivers, N. N. (2019). Evaluating differences in the working alliance based on frequency of mindfulness practices among counselors-in-training. *The Journal of Humanistic Counseling*, *58*(1), 34-52. https://doi.org/10.1002/johc.12088

Johnson, J., Madill, A., Koutsopoulou, G. Z., Brown, C., & Harris, R. (2020). *Tackling gender imbalance in psychology* (The Psychologist, Issue 33). https://thepsychologist.bps.org.uk/volume-33/september-2020/tackling-gender-imbalance-psychology

Jones, L. K. (1974). Toward more adequate selection criteria: Correlates of empathy, genuineness, and respect. *Counselor Education and Supervision*, *14*(1), 13-21. https://doi.org/10.1002/j.1556-6978.1974.tb01988.x

Jooste, J., Kruger, A., Steyn, B. J. M., & Edwards, D. J. (2015). Mindfulness: A foothold for Rogers's humanistic person-centred approach. *Journal of Psychology in Africa*, *25*(6), 554-559. https://doi.org/10.1080/14330237.2015.1124619

Judge, L., Cleghorn, A., McEwan, K., & Gilbert, P. (2012). An exploration of group-based compassion focused therapy for a heterogeneous range of clients presenting to a community mental health team. *International Journal of Cognitive Therapy*, *5*(4), 420-429. https://doi.org/10.1521/ijct.2012.5.4.420

Kabat-Zinn, J. (1982). An outpatient program in behavioral medecine for chronic pain patients based on the practice of mindfulness meditation: Theoretical considerations and preliminary results. *General Hospital Psychiatry*, *4*(1), 33-47. https://doi.org/10.1016/0163-8343(82)90026-3

Kabat-Zinn, J. (1991). *Full catastrophe living: Using the wisdom of your body and mind to face stress, pain, and illness*. Dell Publishing.

Kabat-Zinn, J. (1994). *Wherever you go, there you are: Mindfulness meditation in everyday life*. Hyperion.

Kabat-Zinn, J., Lipworth, L., Burncy, R., & Sellers, W. (1986). Four-year follow-up of a meditation-based program for the self-regulation of chronic pain: Treatment outcomes and compliance. *The Clinical Journal of Pain*, *2*(3), 159-774. https://doi.org/10.1097/00002508-198602030-00004

Kabat-Zinn, J., Lipworth, L., & Burney, R. (1985). The clinical use of mindfulness meditation for the self-regulation of chronic pain. *Journal of Behavioral Medicine*, *8*(2), 163-190. https://doi.org/10.1007/BF00845519

Kamran, S. K. (2011). Effect of gender on ambiguity tolerance of Iranian English language learners. *Journal of Education and Practice*, *2*, 25-33.

Kang, Y., Rahrig, H., Eichel, K., Niles, H. F., Rocha, T., Lepp, N. E., Gold, J., & Britton, W. B. (2018). Gender differences in response to a school-based mindfulness training intervention for early adolescents. *Journal of School Psychology*, *68*, 163-176. https://doi.org/10.1016/j.jsp.2018.03.004

Kawakami, C., White, J. B., & Langer, E. J. (2000). Mindful and masculine: Freeing women leaders from the constraints of gender roles. *Journal of Social Issues*, *56*(1), 49-63. https://doi.org/10.1111/0022-4537.00151

Keane, A. (2013). The influence of therapist mindfulness practice on psychotherapeutic work: A mixed-methods study. *Mindfulness*, *5*(6), 689-703. https://doi.org/10.1007/s12671-013-0223-9

Kelly, A. C., Wisniewski, L., Martin-Wagar, C., & Hoffman, E. (2017). Group-based compassion-focused therapy as an adjunct to outpatient treatment for eating disorders: A pilot randomized controlled trial. *Clinical Psychology & Psychotherapy*, *24*(2), 475-487. https://doi.org/10.1002/cpp.2018

Khoury, B. (2018). Mindfulness: Embodied and embedded. *Mindfulness*, *9*(4), 1037-1042. https://doi.org/10.1007/s12671-017-0858-z

Khoury, B. (2019). Compassion: Embodied and embedded. *Mindfulness*, *10*(11), 2363-2374. https://doi.org/10.1007/s12671-019-01211-w

Khoury, B., & Dionne, F. (2020). Les dimensions incarnée et interpersonnelle de la compassion. *Annales Médico-psychologiques, revue psychiatrique* https://doi.org/10.1016/j.amp.2020.11.018

Khoury, B., Grégoire, S., & Dionne, F. (2020). La dimension interpersonnelle de la pleine conscience. *Annales Médico-psychologiques, revue psychiatrique*, *178*(3), 239-244. https://doi.org/10.1016/j.amp.2018.10.018

Khoury, B., Knäuper, B., Pagnini, F., Trent, N., Chiesa, A., & Carrière, K. (2017a). Embodied Mindfulness. *Mindfulness*, *8*(5), 1160-1171. https://doi.org/10.1007/s12671-017-0700-7

Khoury, B., Knäuper, B., Schlosser, M., Knäuper, B., Carrière, K., & Chiesa, A. (2017b). Effectiveness of traditional meditation retreats: A systematic review and meta-analysis. *Journal of Psychosomatic Research*, *92*, 16-25. https://doi.org/10.1016/j.jpsychores.2016.11.006

Khoury, B., Lecomte, T., Fortin, G., Masse, M., Therien, P., Bouchard, V., Chapleau, M.-A., Paquin, K., & Hofmann, S. G. (2013a). Mindfulness-based therapy: A comprehensive

meta-analysis. *Clinical Psychology Review*, *33*(6), 763-771. https://doi.org/10.1016/j.cpr.2013.05.005

Khoury, B., Lecomte, T., Gaudiano, B. A., & Paquin, K. (2013b). Mindfulness interventions for psychosis: A meta-analysis. *Schizophrenia Research*, *150*(1), 176-184. https://doi.org/10.1016/j.schres.2013.07.055

Khoury, B., Sharma, M., Rush, S. E., & Fournier, C. (2015). Mindfulness-based stress reduction for healthy individuals: A meta-analysis. *Journal of Psychosomatic Research*, *78*(6), 519-528. https://doi.org/10.1016/j.jpsychores.2015.03.009

Khoury, B., Vergara, R. C., Sadowski, I., & Spinelli, C. (2021). Embodied Mindfulness Questionnaire: Scale development and validation. *Assessment* https://doi.org/10.1177/10731911211059856

Khoury, B., Vergara, R. C., & Spinelli, C. (2022). Interpersonal Mindfulness Questionnaire: Scale development and validation. *Mindfulness* https://doi.org/10.1007/s12671-022-01855-1

Kiken, L. G., & Shook, N. J. (2011). Looking up: Mindfulness increases positive judgments and reduces negativity bias. *Social Psychological and Personality Science*, *2*(4), 425-431. https://doi.org/10.1177/1948550610396585

Kim, Y. W., Lee, S. H., Choi, T. K., Suh, S. Y., Kim, B., Kim, C. M., Cho, S. J., Kim, M. J., Yook, K., Ryu, M., Song, S. K., & Yook, K. H. (2009). Effectiveness of mindfulness-based cognitive therapy as an adjuvant to pharmacotherapy in patients with panic disorder or generalized anxiety disorder. *Depression and Anxiety*, *26*(7), 601-606. https://doi.org/10.1002/da.20552

Kirby, J. N., Tellegen, C. L., & Steindl, S. R. (2017). A meta-analysis of compassion-based interventions: Current state of knowledge and future directions. *Behavior Therapy*, *48*(6), 778-792. https://doi.org/10.1016/j.beth.2017.06.003

Kirschner, H., Kuyken, W., Wright, K., Roberts, H., Brejcha, C., & Karl, A. (2019). Soothing your heart and feeling connected: A new experimental paradigm to study the benefits of self-compassion. *Clinical Psychological Science*, *7*(3), 545-565. https://doi.org/10.1177/2167702618812438

Knight, K., Kenny, A., & Endacott, R. (2016). From expert generalists to ambiguity masters: Using ambiguity tolerance theory to redefine the practice of rural nurses. *Journal of Clinical Nursing*, *25*(11-12), 1757-1765. https://doi.org/10.1111/jocn.13196

Krohne, H. W. (1993). Vigilance and cognitive avoidance as concepts in coping research. In H. W. Krohne (Ed.), *Attention and avoidance* (pp. 19-50). Hogrefe & Huber.

Kumary, A., & Baker, M. (2008). Stresses reported by UK trainee counselling psychologists. *Counselling Psychology Quarterly*, *21*(1), 19-28. https://doi.org/10.1080/09515070801895626

Laithwaite, H., O'Hanlon, M., Collins, P., Doyle, P., Abraham, L., Porter, S., & Gumley, A. (2009). Recovery After Psychosis (RAP): A compassion focused programme for individuals residing in high security settings. *Behavioural and Cognitive Psychotherapy*, *37*(5), 511-526. https://doi.org/10.1017/S1352465809990233

Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to western thought*. Basic books.

Lancaster, S. L., Klein, K. P., & Knightly, W. (2016). Mindfulness and relaxation: A comparison of brief, laboratory-based interventions. *Mindfulness*, *7*(3), 614-621. https://doi.org/10.1007/s12671-016-0496-x

Lane, M. S., & Klenke, K. (2004). The Ambiguity Tolerance Interface: A modified social cognitive model For leading under uncertainty. *Journal of Leadership & Organizational Studies*, *10*(3), 69-81. https://doi.org/10.1177/107179190401000306

Langer, E., & Abelson, R. (1974). A patient by any other name…: Clinician group difference in labeling bias. *Journal of Consulting and Clinical Psychology*, *42*, 4-9. https://doi.org/10.1037/h0036054

Langer, E., Djikic, M., Pirson, M., Madenci, A., & Donohue, R. (2010). Believing is seeing: Using mindlessness (mindfully) to improve visual acuity. *Psychological Science*, *21*(5), 661-666. https://doi.org/10.1177/0956797610366543

Langer, E. J. (1989). *Mindfulness*. Da Capo Press.

Langer, E. J. (1992). Matters of mind: Mindfulness/mindlessness in perspective. *Consciousness and cognition*, *1*(3), 289-305.

Langer, E. J. (1997). *The power of mindful learning*. Addison Wesley Longman.

Langer, E. J. (2005). Well-being: Mindfulness versus positive evaluation. In C. R. Snyder & S. J. Lopez (Eds.), *Handbook of positive psychology* (pp. 214–230). Oxford University Press.

Langer, E. J., Blank, A., & Chanowitz, B. (1978). The mindlessness of ostensibly thoughtful action: The role of "placebic" information in interpersonal interaction. *Journal of Personality and Social Psychology*, *36*(6), 635-642. https://doi.org/10.1037/0022-3514.36.6.635

Langer, E. J., Cohen, M., & Djikic, M. (2012). Mindfulness as a psychological attractor: The effect on children. *Journal of Applied Social Psychology*, *42*(5), 1114-1122. https://doi.org/10.1111/j.1559-1816.2011.00879.x

Langer, E. J., Hatem, M., Joss, J., & Howell, M. (1989). Conditional teaching and mindful learning. *Creativity Research Journal*, *2*(3), 139-150. https://doi.org/10.1080/10400418909534311

Langer, E. J., & Imber, L. (1979). When practice makes imperfect: The debilitating effects of overlearning. *Journal of Personality and Social Psychology*, *37*(11), 2014-2025. https://doi.org/10.1037/0022-3514.37.11.2014

Langer, E. J., & Moldoveanu, M. (2000). The construct of mindfulness. *Journal of Social Issues*, *56*(1), 1-9. https://doi.org/10.1111/0022-4537.00148

Langer, E. J., & Piper, A. I. (1987). The prevention of mindlessness. *Journal of Personality and Social Psychology*, *53*(2), 280-287. https://doi.org/10.1037/0022-3514.53.2.280

Langer, E. J., & Rodin, J. (1976). The effects of enhanced personal responsibility for the aged: A field experiment in and institutional setting. *Journal of Personality and Social Psychology*, *35*(34), 191-198. https://doi.org/10.1037/0022-3514.34.2.191

Langer, E. J., Russel, T., & Eisenkraft, N. (2009). Orchestral performance and the footprint of mindfulness. *Psychology of Music*, *37*(2), 125-136. https://doi.org/10.1177/0305735607086053

Lau, M. A., Bishop, S. R., Segal, Z. V., Buis, T., Anderson, N. D., Carlson, L., Shapiro, S., Carmody, J., Abbey, S., & Devins, G. (2006). The Toronto Mindfulness Scale: Development and validation. *Journal of Clinical Psychology*, *62*(12), 1445-1467. https://doi.org/10.1002/jclp.20326

Lauriola, M., Foschi, R., Mosca, O., & Weller, J. (2016). Attitude toward ambiguity: Empirically robust factors in self-report personality scales. *Assessment*, *23*(3), 353-373. https://doi.org/10.1177/1073191115577188

Laverdière, O., Kealy, D., Ogrodniczuk, J. S., & Morin, A. J. S. (2018). Psychological health profiles of Canadian psychotherapists: A wake up call on psychotherapists' mental health. *Canadian Psychology/Psychologie canadienne*, *59*(4), 315-322. https://doi.org/10.1037/cap0000159

Leary, M. R., Tate, E. B., Adams, C. E., Allen, A. B., & Hancock, J. (2007). Self-compassion and reactions to unpleasant self-relevant events: The implications of treating oneself kindly. *Journal of Personality and Social Psychology*, *92*(5), 887-904. https://doi.org/10.1037/0022-3514.92.5.887

Levitt, D. H., & Jacques, J. D. (2005). Promoting tolerance for ambiguity in counselor training programs. *Journal of Humanistic Counseling, Education and Development*, *44*(1), 46. https://doi.org/10.1002/j.2164-490X.2005.tb00055.x

Levy, B. R., Jennings, P., & Langer, E. J. (2001). Improving attention in old age. *Journal of Adult Development*, *8*(3), 189-192. https://doi.org/10.1023/A:1009546408665

Litman, J. A. (2010). Relationships between measures of I-and D-type curiosity, ambiguity tolerance, and need for closure: An initial test of the wanting-liking model of information-seeking. *Personality and Individual Differences*, *48*(4), 397-402. https://doi.org/10.1016/j.paid.2009.11.005

Lomas, T., Medina, J. C., Ivtzan, I., Rupprecht, S., & Eiroa-Orosa, F. J. (2018). A systematic review of the impact of mindfulness on the well-being of healthcare professionals. *Journal of Clinical Psychology*, *74*(3), 319-355. https://doi.org/10.1002/jclp.22515

Long, P., & Neff, K. D. (2018). Self-compassion is associated with reduced self-presentation concerns and increased student communication behavior. *Learning and Individual Differences*, *67*, 223-231. https://doi.org/10.1016/j.lindif.2018.09.003

López, A., Sanderman, R., Ranchor, A. V., & Schroevers, M. J. (2018). Compassion for others and self-compassion: Levels, correlates, and relationship with psychological well-being. *Mindfulness*, *9*(1), 325-331. https://doi.org/10.1007/s12671-017-0777-z

Lucre, K. M., & Corten, N. (2013). An exploration of group compassion-focused therapy for personality disorder. *Psychology and Psychotherapy: Theory, Research and Practice*, *86*(4), 387-400. https://doi.org/10.1111/j.2044-8341.2012.02068.x

Luther, V. P., & Crandall, S. J. (2011). Commentary: ambiguity and uncertainty: Neglected elements of medical education curricula? *Academic Medicine*, *86*(7), 799-800. https://doi.org/10.1097/ACM.0b013e31821da915

MacBeth, A., & Gumley, A. (2012). Exploring compassion: A meta-analysis of the association between self-compassion and psychopathology. *Clinical Psychology Review*, *32*(6), 545-552. https://doi.org/10.1016/j.cpr.2012.06.003

Mace, C. (2007). Mindfulness in psychotherapy: An introduction. *Advances in Psychiatric Treatment*, *13*(2), 147-154. https://doi.org/10.1192/apt.bp.106.002923

Maguen, T. (1993). *The impact of tolerance-intolerance of ambiguity on the therapeutic interaction* (Publication No DP20858) [Doctoral dissertation, The Chicago School of Professional Psychology]. ProQuest Dissertations Publishing.

Mangione, S., Chakraborti, C., Staltari, G., Harrison, R., Tunkel, A. R., Liou, K. T., Cerceo, E., Voeller, M., Bedwell, W. L., Fletcher, K., & Kahn, M. J. (2018). Medical students' exposure to the humanities correlates with positive personal qualities and reduced

burnout: A multi-institutional U.S. survey. *Journal of General Internal Medicine*, *33*(5), 628-634. https://doi.org/10.1007/s11606-017-4275-8

Mann, S. (2004). 'People-work': Emotion management, stress and coping. *British Journal of Guidance & Counselling*, *32*, 205-221. https://doi.org/10.1080/0369880410001692247

Maranzan, K. A., Kowatch, K. R., Mascioli, B. A., McGeown, L., Popowich, A. D., & Spiroiu, F. (2018). Self-care and the Canadian Code of Ethics: Implications for training in professional psychology. *Canadian Psychology/Psychologie canadienne*, *59*(4), 361-368. https://doi.org/10.1037/cap0000153

Martin-Asuero, A., Queralto, J. M., Pujol-Ribera, E., Berenguera, A., Rodriguez-Blanco, T., & Epstein, R. M. (2014). Effectiveness of a mindfulness education program in primary health care professionals: A pragmatic controlled trial. *Journal of Continuing Education in the Health Professions*, *34*(1), 4-12. https://doi.org/10.1002/chp.21211

Martin, J. R. (1997). Mindfulness: A proposed common factor. *Journal of Psychotherapy Integration*, *7*(4), 291-312. https://doi.org/10.1023/B:JOPI.0000010885.18025.bc

Marzban, A., Barati, H., & Moinzadeh, A. (2012). An Investigation into Ambiguity Tolerance in Iranian Senior EFL Undergraduates. *English Language Teaching*, *5*(1), 76-85.

Mason, M. F., Norton, M. I., Van Horn, J. D., Wegner, D. M., Grafton, S. T., & Macrae, C. N. (2007). Wandering minds: The default network and stimulus-independent thought. *Science*, *315*(5810), 393-395. https://doi.org/10.1126/science.1131295

May, S., & O'Donovan, A. (2007). The advantages of the mindful therapist. *Psychotherapy in Australia*, *13*(4), 46-53.

Mazhirina, K. G., Dzhafarova, O. A., Kozlova, L. I., Pervushina, O. N., Fedorov, A. A., Bliznyuk, M. V., Khoroshilov, B. M., Savelov, A. A., Petrovskii, E. D., & Shtark, M. B.

(2020). The relationships between cortical activity while observing images featuring different degrees of ambiguity and ambiguity tolerance. *Bulletin of Experimental Biology and Medicine*, *169*(4), 421-425. https://doi.org/10.1007/s10517-020-04900-y

McAuliffe, G., & Lovell, C. (2006). The influence of counselor epistemology on the helping interview: A qualitative study. *Journal of Counseling & Development*, *84*(3), 308-317. https://doi.org/10.1002/j.1556-6678.2006.tb00410.x

McCollum, E. E., & Gehart, D. R. (2010). Using mindfulness meditation to teach beginning therapists therapeutic presence: A qualitative study. *Journal of Marital and Family Therapy*, *36*(3), 347-360. https://doi.org/10.1111/j.1752-0606.2010.00214.x

McLain, D. L. (1993). The MSTAT-I: A new measure of an individual's tolerance for ambiguity. *Educational and Psychological measurement*, *53*(1), 183-189. https://doi.org/10.1177/0013164493053001020

McLain, D. L. (2009). Evidence of the properties of an ambiguity tolerance measure: The Multiple Stimulus Types Ambiguity Tolerance Scale–II (MSTAT–II). *Psychological Reports*, *105*(3), 975-988. https://doi.org/10.2466/PR0.105.3.975-988

McLain, D. L., Kefallonitis, E., & Armani, K. (2015). Ambiguity tolerance in organizations: Definitional clarification and perspectives on future research. *Frontiers in Psychology*, *6*, 344. https://doi.org/10.3389/fpsyg.2015.00344

Mesmer-Magnus, J., Manapragada, A., Viswesvaran, C., & Allen, J. W. (2017). Trait mindfulness at work: A meta-analysis of the personal and professional correlates of trait mindfulness. *Human Performance*, *30*(2-3), 79-98. https://doi.org/10.1080/08959285.2017.1307842

Moafian, F., Pagnini, F., & Khoshsima, H. (2017). Validation of the Persian version of the Langer Mindfulness Scale. *Frontiers in Psychology*, *8* https://doi.org/10.3389/fpsyg.2017.00468

Morse, G., Salyers, M. P., Rollins, A. L., Monroe-DeVita, M., & Pfahler, C. (2012). Burnout in mental health services: A review of the problem and its remediation. *Administration and Policy in Mental Health and Mental Health Services Research*, *39*(5), 341-352. https://doi.org/10.1007/s10488-011-0352-1

Myers, S. B., Sweeney, A. C., Popick, V., Wesley, K., Bordfeld, A., & Fingerhut, R. (2012). Self-care practices and perceived stress levels among psychology graduate students. *Training and Education in Professional Psychology*, *6*(1), 55-66. https://doi.org/10.1037/a0026534

Ndoja, S., Chahine, S., Saklofske, D. H., & Lanting, B. (2020). The erosion of ambiguity tolerance and sustainment of perfectionism in undergraduate medical training: Results from multiple samplings of a single cohort. *BMC Medical Education*, *20*(1), 1-7. https://doi.org/10.1186/s12909-020-02345-5

Neff, K. (2003a). Self-compassion: An alternative conceptualization of a healthy attitude toward oneself. *Self and Identity*, *2*(2), 85-101. https://doi.org/10.1080/15298860309032

Neff, K., & Germer, C. (2022). The role of self-compassion in psychotherapy. *World Psychiatry*, *21*(1), 58-59. https://doi.org/10.1002/wps.20925

Neff, K. D. (2003b). The development and validation of a scale to measure self-compassion. *Self and Identity*, *2*, 223-250. https://doi.org/10.1080/15298860309027

Neff, K. D., & Germer, C. K. (2013). A pilot study and randomized controlled trial of the mindful self-compassion program. *Journal of Clinical Psychology*, *69*(1), 28-44. https://doi.org/10.1002/jclp.21923

Neff, K. D., Kirkpatrick, K. L., & Rude, S. S. (2007). Self-compassion and adaptive psychological functioning. *Journal of Research in Personality*, *41*(1), 139-154. https://doi.org/10.1016/j.jrp.2006.03.004

Neff, K. D., Knox, M. C., Long, P., & Gregory, K. (2020). Caring for others without losing yourself: An adaptation of the Mindful Self-Compassion Program for healthcare communities. *Journal of Clinincal Psychology*, *76*(9), 1543-1562. https://doi.org/10.1002/jclp.23007

Neff, K. D., Pisitsungkagarn, K., & Hsieh, Y.-P. (2008). Self-compassion and self-construal in the United States, Thailand, and Taiwan. *Journal of Cross-Cultural Psychology*, *39*(3), 267-285. https://doi.org/10.1177/0022022108314544

Neff, K. D., Tóth-Király, I., Knox, M. C., Kuchar, A., & Davidson, O. (2021). The development and validation of the State Self-Compassion Scale (long- and short form). *Mindfulness*, *12*(1), 121-140. https://doi.org/10.1007/s12671-020-01505-4

Neff, K. D., & Vonk, R. (2009). Self-Compassion versus global self-esteem: Two different ways of relating to oneself. *Journal of Personality*, *77*(1), 23-50. https://doi.org/10.1111/j.1467-6494.2008.00537.x

Nelson, J. R., Hall, B. S., Anderson, J. L., Birtles, C., & Hemming, L. (2018). Self-compassion as self-care: A simple and effective tool for counselor educators and counseling students. *Journal of Creativity in Mental Health*, *13*(1), 121-133. https://doi.org/10.1080/15401383.2017.1328292

Nelson, N. G., Dell'Oliver, C., Koch, C., & Buckler, R. (2001). Stress, coping, and success among graduate students in clinical psychology. *Psychological Reports*, *88*(3), 759-767. https://doi.org/10.2466/pr0.2001.88.3.759

Nevalainen, M. K., Mantyranta, T., & Pitkala, K. H. (2010). Facing uncertainty as a medical student - A qualitative study of their reflective learning diaries and writings on specific themes during the first clinical year. *Patient Education and Counseling*, *78*(2), 218-223. https://doi.org/10.1016/j.pec.2009.07.011

Newsome, S., Waldo, M., & Gruszka, C. (2012). Mindfulness group work: Preventing stress and increasing self-compassion among helping professionals in training. *The Journal for Specialists in Group Work*, *37*(4), 297-311. https://doi.org/10.1080/01933922.2012.690832

Niedenthal, P. M., Barsalou, L. W., Winkielman, P., Krauth-Gruber, S., & Ric, F. (2005). Embodiment in attitudes, social perception, and emotion. *Personality and Social Psychology Review*, *9*(3), 184-211. https://doi.org/10.1207/s15327957pspr0903_1

Norton, R. W. (1975). Measurement of ambiguity tolerance. *Journal of Personality Assessment*, *39*(6), 607-619. https://doi.org/10.1207/s15327752jpa3906_11

O'Connor, M. F. (2001). On the etiology and effective management of professional distress and impairment among psychologists. *Professional Psychology: Research and Practice*, *32*(4), 345-350. https://doi.org/10.1037//0735-7028.32.4.345

Odou, N., & Brinker, J. (2014). Exploring the relationship between rumination, self-compassion, and mood. *Self and Identity*, *13*(4), 449-459. https://doi.org/10.1080/15298868.2013.840332

Ostafin, B. D., & Kassman, K. T. (2012). Stepping out of history: Mindfulness improves insight problem solving. *Consciousness and Cognition*, *21*(2), 1031-1036. https://doi.org/10.1016/j.concog.2012.02.014

Pagnini, F., Bercovitz, K. E., & Langer, E. J. (2016). Perceived control and mindfulness: Implications for clinical practice. *Journal of Psychotherapy Integration*, *26*, 91-102. https://doi.org/10.1037/int0000035

Pagnini, F., Bercovitz, K. E., & Phillips, D. (2018). Langerian mindfulness, quality of life and psychological symptoms in a sample of Italian students. *Health and Quality of Life Outcomes*, *16*(1), 29. https://doi.org/10.1186/s12955-018-0856-4

Pagnini, F., Cavalera, C., Rovaris, M., Mendozzi, L., Molinari, E., Phillips, D., & Langer, E. (2019). Longitudinal associations between mindfulness and well-being in people with multiple sclerosis. *International Journal of Clinical and Health Psychology*, *19*(1), 22-30. https://doi.org/10.1016/j.ijchp.2018.11.003

Pagnini, F., Phillips, D., Bosma, C. M., Reece, A., & Langer, E. (2014). Mindfulness, physical impairment and psychological well-being in people with amyotrophic lateral sclerosis. *Psychology & Health*, 1-15. https://doi.org/10.1080/08870446.2014.982652

Pakenham, K. I., & Stafford-Brown, J. (2012). Stress in clinical psychology trainees: Current research status and future directions. *Australian Psychologist*, *47*(3), 147-155. https://doi.org/10.1111/j.1742-9544.2012.00070.x

Paralkar, U., & Knutson, D. (2021). Coping with academic stress: Ambiguity and uncertainty tolerance in college students. *Journal of American College Health*, 1-9. https://doi.org/10.1080/07448481.2021.1965148

Park, S., Garrison, Y. L., & Liu, W. M. (2020). Career decision ambiguity tolerance of Asian men in the United States. *Journal of Career Development*, *47*(6), 642-656. https://doi.org/10.1177/0894845318811675

Patsiopoulos, A. T., & Buchanan, M. J. (2011). The practice of self-compassion in counseling: A narrative inquiry. *Professional Psychology: Research and Practice*, *42*(4), 301-307. https://doi.org/10.1037/a0024482

Per, M., Spinelli, C., Sadowski, I., Schmelefske, E., Anand, L., & Khoury, B. (2020). Evaluating the effectiveness of mindfulness-based interventions in incarcerated populations: A meta-analysis. *Criminal Justice and Behavior*, *47*(3), 310-330. https://doi.org/10.1177/0093854819891457

Pica, M. (1998). The ambiguous nature of clinical training and its impact on the development of student clinicians. *Psychotherapy: Theory, Research, Practice, Training*, *35*(3), 361. https://psycnet.apa.org/doi/10.1037/h0087840

Pidgeon, A. M., & Pickett, L. (2017). Examining the differences between university students' levels of resilience on mindfulness, psychological distress and coping strategies. *European Scientific Journal*, *13*(12), 103-113.

Pirson, M., Langer, E. J., Bodner, T., & Zilcha-Mano, S. (2012). The development and validation of the Langer Mindfulness Scale - Enabling a socio-cognitive perspective of mindfulness in organizational contexts. *Fordham University Schools of Business Research Paper* https://dx.doi.org/10.2139/ssrn.2158921

Pommier, E., Neff, K. D., & Tóth-Király, I. (2020). The development and validation of the compassion scale. *Assessment*, *27*(1), 21-39. https://doi.org/10.1177/1073191119874108

Pushkarskaya, H., Liu, X., Smithson, M., & Joseph, J. E. (2010). Beyond risk and ambiguity: Deciding under ignorance. *Cognitive, Affective & Behavioral Neuroscience*, *10*(3), 382-391. https://doi.org/10.3758/CABN.10.3.382

Quinlan, E., Schilder, S., & Deane, F. P. (2021). "This wasn't in the manual": A qualitative exploration of tolerance of uncertainty in the practicing psychology context. *Australian Psychologist*, *56*(2), 154-167. https://doi.org/10.1080/00050067.2020.1829451

Radeke, J. T., & Mahoney, M. J. (2000). Comparing the personal lives of psychotherapists and research psychologists. *Professional Psychology: Research and Practice*, *31*(1), 82-84. https://doi.org/10.1037/0735-7028.31.1.82

Raes, F. (2010). Rumination and worry as mediators of the relationship between self-compassion and depression and anxiety. *Personality and Individual Differences*, *48*(6), 757-761. https://doi.org/10.1016/j.paid.2010.01.023

Richardson, C. M. E., Trusty, W. T., & George, K. A. (2020). Trainee wellness: Self-critical perfectionism, self-compassion, depression, and burnout among doctoral trainees in psychology. *Counselling Psychology Quarterly*, *33*(2), 187-198. https://doi.org/10.1080/09515070.2018.1509839

Rimes, K. A., & Wingrove, J. (2011). Pilot study of mindfulness-based cognitive therapy for trainee clinical psychologists. *Behavioural and Cognitive Psychotherapy*, *39*(2), 235-241. https://doi.org/10.1017/S1352465810000731

Robinson, J. J. (2019). *Mindfulness, tolerance of ambiguty, and attitudes toward interracial relationships* (Publication No 13426037) [Doctoral dissertation, Alliant International University]. ProQuest Dissertations Publishing.

Rodin, J., & Langer, E. J. (1977). Long-term effects of a control-relevant intervention with the institutionalized aged. *Journal of Personality and Social Psychology*, *35*, 897-902. https://doi.org/10.1037/0022-3514.35.12.897

Roemer, L., Williston, S. K., & Rollins, L. G. (2015). Mindfulness and emotion regulation. *Current Opinion in Psychology*, *3*, 52-57. https://doi.org/10.1016/j.copsyc.2015.02.006

Rojiani, R., Santoyo, J. F., Rahrig, H., Roth, H. D., & Britton, W. B. (2017). Women benefit more Than men in response to college-based meditation training. *Frontiers in Psychology*, *8*, 551-551. https://doi.org/10.3389/fpsyg.2017.00551

Rønnestad, M. H., & Skovholt, T. M. (2003). The journey of the counselor and therapist: Research findings and perspectives on professional development. . *Journal of Career Development*, *30*(1), 5-44. https://doi.org/10.1023/A:1025173508081

Rosen, N. O., Ivanova, E., & Knäuper, B. (2014). Differentiating intolerance of uncertainty from three related but distinct constructs. *Anxiety, Stress, & Coping*, *27*(1), 55-73. https://doi.org/10.1080/10615806.2013.815743

Rudaz, M., Twohig, M. P., Ong, C. W., & Levin, M. E. (2017). Mindfulness and acceptance-based trainings for fostering self-care and reducing stress in mental health professionals: A systematic review. *Journal of Contextual Behavioral Science*, *6*(4), 380-390. https://doi.org/10.1016/j.jcbs.2017.10.001

Rummell, C. M. (2015). An exploratory study of psychology graduate student workload, health, and program satisfaction. *Professional Psychology: Research and Practice*, *46*(6), 391-399. https://doi.org/10.1037/pro0000056

Ryan, A., Safran, J. D., Doran, J. M., & Muran, J. C. (2012). Therapist mindfulness, alliance, and treatment outcome. *Psychotherapy Research*, *22*(3), 289-297. https://doi.org/10.1080/10503307.2011.650653

Sagioglou, C., & Forstmann, M. (2013). Activating Christian religious concepts increases intolerance of ambiguity and judgment certainty. *Journal of Experimental Social Psychology*, *49*(5), 933-939. https://doi.org/10.1016/j.jesp.2013.05.003

Scarlet, J., Altmeyer, N., Knier, S., & Harpin, R. E. (2017). The effects of Compassion Cultivation Training (CCT) on health-care workers. *Clinical Psychologist*, *21*(2), 116-124. https://doi.org/10.1111/cp.12130

Schmelefske, E., Per, M., Khoury, B., & Heath, N. (2020). The effects of mindfulness-based interventions on suicide outcomes: A meta-analysis. *Archives of Suicide Research*, 1-18. https://doi.org/10.1080/13811118.2020.1833796

Schomaker, S. A., & Ricard, R. J. (2015). Effect of a mindfulness-based intervention on counselor–client attunement. *Journal of Counseling & Development*, *93*(4), 491-498. https://doi.org/10.1002/jcad.12047

Segal, Z. V., Williams, J. M. G., & Teasdale, J. D. (2013). *Mindfulness-based cognitive therapy for depression* (2 ed.). Guilford Press.

Seppala, E. M., Hutcherson, C. A., Nguyen, D. T. H., Doty, J. R., & Gross, J. J. (2014). Loving-kindness meditation: A tool to improve healthcare provider compassion, resilience, and patient care. *Journal of Compassionate Health Care*, *1*(1), 5. https://doi.org/10.1186/s40639-014-0005-9

Shapira, L. B., & Mongrain, M. (2010). The benefits of self-compassion and optimism exercises for individuals vulnerable to depression. *The Journal of Positive Psychology*, *5*(5), 377-389. https://doi.org/10.1080/17439760.2010.516763

Shapiro, S. L., Astin, J. A., Bishop, S. R., & Cordova, M. (2005). Mindfulness-based stress reduction for health care professionals: Results from a randomized trial. *International Journal of Stress Management*, *12*(2), 164-176. https://doi.org/10.1037/1072-5245.12.2.164

Shapiro, S. L., Brown, K. W., & Biegel, G. M. (2007). Teaching self-care to caregivers: Effects of mindfulness-based stress reduction on the mental health of therapists in training. *Training and Education in Professional Psychology*, *1*(2), 105-115. https://doi.org/10.1037/1931-3918.1.2.105

Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of Clinical Psychology*, *62*(3), 373-386. https://doi.org/10.1002/jclp.20237

Shen-Miller, D. S., Grus, C. L., Van Sickle, K. S., Schwartz-Mette, R., Cage, E. A., Elman, N. S., Jacobs, S. C., & Kaslow, N. J. (2011). Trainees' experiences with peers having competence problems: A national survey. *Training and Education in Professional Psychology*, *5*(2), 112-121. https://doi.org/10.1037/a0023824

Shonin, E., Van Gordon, W., & Griffiths, M. D. (2013). Mindfulness-based interventions: Towards mindful clinical integration. *Frontiers in Psychology*, *4*, 194. https://doi.org/10.3389/fpsyg.2013.00194

Shonin, E., Van Gordon, W., & Griffiths, M. D. (2014). The emerging role of Buddhism in clinical psychology: Toward effective integration. *Psychology of Religion and Spirituality*, *6*(2), 123-137. https://doi.org/10.1037/a0035859

Siegel, R. D., Germer, C. K., & Olendzki, A. (2009). Mindfulness: What Is It? Where Did It Come From? In F. Didonna (Ed.), *Clinical handbook of mindfulness* (pp. 17-35). Springer New York.

Skovholt, T. M., & Rønnestad, M. H. (2003). Struggles of the novice counselor and therapist. *Journal of Career Development*, *30*(1), 45-58. https://doi.org/10.1177/089484530303000103

Skovholt, T. M., & Starkey, M. T. (2010). The three legs of the practitioner's learning stool: Practice, research/theory, and personal life. *Journal of Contemporary Psychotherapy*, *40*(3), 125-130. https://doi.org/10.1007/s10879-010-9137-1

Slonim, J., Kienhuis, M., Di Benedetto, M., & Reece, J. (2015). The relationships among self-care, dispositional mindfulness, and psychological distress in medical students. *Medical Education Online*, *20*(1) https://doi.org/10.3402/meo.v20.27924

Smeets, E., Neff, K., Alberts, H., & Peters, M. (2014). Meeting suffering with kindness: Effects of a brief self-compassion intervention for female college students. *Journal of Clinical Psychology*, *70*(9), 794-807. https://doi.org/10.1002/jclp.22076

Statistics Canada. (2019). *Mental health care needs* (82-625-X). https://www150.statcan.gc.ca/n1/en/pub/82-625-x/2019001/article/00011-eng.pdf?st=AIU9cke-

Sternberg, R. J. (2000). Images of mindfulness. *Journal of Social Issues*, *56*(1), 11-26. https://doi.org/10.1111/0022-4537.00149

Stieger, M., Flückiger, C., Rüegger, D., Kowatsch, T., Roberts, B. W., & Allemand, M. (2021). Changing personality traits with the help of a digital personality change intervention.

Proceedings of the National Academy of Sciences of the United States of America, *118*(8) https://doi.org/10.1073/pnas.2017548118

Stone, S. C., & Shertzer, B. (1963). The militant counselor. *The Personnel and Guidance Journal*, *42*(4), 342-347. 10.1002/j.2164-4918.1963.tb04401.x

Strauss, C., Gu, J., Montero-Marin, J., Whittington, A., Chapman, C., & Kuyken, W. (2021). Reducing stress and promoting well-being in healthcare workers using mindfulness-based cognitive therapy for life. *International Journal of Clinical and Health Psychology*, *21*(2) https://doi.org/10.1016/j.ijchp.2021.100227

Strauss, C., Lever Taylor, B., Gu, J., Kuyken, W., Baer, R., Jones, F., & Cavanagh, K. (2016). What is compassion and how can we measure it? A review of definitions and measures. *Clinical Psychology Review*, *47*, 15-27. https://doi.org10.1016/j.cpr.2016.05.004

Swift, J. K., Callahan, J. L., Dunn, R., Brecht, K., & Ivanovic, M. (2017). A randomized-controlled crossover trial of mindfulness for student psychotherapists. *Training and Education in Professional Psychology*, *11*(4), 235-242. https://doi.org/10.1037/tep0000154

Testa, D., & Sangganjanavanich, V. F. (2016). Contribution of mindfulness and emotional intelligence to burnout among counseling interns. *Counselor Education and Supervision*, *55*(2), 95-108. https://doi.org/10.1002/ceas.12035

Tomasino, B., & Fabbro, F. (2016). Increases in the right dorsolateral prefrontal cortex and decreases the rostral prefrontal cortex activation after 8 weeks of focused attention based mindfulness meditation. *Brain and Cognition*, *102*, 46-54. https://doi.org/10.1016/j.bandc.2015.12.004

Tong, D., Yang, W., Zhang, Q., Li, W., Wei, D., Che, X., Zhang, M., Hitchman, G., Qiu, J., Liu, Y., & Cao, G. (2015). Association between regional white and gray matter volume and ambiguity tolerance: Evidence from voxel-based morphometry. *Psychophysiology*, *52*(8), 983-989. https://doi.org/10.1111/psyp.12433

Uddin, L. Q., Nomi, J. S., Hébert-Seropian, B., Ghaziri, J., & Boucher, O. (2017). Structure and function of the human insula. *Journal of Clinical Neurophysiology*, *34*(4), 300-306. https://doi.org/10.1097/WNP.0000000000000377

Van Dam, N. T., Sheppard, S. C., Forsyth, J. P., & Earleywine, M. (2011). Self-compassion is a better predictor than mindfulness of symptom severity and quality of life in mixed anxiety and depression. *Journal of Anxiety Disorders*, *25*(1), 123-130. https://doi.org/10.1016/j.janxdis.2010.08.011

Van Hiel, A., Onraet, E., & De Pauw, S. (2010). The relationship between social-cultural attitudes and behavioral measures of cognitive style: A meta-analytic integration of studies. *Journal of Personality*, *78*(6), 1765-1799. https://doi.org/10.1111/j.1467-6494.2010.00669.x

Virgili, M. (2013). Mindfulness-based interventions reduce psychological distress in working adults: A meta-analysis of intervention studies. *Mindfulness*, 1-12. https://doi.org/10.1007/s12671-013-0264-0

Vivino, B. L., Thompson, B. J., Hill, C. E., & Ladany, N. (2009). Compassion in psychotherapy: The perspective of therapists nominated as compassionate. *Psychotherapy Research*, *19*(2), 157-171. https://doi.org/10.1080/10503300802430681

Walach, H., Buchheld, N., Buttenmüller, V., Kleinknecht, N., & Schmidt, S. (2006). Measuring mindfulness—the Freiburg Mindfulness Inventory (FMI). *Personality and Individual Differences*, *40*(8), 1543-1555. https://doi.org/10.1016/j.paid.2005.11.025

Wilson, A. C., Mackintosh, K., Power, K., & Chan, S. W. Y. (2019). Effectiveness of self-compassion related therapies: A systematic review and meta-analysis. *Mindfulness*, *10*(6), 979-995. https://doi.org/10.1007/s12671-018-1037-6

Winborn, B. B., & Martinson, W. D. (1965). The use of ambiguity as a technique in counselor education. *Counselor Education and Supervision*, *5*(1), 35-39. https://doi.org/10.1002/j.1556-6978.1965.tb00418.x

Wittenberg, K. J., & Norcross, J. C. (2001). Practitioner perfectionism: Relationship to ambiguity tolerance and work satisfaction. *Journal of Clinical Psychology*, *57*(12), 1543-1550. https://doi.org/10.1002/jclp.1116

Wolfradt, U., Oubaid, V., Straube, E. R., Bischoff, N., & Mischo, J. (1999). Thinking styles, schizotypal traits and anomalous experiences. *Personality and Individual Differences*, *27*(5), 821-830. https://doi.org/10.1016/S0191-8869(99)00031-8

Xu, H., & Tracey, T. J. G. (2015). Career Decision Ambiguity Tolerance Scale: Construction and initial validations. *Journal of Vocational Behavior*, *88*, 1-9. https://doi.org/10.1016/j.jvb.2015.01.006

Yela, J. R., Gómez-Martínez, M. Á., Crego, A., & Jiménez, L. (2020). Effects of the Mindful Self-Compassion programme on clinical and health psychology trainees' well-being: A pilot study. *Clinical Psychologist*, *24*(1), 41-54. https://doi.org/10.1111/cp.12204

Zahniser, E., Rupert, P. A., & Dorociak, K. E. (2017). Self-care in clinical psychology graduate training. *Training and Education in Professional Psychology*, *11*(4), 283-289. https://doi.org/10.1037/tep0000172

Zainal, N. Z., Booth, S., & Huppert, F. A. (2013). The efficacy of mindfulness-based stress reduction on mental health of breast cancer patients: A meta-analysis. *Psycho-Oncology*, *22*(7), 1457-1465. https://doi.org/10.1002/pon.3171

Zenasni, F., Besancon, M., & Lubart, T. (2008). Creativity and tolerance of ambiguity: An empirical study. *The Journal of Creative Behavior*, *42*(1), 61-73. https://doi.org/10.1002/j.2162-6057.2008.tb01080.x

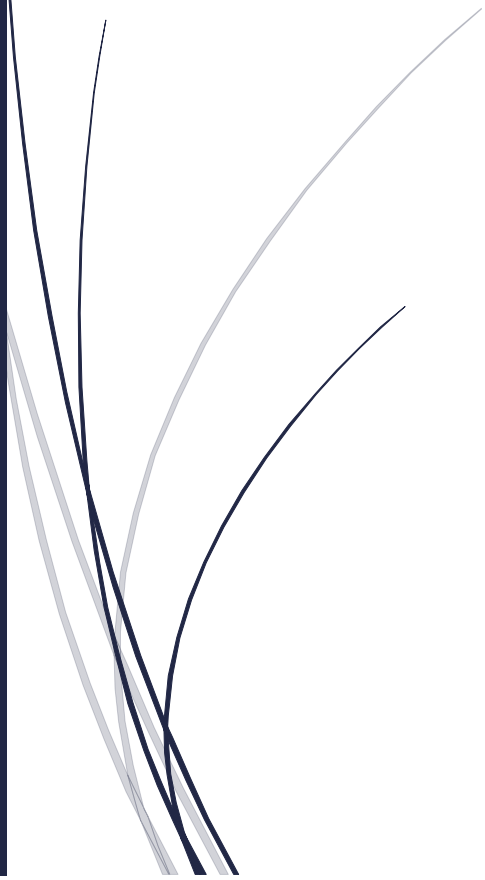
Zhaleh, K., Ghonsooly, B., & Pishghadam, R. (2018). Effects of conceptions of intelligence and ambiguity tolerance on teacher burnout: A case of Iranian EFL teachers. *Research in Applied Linguistics*, *9*, 118-140. https://doi.org/10.22055/RALS.2018.13796

Appendix A: Reflective Journal

2020

Workshop Reflections

Practicing Mindfulness and Compassion



McGill Mindfulness Research Lab

Week One Reflections

What is my experience of ambiguity in grad school?

When I think about such experiences, how do I feel? How do I react?

Meditative Exercises

Formal Practice: Try meditating once per day!

https://www.mindful.org/a-five-minute-breathing-meditation/

https://www.mindful.org/a-guided-meditation-to-label-difficult-emotions/

https://www.mindful.org/a-10-minute-meditation-to-work-with-difficult-emotions/

Sunday ☐

Monday ☐

Tuesday ☐

Wednesday ☐

Thursday ☐

Friday ☐

Saturday ☐

What have I learned this week?

Relevant Reading

Pica, 1998 – The Ambiguous Nature of Clinical Training and its Impact on the Development of Student Clinicians

Week Two Reflections

What expectations do I hold for myself as counsellor-in-training and graduate student?

How do I feel when I consider these expectations?

Meditative Exercises

Formal Practice: Try meditating once per day!

https://www.mindful.org/a-meditation-to-focus-attention/

https://www.mindful.org/a-mindfulness-practice-to-notice-the-mind-body-connection/

https://www.mindful.org/a-meditation-on-observing-thoughts-non-judgmentally/

- **Sunday** ☐
- **Monday** ☐
- **Tuesday** ☐
- **Wednesday** ☐
- **Thursday** ☐
- **Friday** ☐
- **Saturday** ☐

What have I learned this week?

Relevant Reading

Carson & Langer, 2006 – Mindfulness and Self-Acceptance

Week Three Reflections

How do I feel about working with clients?

What counseling qualities and skills do I have? What skills do I anticipate wanting to develop?

Meditative Exercises

Formal Practice: Try meditating once per day!

https://www.meditationlifeskills.com/5-minute-mindfulness-body-scan-meditation-script-mp3/

https://www.mindful.org/a-compassion-practice-for-opening-the-heart/

https://self-compassion.org/category/exercises/#guided-meditations

- **Sunday** ☐
- **Monday** ☐
- **Tuesday** ☐
- **Wednesday** ☐
- **Thursday** ☐
- **Friday** ☐
- **Saturday** ☐

What have I learned this week?

Relevant Reading

Skovholt & Starkey, 2003 – Struggles of the Novice Counselor and Therapist

Week Four Reflections

How do I define myself?

What do I value?

Meditative Exercises

Formal Practice: Try meditating once per day!

https://www.mindful.org/walking-meditation/

https://www.mindful.org/10-minute-guided-mindfulness-meditation-foster-forgiveness/

https://chrisgermer.com/meditations/ - *Try the exercise on Giving and Receiving Compassion*

- **Sunday** ☐
- **Monday** ☐
- **Tuesday** ☐
- **Wednesday** ☐
- **Thursday** ☐
- **Friday** ☐
- **Saturday** ☐

What have I learned this week?

Relevant Reading

Dong et al., 2018 – Development of Professional Identity for Counseling Professionals: A Mindfulness-Based Perspective

Week Five Reflections

What have I learned about mindfulness, compassion, and managing ambiguity?

What questions do I still have? What do I want to learn more about?

Meditative Exercises

Formal Practice: Try meditating once per day!

https://www.mindful.org/5-minute-gratitude-practice-focus-good-tapping-senses

https://www.tarabrach.com/meditation-letting-go-living-presence/

https://www.mindful.org/a-reconciliation-meditation/

- **Sunday** ☐
- **Monday** ☐
- **Tuesday** ☐
- **Wednesday** ☐
- **Thursday** ☐
- **Friday** ☐
- **Saturday** ☐

What have I learned this week?

Relevant Readings

Khoury et al., 2017 – Embodied Mindfulness

Khoury, 2019 – Compassion: Embodied and Embedded

Additional Resources

Readings about Ambiguity Tolerance

Furnham, A., & Marks, J. (2013). Tolerance of Ambiguity: A Review of the Recent Literature. *Psychology, 04*, 717-728.

Jahn, S. A., & Smith-Adcock, S. (2017). A Phenomenological Study of Counseling Students' Experiences with Ambiguity. *The Journal of Counselor Preparation and Supervision, 10*(1), 9.

Levitt, D. H., & Jacques, J. D. (2005). Promoting Tolerance for Ambiguity in Counselor Training Programs. *Journal of Humanistic Counseling, Education and Development, 44*(1), 46.

Readings about Mindfulness

Carson, S. H., & Langer, E. J. (2004). Mindful Practice for Clinicians and Patients. In *Handbook of Primary Care Psychology.* (pp. 173-183). New York, NY, US: Oxford University Press.

Hart, R., Ivtzan, I., & Hart, D. (2013). Mind the Gap in Mindfulness Research: A Comparative Account of the Leading Schools of Thought. *Review of General Psychology, 17*(4), 453-466.

Spinelli, C., Wisener, M., & Khoury, B. (2019). Mindfulness Training for Healthcare Professionals and Trainees: A Meta-Analysis of Randomized Controlled Trials. *J Psychosom Res, 120*, 29-38.

Readings about Counsellor Development

Christopher, J. C., & Maris, J. A. (2010). Integrating Mindfulness as Self-Care into Counselling and Psychotherapy Training. *Counselling and Psychotherapy Research, 10*(2), 114-125.

Pakenham, K. I., & Stafford-Brown, J. (2012). Stress in Clinical Psychology Trainees: Current Research Status and Future Directions. *Australian Psychologist, 47*(3), 147-155.

Skovholt, T. M., & Starkey, M. T. (2010). The Three Legs of the Practitioner's Learning Stool: Practice, Research/Theory, and Personal Life. *Journal of Contemp Psychotherapy, 40*(3), 125-130.

Formal Meditations

https://jackkornfield.com/meditations/

https://www.mindful.org/the-top-10-guided-meditations-from-2019/

https://www.sonima.com/meditation/meditation-for-change/

https://mbsrtraining.com/mindfulness-exercises/eating-a-raisin-script/

http://centerformsc.org/practice-msc/guided-meditations-and-exercises/

http://www.centerformindfullearning.org/concentration-equanimity-thankfulness/

Informal Mindfulness

https://www.canr.msu.edu/news/your_mindfulness_practice_can_be_formal_or_informal

https://www.mindful.org/6-ways-practice-mindful-eating/

http://thehappinesstrap.com/upimages/Informal_Mindfulness_Exercises.pdf

https://mindfulminutes.com/informal-mindfulness-5-everyday-practices-help-present/

"Like it or not, this moment is all we really have to work with." - Jon Kabat-Zinn (1994)

"Mindfulness can encourage creativity when the focus is on the process and not the product." - Ellen J. Langer (1989)