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Mindfulness and Individual Error Orientation in High Reliability Organizations

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Abstract

Mindfulness is a concept drawn from the contemplative traditions that refers to present-moment, non-judgmental awareness. Exactly how applicable mindfulness is in the workplace requires further empirical validation, particularly on outcomes immediately relevant to organizations. This study contributes to literature examining the effects of mindfulness in organizational settings by considering the effects of an 8-week workplace mindfulness training program in a high-reliability organization (hospital) on individual error orientation, an individual's propensity to learn from error, worry about error, or hide error. This study adds to the current state of knowledge by providing further insight into why one holds a particular error orientation and what can be done to encourage productive responses to error.

Applying a randomized control trial design, employees of multiple hospital sites were recruited and assigned to one of three conditions: mindfulness, Pilates, or a no-treatment control condition. It was hypothesized that mindfulness training would increase the mindfulness levels of individuals and further, that mindfulness levels would predict error orientation. Three mechanisms were proposed as mediators of mindfulness and the positive relationship with learning from error, negative relationship with worrying about error, and negative relationship with hiding error: core self-evaluations, self-compassion, and authenticity.

Quantitative findings confirmed that participants who received the mindfulness training reported increases in their perceived levels of mindfulness. Mindfulness levels were also related to worrying about error and hiding error in the hypothesized directions. The mediation hypotheses had mixed findings. While mindfulness showed significant relationships with the proposed mediators, these constructs were not always significantly related to the facets of error orientation. Qualitative findings suggest that mindfulness training offers emotion regulation skills that support productive responses to error. Mindfulness may be a meaningful training for employees with a wide range of cognitive, affective, attitudinal and behavioural benefits. It appears there may be a role for workplace mindfulness training as it relates to error orientation, productivity, and overall employee well-being.

Keywords

Acknowledgments

"You don't drown by falling in the water; you drown by staying there."

- Edwin Louis Cole

Throughout this degree and this thesis, I would have surely drowned without the joint effort of many people whom inspired me to keep getting up.

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Table of Contents

List of Tables

List of Figures

List of Appendices

Chapter 1

1 Thesis Summary

1.1 Introduction

"We can complain because rose bushes have thorns, or rejoice because thorn bushes have roses."

— Abraham Lincoln

Imagine a doctor that has transplanted the wrong organ into a patient. Upon detecting the mistake, they may silently lambaste themselves eliciting shameful emotions that consequently drive the doctor to blame her team for the error. Or, they may reflect on the processes that led to the mistake and identify what needs to be changed to ensure such an error does not occur again. In another instance, imagine an employee that sends a personal email to the entire company's distribution list. They may admonish themselves until their cheeks burn, or they may chuckle with a colleague who may then share a technique that obstructs the use of the treacherous 'reply-all' button. In general, errors can be understood as an unintended discrepancy between a present state and a goal or standard where the actions that lead to the discrepancy can be attributed to the individual and were potentially avoidable (Frese & Zapf, 1994; Norman, 1981; Reason, 1990). Whether the error results from a misplaced finger or a misplaced organ, it is how an individual interprets the discrepancy that leads to productive or adverse response to that error. A learning organization (Senge, 1990) for instance, requires individuals to hold a positive attitude towards the process of error inquiry in order to deal with error in an active and exploratory manner (Rybowiak et al., 1999).

There is no shortage of examples illuminating the power of perception in determining an individual's experience. Managing one's own emotions, thoughts and attitudes can have important implications on behaviour, particularly in situations where there is limited opportunity to control events that arise (Gross, 1998). Abraham Lincoln's famous quotation shows that whether one complains or rejoices is determined to some extent by the individual. Errors are archetypal examples of such thorns. Given the ubiquity of errors and the inevitability of their encounter, how individuals emotionally and cognitively orient themselves to error, herein referred to as error orientation, can predict subsequent behavior

that results in productive outcomes like learning, or negative outcomes like concealing mistakes.

Mistakes made within some organizations can be costlier than others. As such, high-reliability organizations (HROs), like health care, are one context where learning from errors has been studied extensively (e.g. Edmondson, 1991; van Dyck, 2000), and for good reason. In the United States, some 210,000 to 440,000 patients suffer from preventable harm leading to death while in hospital care (James, 2013). Given the potentially fatal consequences of both typos and transplants in these organizations, these high stakes were identified as likely to induce negative error management cultures that influence norms surrounding how individuals respond to, report, and correct error (van Dyck, 2000). In these studies, scholars have consistently maintained that errors represent key learning points for organizations (Edmondson, 1996, 1999; Heimbeck, Frese, Sonnentag, & Keith, 2003; Hutchins, 1995) and that open error climates where there is a willingness to report and discuss errors, stimulates learning from errors (Cannon & Edmondson, 2001). At the group and organizational level, there has been a growing stream of empirical accounts establishing relationships between positive attitudes towards error and performance (Steele-Johnson & Kalinoski, 2014; Keith & Frese, 2008). Yet, at the individual level, the psychological processes that explain why an individual holds a particular error orientation and what can be done to shift it remains relatively under examined.

Simply put, error orientation reflects a set of attitudes towards errors. An attitude is a tendency to respond in a positive or negative manner to a given attitude object and are formed from cognitive, affective and/or behavioural information about the attitude object (Oskamp and Schultz, 2005). More specifically, error orientation refers to how an individual copes with (Lazarus & Folkman, 1984) and thinks about errors at work (Rybowiak, Garst, Frese, & Batinic, 1999). Error orientation falls under the conceptual umbrella of coping (Lazarus & Folkman, 1984) where there is a continuum of possible error responses that result in differences in the perception of threat and accordingly, how much anxiety a person experiences. It encompasses emotion-focused responses (Lazarus and Folkman, 1984) like the extent to which errors are anticipated (Schell, 2012) and how different coping strategies are enacted to alleviate anxiety upon error detection (Rybowiak et al., 1999). It also includes problem-focused responses (Lazarus and Folkman, 1984) that aim to alter how a person relates to their environment, like the attitudes an individual holds towards reporting or hiding their errors. In this way, error orientation can be understood as having two stages of appraisal: 1) a primary emotional appraisal that gages how negatively errors are perceived and the extent to which an individual expects an error will occur; and

2) a secondary appraisal of one's error outlook that informs how an individual copes with the error (Rybowiak et al., 1999). Error orientation thus includes cost-benefit evaluations for the self and other involved parties based on a range of potentially negative emotions an individual may experience from the stress of errors (Broadbeck, Zapf, Prümper and Frese, 1993). These emotions found the basis of an individual's approach or avoidance motivation towards error experiences (Schell, 2012) and whether they see errors as positive or negative (Keith & Frese, 2008), which in turn influences how an individual chooses a coping strategy. Feelings of fear, anxiety, insecurity and shame, for example, may lead an individual to be defensive and hide their mistakes. A more proactive stance, on the other hand, may result in more accepting and calming coping tactics such that individuals show a willingness to report and learn from their errors.

For many, the suggestion of incompetence that error detection can trigger may lead to a negative error orientation. Indeed, negative error orientations may be a function of defensive biases that limit learning opportunities as individuals are more inclined to protect their sense of self-worth (Sherman & Cohen, 2002). In support of this view is research that finds feedback that threatens individual self-worth can activate a defensive response resulting in a desire to deny, dismiss or downplay that information (Steele, 1988). Individuals who are able to reinforce their sense of self-worth by drawing on other sources (e.g. their success in an alternate context) respond to negative feedback and defeat in more open-minded and less defensive ways (e.g. Kunda, 1987; Sherman, Nelson, & Steele, 2000). The ability to apply an objective perspective to the detection of one's errors and having the attentional resources to choose what information to focus on may facilitate a less defensive response by limiting the cognitive, affective and behavioural strain of errors thereby bolstering coping resources. By applying a frame of mind that can appraise error objectively, individuals may be better equipped to focus on a solution rather than the ramifications of their error. How an automatic negative reaction to error can be reframed is an important question given learning to reframe habitual responses to error creates the opportunity to form a different set of cognitive and emotional associations with error, like an opportunity to grow for instance, that may support the development of positive error orientation.

Relational Frame Theory (RFT: Hayes et al., 2001) provides a perspective through which reframing error orientation can be understood. In RFT, attitudes are derived from the cognitive relationships individuals have formed in the context of their environment. Reframing negative individual error orientation would necessitate a person to change how they relate to errors made at work such that cognitive relationships between error and

outcomes were benign or minimally threatening to their identity. Such reframing first requires the metacognition, or the broader awareness of awareness, to notice one's immediate emotional and cognitive reactions to error. Secondly, reframing relies on an individual's self-regulatory capability to change how they see their error through a more productive attitudinal lens. Training that enhances self-regulatory resources like self-awareness, metacognition and emotional control would be beneficial for shifting an individual's error orientation. Mindfulness training may offer such a framework to build the self-regulatory resources needed to cultivate productive responses to error.

Mindfulness can be understood as "the awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experience moment by moment" (Kabat-Zinn, 2003, p. 145). Existing research suggests that a practice in mindfulness leads to greater awareness of thoughts and emotions and that this metacognition empowers individuals to regulate which thoughts they will and will not pay attention to (Baer, 2003). More mindful individuals may be better able to access productive coping strategies by selectively avoiding attending to information that generates a negative appraisal of error or by reframing the situation in a manner that does not threaten their self-worth. For example mindfulness may diffuse the threatening nature of errors by allowing individuals to reframe errors as a ubiquitous reality of life and to simply be more accepting of one's human fallibility. In this way, individuals would be less inclined to experience error as a catastrophic setback and may instead get back on the proverbial horse with a minimal sense of inertia. Individuals that undergo mindfulness training may thus cultivate the attitudinal curiosity and lack of defensiveness promulgating a tendency to learn from error, worry less about error, and not hide errors when they occur.

This research focuses on the relationship between individual error orientation and mindfulness to see whether the open and non-judgmental hallmarks of mindfulness will predict how an individual feels and thinks and reacts to error. This contributes to the literature by identifying mindfulness as a means of equipping individuals with some agency in their error response, regardless of their environment. Drawing on self-regulatory principles of emotion regulation and meta-cognition, it seeks to explain how emotional and cognitive responses can be reframed as an individual's error orientation changes. This research shares the view that a positive attitude towards error, or a positive error orientation, is a likely antecedent to optimal learning outcomes (Dorman & Frese, 1994; Frese, 1995) and greater organizational effectiveness (Argyris & Schon, 1978). As such, building knowledge around how and why an individual can view errors more positively not only benefits the individual but the wider organization as well. Additionally, as

mindfulness levels can improve with mindfulness practice (e.g., MacKillop & Anderson, 2007) this study may provide more information on how productive error responses may be trained. This has particularly compelling implications for high-reliability organizations where openness to error, error reporting, and learning from errors have greater associated risks and benefits.

1.2 Research Questions

The overarching question this thesis seeks to address is to what extent how mindful an individual is predicts individual error orientation, a pertinent workplace attitude that precedes learning from error and organizational performance. In this way this research explores whether mindfulness training can offer more broadly applicable workplace related outcomes rather than stress reduction alone, which has been the predominant focus of mindfulness training (e.g., Kabat-Zinn, 1992). If mindfulness does in fact predict a more positive error orientation, than it provides organizations with an opportunity to enact a form of training that extends skills beyond error management training alone. Accordingly, this study attempts to identify and evaluate three mechanisms through which mindfulness may impact error orientation and attempts to empirically validate them in a way that develops theory about the mechanisms of mindfulness. Specifically this study examines three questions:

1. What is the effect of a workplace mindfulness training on individual mindfulness levels?
2. How does an individual's level of mindfulness relate to their error orientation?
3. If mindfulness predicts error orientation, to what extent do core self-evaluation, authenticity, and self-compassion explain the relationship between mindfulness and individual error orientation?

1.3 Overview of Study

This proposal uses both quantitative and qualitative approaches in one longitudinal randomized controlled intervention study conducted in a healthcare setting. Participants were recruited from a group of hospitals in Toronto. Participants were randomly assigned to one of three groups: 1) an 8-week mindfulness program; 2) an 8-week Pilates program; and 3) a no-treatment control group. All participants completed surveys before and after the training period (8-weeks) and a follow-up survey 4-weeks after training. Those in the mindfulness and Pilates program also completed weekly surveys during the training period.

Interviews were held with willing participants from the mindfulness and Pilates conditions during the 12-week study period.

The purpose of the survey component was to track within and between group changes over time related to the variables of interest (mindfulness, individual error orientation, core self-evaluations, self-compassion, and authenticity). In this way, the data offers insight into whether a mindfulness intervention is capable of increasing mindfulness, and relatedly, what relationships and mechanisms mindfulness and mindfulness training have with error orientation. Unfortunately, due to a wealth of missing data, the weekly survey data collected during the 8-week training period from the mindfulness and Pilates participants was not analyzed. Thus, the results herein report survey responses from week 1 (T1), week 8 (T8), and week 12 (T9) of the study representing pre-training, post-training, and four-weeks post-training.

The purpose of the interviews was to glean a more in-depth understanding of the general effects of the intervention programs, what aspects of the intervention design were most impactful in a work setting, and to gain insight into the deeper overall phenomenological experiences of the participants. This qualitative perspective offers complimentary insight into data that the surveys alone do not fully capture.

1.4   Theoretical Contribution

Although the literature on error orientation and learning from errors, particularly in healthcare settings, has produced many interesting findings there remains an opportunity to gain more clarity on what predicts an individual's error orientation and how to cultivate positive error attitudes. Surprisingly, there is very little research into why individuals have certain error attitudes and what can be done to impact them (Zhao & Olivera, 2006). As several scholars have suggested, individual cognition is key to assuring high performance in uncertain and complex environments (Walsh, 1995; Weick, Sutcliffe, & Obstfeld, 1999), such as hospitals. Thus, it is important to examine whether and how cognition-related constructs can be affected. This study looks specifically at the relationship between mindfulness and error orientation by examining the cognitive and emotional elements of individual error orientation to see whether an 8-week mindfulness program, relative to an 8-week Pilates program and no-treatment control group, can increase mindfulness levels and accordingly, whether mindfulness predicts one's error attitudes, cognitions, and behaviours.

Furthermore, this study also contributes to mindfulness theory on how and when mindfulness impacts work relevant outcomes. The nascent state of the organizational mindfulness literature has led to calls for more empirical research that examines mindfulness and its relationships to workplace outcomes (Reb & Choi, 2015). This is important because validating the relevance and applicability of an ancient contemplative tradition in the modern workplace is required to ground the theoretical arguments that have been proposed (e.g., Glomb et al., 2011). Although mindfulness has been proposed as a promising cognition-related construct for predicting job performance (Dane & Brummel, 2013) and work-related errors (Dane, 2011; 2013), an individual level mindfulness intervention examining error orientation in the workplace has not yet been conducted limiting our understanding of this error relationship in the workplace. This study not only provides an empirical account of mindfulness and its effect on error orientation from the field, it also puts forth several mechanisms. Obtaining a clear grasp on the mediating mechanisms of mindfulness interventions has repeatedly been an area that mindfulness scholars have identified as underdeveloped (Arch & Craske, 2006; Choi & Leroy, 2015; Shapiro, Carlson, Astin & Freedman, 2006). Gaining a clearer picture of the mechanisms of mindfulness would contribute to understanding the broader nomological network of mindfulness and how it fits within the industrial and organizational literature. Additionally, past studies have explored mindfulness and error relationships relying on the attentional control component of mindfulness (e.g. Dane, 2011; 2013). This thesis, however, focuses on the attitudinal component of mindfulness to explain why a more mindful individual would be more likely to hold a positive error orientation.

If this study confirms that mindfulness is related to how an individual thinks and feels about their errors, it will have provided some empirical support for the efficacy of mindfulness training to cultivate mindfulness levels that in turn, predict positive error orientations in individuals within HROs, like hospital settings. Furthermore, it will have identified the mechanisms that explain more productive responses to error. This is important because mindfulness training may not to appeal to all audiences. Providing different approaches that develop the mechanisms of positive error orientation could reach those that were not interested in mindfulness. Theoretically, we will have integrated research from organizational error and self-concepts to suggest that mindfulness facilitates core self-evaluation, self-compassion, and authenticity to generate more optimal cognitive, emotional and behavioural responses to error.

1.5   Practical Contribution

There are several promising practical contributions of this research. First, the use of interviews offers unique opportunities to study the phenomenon more intimately. Much of the existing mindfulness research has not captured the phenomenological experience of participants as they engage in training programs through the use of surveys alone. There has also been little inquiry into when or why the effects of training manifest. The data gleaned through interviews serves to address such voids as participants share more detailed accounts of their transitory experience, including specific examples of how the training impacted them, over and above the surveys. This information also stands to benefit facilitators and program designers by providing feedback on how the structure and content of the program is digested and applied by participants. In this way this study offers some practical knowledge about the content, structure and amount of mindfulness training required to be effective, an area of mindfulness intervention area that presently remains obfuscated (Carmody & Baer, 2009). Identifying which specific parts of the training the participants find helpful, constraining, beneficial or obsolete sheds further light on the low compliance and high attrition rates that tend to occur with mindfulness training (Dobkin, Irving & Amar, 2011). Discovering ways to adapt the intervention training to support those that are prone to rumination or have uncomfortable training experiences is another important challenge to address (Crane & Williams, 2010). Interview responses help illuminate how mindfulness training can be structured and adapted to be more effective in the workplace.

Second, this study contributes broadly to the growing body of research on the efficacy of mindfulness training in organizational settings. Employee performance, employee wellbeing, and employee productivity are three highly prioritized management objectives. High levels of stress, emotional exhaustion, and employee burnout are common experiences that come at a great cost to employers. In Canada, costs due to stress are estimated to be upwards of $50 billion (Lim et al., 2008). Research on mindfulness training suggests that programs like mindfulness-based stress reduction (e.g. Kabat-Zinn, 1992) and mindfulness-based cognitive therapy (e.g. Segal, Teasdale & Williams, 2004) strengthen the mental health and well-being of individuals. In general, mindfulness programs have been shown to be highly efficacious at building resilience to stress, addressing chronic illness (e.g. depression, anxiety), and improving self-regulatory processes related to performance, for example, willpower, attentional control, and emotion regulation (Brown & Ryan, 2003). What remains inconclusive is whether mindfulness

training may enhance performance at work. Presently, the efficacy of mindfulness interventions in work settings is in great need of further study and validation. This study empirically validates the relationship between mindfulness and one particular construct that has implications for organizational performance: error orientation. If employee responses to error are important to an organization, this research may help inform managers who are considering which training programs should be implemented in their organizations.

Finally, in a very immediate and specific circumstance, this study largely had a positive impact on the participants that partook in the mindfulness course. During the interviews there were countless, rather heartwarming, anecdotes shared about how the training was positively impacting their work, relationships, and life overall. Participants described moments where they noticed connecting deeply with their spouses, children, patients and colleagues for the first time in an extended period of time. Others found a renewed sense of engagement at work or described simply feeling happy again. Even those in the Pilates course were positively impacted by the brief break and exercise that the sessions afforded them. Collecting such reports of participants was a tremendously fulfilling experience even for the researcher.

This chapter has intended to outline the rationale for studying the relationship between mindfulness and individual error orientation and to provide a high-level general summary of the proposal altogether. Chapter two of this proposal reviews the relevant literature and proposes five hypotheses. Chapter three describes the methodology in detail by outlining the specific procedure for the study, presenting the participant sample along with the three conditions, and explaining the survey measures used in the study. Chapter four presents the quantitative and qualitative results, and a rationale for decisions surrounding the data analyses. The discussion and conclusion comprise the fifth and final chapter. All of the relevant study materials, for example survey items, recruiting materials and letters to participants, are contained in the Appendices.

Chapter 2

2 Literature Review and Hypothesis Development

2.1 Error

As stated in the introduction, human errors are defined as a lack of goal attainment due to individual actions that could have been avoided (Frese & Zapf, 1994; Norman, 1981; Reason, 1990). Zapf and Reason (1994) note that the error literature is a long-standing body of work that has been developed since the early 1900's in the days of Sigmund Freud remains pertinent to cognitive and applied psychology. While a full review of errors is beyond the scope of this paper, there are two foundational distinctions within error theory that are relevant to consider before presenting a more detailed overview on individual error orientation. A first necessary distinction begins with the typology of error. Presently the error literature identifies three different types of human error: slips, rule-based mistakes, and knowledge-based mistakes (Reason, 1990; 1997). *Slips* involve correct intention, but incorrect action like writing down a wrong pill when writing a prescription. *Rule-based mistakes* occur when the actions are correct but applied in the wrong setting, for example, correctly amputating a limb but on the wrong patient. *Knowledge-based mistakes* result from a lack of information or an inability to fully assess or analyze a problem and its elements. Such errors might be familiar to health workers who are attempting to diagnose a patient based on a faulty or incomplete mental model. While such distinctions in types of error are valuable, this study does not distinguish between the three given that in hospital settings, any error can have high-risk associations.

A second important distinction made in the error literature is the error handling process (Bagnara & Rizzo, 1989; Reason, 1990). This process is comprised of three stages: 1) error occurrence; 2) error diagnosis, which involves detecting and diagnosing the error that has occurred; and 3) error recovery, which refers to the planning and execution of a solution to recover from error. By examining individual error orientation, or how one thinks/feels/behaves once they realize an error has occurred, this study considers phenomenon that occurs in and between error diagnosis and error recovery.

2.2   Individual Error Orientation

Reason (1990) theorized that there are three major elements in the production of an error: 1) nature of the task and its environment; 2) mechanisms governing performance; and the 3) general nature of the individual. Similarly, a multi-level framework at the individual, group and organizational level can categorize existing research on error attitudes. At the organizational level, some have examined how individual error attitudes are embedded in organizational culture (Baron, 1986). Others have studied the organizational factors that lead to, or impede, learning from errors (e.g., Tucker & Edmondson, 2003; Tucker, Nembhard, & Edmondson, 2007). For example, entrepreneurial firms that tend to have more positive attitudes towards error and learning opportunities (van Dyck Frese, & Sonnentag, 2000). At the group level, the effects of psychological safety (Edmondson, 1999) have been studied on a willingness to discuss, report and learn from errors (Edmondson, 1999; Edmondson, 2003; Naveh & Katz-Navon, 2014). Once such example comes from Amy Edmondson's (1996) hospital field study that found highly performing teams reported more errors. Others have studied managerial error responses where punitive, embarrassing and adversarial management reactions may shape the behaviours of employees (van Dyck, 2000; Leape, 2002; Studdert, Mello, & Brennan, 2004).

In 2006, error orientation purely at the individual level was largely unexplored (Zhao & Olivera, 2006). While there is much that stands to be discovered at this level, at least two important areas have emerged. First, some inquiry into the antecedents of individual error orientation has taken place. In particular, motivational theory (Dweck, 1986; Dweck & Leggett, 1988) has been applied to error orientation such that learning goal orientations, rather than performance goal orientations, have a positive relationship between error risk taking (Arenas, Tabernero, and Briones, 2006) and error competence (Schell & Conte, 2008), two aspects of a productive response to error (van Dyck, Van Hooft, De Gilder & Liesveld, 2010). From a self-regulation perspective, action control theory (Kuhl, 1994) has also been applied to error competence and error risk taking (Rybowiak et al., 1999; van Dyck, Van Hooft, De Gilder & Liesveld, 2010). Here, action-state orientation relates to individual differences in the ability to enact and maintain the pursuit of one's goal where action orientation demonstrates a high ability to initiate and focus on intentions. State orientation, on the other hand, is slow to initiate and easily over run by ruminatory thoughts of challenge, like errors or failure (Kuhl, 1994). There have been mixed findings in the relationships with error orientation and action-state orientation (Rybowiak et al., 1999; van

Dyck et al., 2010) suggesting that individual differences and error orientation antecedents remain an opportunity for further study.

The second area of individual error attitude research has examined the efficacy of error management training on learning from error and ultimately, performance (Steel-Johnson & Kalinoski, 2014; Bell & Kozlowski, 2008; Keith & Frese, 2005; Keith & Frese, 2008). This stream of research examines how training impacts learning transfer, where transfer refers to the "knowledge, skills and attitudes" that are "transferred from one task or job to another" (Hesketh, 1997, p. 318). In error management training, participants have an opportunity to learn a task, make as many errors as possible, and are repeatedly told that errors are a source of learning. When they go back to their work tasks and encounter error, participants can apply the knowledge, skills and attitudes from their error training to their own work. Largely this research has found that error management training, rather than error prevention approaches, is positively related to learning from errors (van Dyck, Frese, Baer, & Sonnentag, 2005). Emotion regulation, monitoring and controlling one's feelings, and metacognition, the monitoring and regulation of one's own thoughts, have been identified as mechanisms between error attitudes and performance (e.g. Frese et al., 1991; Heimbeck et al., 2003; Keith & Frese, 2005; Dimitrova, van Dyck, van Hooft, & Groenewegen, 2014).

The predominant means of measuring individual error orientation has been with the Error Orientation Questionnaire (EOQ: Rybowiak, Garst, Frese, & Batinic, 1999), which has eight elements: 1) error competence; 2) learning from errors; 3) error risk taking; 4) error strain; 5) error anticipation; 6) hiding errors; 7) error communication; and 8) thinking about errors. Recently, the Error Orientation and Motivation Scale (EOMS: Schell, 2012) was developed to integrate theory related to approach and avoidance, learning orientation, performance orientation, and goal achievement. EOMS reasons that errors, like goals, signal discrepancy between the actual state and the goal state, which produces arousal in the individual and prompts them to act (Schell, 2012). Relative to the EOQ, the EOMS is a significantly shorter measure, which makes it attractive in situations where survey exhaustion is a concern.

In the EOMS, individual error orientation is comprised of three factors that influence one's attitude: learning from errors; worrying about errors; and hiding errors. Learning from errors describes a mastery approach orientation (Dweck, 1986) that allows individuals to use errors as a basis for improvement (Schell, 2012). Worrying about errors is associated with an avoidant orientation where errors lead to negative affect and stress (Schell, 2012).

12

Hiding errors relates to a performance approach orientation where individuals may be inclined to hide or rationalize errors to uphold a favourable introspective and external image (Schell, 2012).

This research focuses on the individual level as capturing the individual experience from the individual's immediate perspective through individual level variables is a particularly important piece of the error orientation puzzle for several reasons. In line with previous research (Barach & Small, 2000; Pfeiffer, Manser, & Wehner, 2010) this study takes the view that many errors are often only visible to the person that committed them and as such, the self-report nature of the EOMS is particularly well suited to understanding individual error orientation. Moreover, in the healthcare environment and with respect to organizational error prevention, hospitals tend to rely on individuals and their skill sets to deliver quality patient care (Tucker & Edmondson, 2003) and this may shift significant responsibility and liability onto individuals further influencing individual error orientation. Finally, relevant group-level factors will be reflected at the individual-level, as evidenced by past research that found individual responses to errors were influenced by multi-level phenomenon like their perceptions of the organization's error culture (Zhao, 2011).

The present study builds on individual error attitude research by further examining the emotional and cognitive determinants of error orientation and by using a mindfulness intervention to build the self-regulatory resources required to perceive errors with a more positive attitude. Indeed, mindfulness training may be a more widely applicable intervention that helps individuals undergo a deeper attitudinal transformation in response to a wider range of challenging events, rather than error management training, which targets error responses alone. In sum, what the existing research suggests is that errors without positive framing can threaten self-esteem (Pearn, Mulrooney, & Payne, 1998) and that greater environmental error intolerance is distressful (Edmondson, 1996) limiting productive error responses, namely opportunities to learn and improve performance. A greater understanding of how individuals may come to worry less about errors, report the errors they make, and see error as a source for learning could improve the psychological experience of the individual, but also the wider error culture and overall performance of the organization. The next section reviews the literature on mindfulness and builds towards the argument that more mindful individuals are more prone to hold a more positive error orientation.

2.3   Mindfulness

Mindfulness, "the awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experience moment by moment" (Kabat-Zinn, 2003, p. 145), has become somewhat of a "hot" topic as of late. The burgeoning interest in mindfulness has been largely driven by its efficacy in decreasing stress while enhancing attentional control, emotion regulation, self-regulation, and overall physical and psychological well-being (see Brown & Ryan, 2003 for a review). Recently, studies have begun to examine mindfulness within organizational behavior, studying its relation to constructs like employee engagement (Hulsheger et al., 2013), task performance (Dane, 2011), and leadership (Reb, Narayanan, & Chaturverdi, 2012). One study found that sustained attention to the present moment decreases the occurrence of errors caused by distractions and highly automatized behavior (Moore & Malinowski, 2008). These studies demonstrate that there are compelling benefits to the application of mindfulness to organizations and that further study is a worthy endeavor.

While researchers have confirmed the construct validity of mindfulness (Giluk, 2009), the concept is complex and the exact definition has remained rather elusive. In Bhante Gunaratana's (2011) book, *Mindfulness in Plain English*, he describes the complexity of mindfulness's description:

> *Mindfulness is the English translation of the Pali word sati. Sati is an activity. What exactly is that? There can be no precise answer, at least not in words. Words are devised by the symbolic levels of the mind, and they describe those realities with which symbolic thinking deals. Mindfulness is presymbolic. It is not shackled to logic. Nevertheless, mindfulness can be experienced—rather easily— and it can be described, as long as you keep in mind that the words are only fingers pointing at the moon. They are not the moon itself. The actual experience lies beyond the words and above the symbols. Mindfulness is a subtle process that you are using at this very moment. The fact that this process lies above and beyond words does not make it unreal—quite the reverse. Mindfulness is the reality that gives rise to words—the words that follow are simply pale shadows of reality. It will always remain beyond verbal logic* (p. 131).

While respecting the view that mindfulness is difficult to define, mindfulness scholars tend to agree that mindfulness is a state of consciousness that involves attention to the present-

moment (Brown & Ryan, 2003) and being aware of what arises without reacting to what is noticed (Mrazek, Smallwood, & Schooler, 2012). An alternate purely cognitive-based definition of mindfulness comes from Langer and Moldoveanu (2000) where mindfulness refers to a "process of drawing novel distinctions" (p.1). This process is said to result in greater openness to new information, enhanced ability to engage in multiple perspectives, and the development of new categories in an associative network (Langer & Moldoveanu, 2000).

Mindfulness has been conceptualized as both as a state, fluctuating within an individual (e.g., Allen & Kiburz, 2012; Bishop et al., 2004; Brown & Ryan, 2003; Dane, 2011; Glomb et al., 2011), and as a trait, varying between individuals (e.g., Brown et al., 2007; Hülsheger et al., 2013). An athlete, for instance, might experience a high state of mindfulness. Picture a tennis player, alert and vigilant, as she prepares to receive a serve. Even if she misses the return, she does not ruminate over the miss; instead, she lets go of the past and refocuses on the present incoming serve. As a trait, mindfulness shows itself in the equanimity that individuals embody, as they remain aware, accepting, and non-reactive to the events of life. A less mindful individual might operate in a highly automatic, habitual and/or reactive mode where they were unaware of their internal and external experience. Mindless eating is a good example where it is not until one gets to the bottom of a bag of potato chips before realizing they have eaten the entire bag.

It is important to note that when looking at the impact of mindfulness, the literature tends not to distinguish state mindfulness from trait mindfulness from mindfulness interventions. Studies using any of these three conceptualizations of mindfulness are often grouped and cited as one large conceptual category of mindfulness. State mindfulness can be assessed by measures like the MAAS, which as mentioned have both state and trait versions of the scale. Experimental designs are another way state mindfulness is studied (e.g., Hafenbrack, Kinias & Barsade, 2014; Kudesia, Baer & Elfenbein, 2015). In these cases participants are assigned to a mindfulness condition where they engage in a short mindfulness manipulation (e.g., 10-minute guided mediation) and are compared to a non-mindfulness condition (e.g., 10-minute guided mind-wandering exercise). Mindfulness interventions, or programs that are specifically intended to train mindfulness, are yet another way to view mindfulness. These studies compare participants in a mindfulness training condition to some control condition. While some researchers explicitly measure trait and/or state mindfulness in intervention studies (e.g., Hülsheger et al., 2013; Meland, 2015), others find assignment to the different conditions to be sufficient (e.g., Aikens, 2014; Manocha et al., 2011).

Research that conceptualizes mindfulness as a trait assesses mindfulness with survey measures that measure trait mindfulness. The predominant measure of mindfulness is Brown & Ryan's (2003) self-report instrument, the Mindful Attention and Awareness Scale (MAAS), which has been validated on general populations and reliably assesses both trait and state mindfulness. Here, trait mindfulness is often investigated through a cross-sectional survey where dispositional mindfulness is related to a particular outcome, for example Malinowski & Lim's (2015) recent article on trait mindfulness, work engagement and wellbeing. Trait mindfulness is assessed via self-report and accordingly, is vulnerable to the limitations of self-report as mindfulness scholars have noted. Grossman (2011) wrote a paper commenting on the MAAS titled "Defining mindfulness by how poorly I think I pay attention during everyday awareness and other intractable problems for psychology's (re)invention of mindfulness". He argues that there are interpretation issues and response biases stemming from the degree of experience one has with mindfulness practice. Along these lines, he highlights that mindfulness is easily conflated with valuations of importance, which encourages positive self-evaluations. This suggests that for individuals unfamiliar with mindfulness, they may not be able to accurately recognize the extent to which they are mindful, or they may not be willing to admit the extent to which they are not mindful.

2.4   Mindfulness-Based Interventions

2.4.1 A Brief Review of Mindfulness-Based Interventions

Mindfulness training in the Western world originally surfaced as a means to remedy symptoms of stress and chronic pain (Kabat-Zinn, 1982). Mindfulness interventions have repeatedly been found to effectively treat stress and anxiety by managing negative thought and stabilizing emotion (Miller, Fletcher, & Kabat-Zinn, 1995; Shapiro, Schwartz, & Bonner, 1998). The two most established mindfulness protocols are Mindfulness-Based Stress Reduction (MBSR: Kabat-Zinn, 1982) and Mindfulness-Based Cognitive Therapy (Segal & Teasdale, 2002). MBSR is an 8-week group-based program intended to teach individuals dealing with chronic stress techniques that train an observant, non-judgmental stance toward mental, emotional and physiological experience. Participants meet on a weekly basis for 2-3 hours plus one additional full-day session. Each week participants are assigned 45-60 minutes of daily mindfulness practices and course material (e.g. reading and journaling). Formal mindfulness practices include body scanning, or shifting awareness through the body from head to toe; Hatha Yoga practices, which includes breath awareness and stretching; and sitting meditations that bring awareness to the breath while applying a

non-evaluative lens to the observation of thoughts as they distract attention away from the breath. These practices are facilitated in-class and then debriefed by the facilitator and participants are able to ask questions to gain more support for their practice.

While MBSR is designed for the general population, MBCT is designed to teach clinical populations techniques and skills to prevent the recurrence of depression and/or anxiety and explicitly focuses on how to process low mood and/or negative thought patterns (Segal, Williams, & Teasdale, 2002). Similar to MBSR, it is also a group-based intervention that takes place over 8-consecutive weeks with weekly 2-3 hour in-person sessions, and one full-day session. Mindfulness practices, also based on the body scan, seated breath meditation, and yoga, are taught during the session after which the facilitator leads an inquiry into participant experiences. Approximately 40-minutes of daily home practice is assigned to participants and participants are invited to review and discuss their home practice experiences in class during the sessions with the group. Table 2-1 presents the themes covered in each of the eight sessions for MBSR and MBCT as taught by the Centre for Mindfulness Studies, a Canadian mindfulness-based intervention service provider.

Table 2-1. MBSR and MBCT Themes

	MBCT	MBSR
Session 1	Awareness & Automatic Pilot	Experiencing New Possibilities
Session 2	Living in Our Heads	Discovering the Wisdom of Embodiment
Session 3	Gathering Attention	Perception Determines Experience
Session 4	Recognizing Aversion	Impact of Stress & Stress Reactivity
Session 5	Allowing/Letting Be	Coping Strategies & Emotional Intelligence
Session 6	Thoughts Are Not Facts	Stressful Communications
Session 7	How Can I Best Take Care of Myself	Increasing Resilience & Self-Care
Session 8	Using What I Have Learned	Weaving Your Parachute Before You Jump

Chiesa and Serretti (2009) reviewed 10 studies applying Kabat-Zinn's (1982) MBSR protocol to find that it had a medium to large effect size on reducing stress in healthy populations. These authors compared Cohen's d of MBSR interventions to those of control groups using t-test weighted for the number of participants. From these comparisons of Cohen's d, the authors consistently found a significant positive effect of MBSR training on reducing stress. In one particular study, 64% of university undergraduate students that participated in MBSR benefited from a significant reduction in stress compared to 14% of students that did not receive training, $p < .01$ (Astin, 1997). Grossman and his colleagues (2004) similarly found a $d = .5$ ($p < .0001$) effect size supporting the efficacy of an 8-week mindfulness training to reduce stress and increase health benefits in both clinical and general populations. Interestingly, while the authors found sixty-four studies related to health outcomes (e.g., pain, cancer, heart disease, depression, and anxiety) and MBSR, only

17

twenty studies met their inclusion criteria. Reasons for exclusion were related to (1) insufficient information about interventions, (2) poor quantitative health evaluation, (3) inadequate statistical analysis, (4) mindfulness not being the central component of intervention, or (5) the setting of intervention or sample composition deviating too widely from the health-related MBSR program.

Khoury and colleagues (2013) conducted a meta-analytic review of 209 studies using Segal & Teasdale's (2002) MBCT protocol as a treatment for psychological problems. They found that effect sizes ranged from Hedge's g .22 to Hedge's g .72 depending on which control group MBCT was compared to. In pre-post test studies with no control groups (n = 72) Hedge's g was .55. Waitlist controlled studies (n = 67) were less effective, Hedge's g = .53. Studies with active control groups (n = 68) showed lower effect sizes still with Hedge's g between .33 and .22 depending on whether the active control group (e.g. yoga) was another form of psychological treatment like cognitive behavioural therapy (n = 35).

Some of the most compelling findings related to mindfulness and its relevance in organizational scholarship comes from the world of neuroscience. One such example is a study that found mindfulness training resulted in increased grey matter in areas of the brain related to executive functioning in the pre-frontal cortex (Hozel et al., 2011). Studies such as this one tend to be derived from longer, multi-week interventions like MBSR or MBCT because neuroplasticity outcomes require longitudinal designs. In the workplace, holding weekly 3-hour training sessions over two-months and requiring an additional hour of daily practice may not be feasible. As such, it is important to consider whether shorter interventions will have comparable effects on outcomes. Based on meta-analytic evidence, it appears there is at least a small to medium effect of brief interventions (2-weeks or less) on psychological distress (Creswell, 2016[i]). Another meta-analysis of the efficacy of mindfulness-based interventions reducing psychological distress in working adults found no difference between brief and standard versions of MBSR with both yielding medium-to-large effect sizes ranging from Hedges's g = 0.68, 95 % confidence interval (CI) (0.58, 0.78) for studies with pretest versus post-test comparisons, and Hedges's g = 0.68, 95 % CI (0.48, 0.88) for comparison of MBI with a control group (Virgili, 2013). While these existing meta-analyses give some indication of the relationship between mindfulness training and stress, they are conducted on samples that include clinical populations, are that

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[i] While Creswell's (2016) paper mentions this meta-analysis on brief interventions, it does not report exact effect sizes. At the time this paper was written, the meta-analysis itself was not yet published.

are set in contexts other than the workplace, and study outcomes that may not be immediately relevant to organizational behaviour scholarship.

In December 2015, Tammy Allen and colleagues reviewed mindfulness intervention studies that took place specifically in work settings and examined work or performance related outcomes. They included any studies that applied an experimental design, for example pretest versus posttest, waitlist control groups, and randomized control trials. Studies that used student samples were excluded, as were any training programs where mindfulness was not the featured component of the curriculum (rather than yoga, relaxation techniques etc.). Twenty-seven studies met their criteria. The authors found that the duration of mindfulness interventions varied from 8-days to 6-months, with 8-weeks being the most frequent length of training. The number of contact hours also varied considerably with swings from 3-half day sessions (over 6-months), to 3-hours a week (over 8-weeks) plus an 8-hour retreat day. Nine out of the twenty-seven studies were conducted in a health care context. Other occupational contexts included education, military, and science and technology. The majority of studies ($N = 17$) were either based on Jon Kabat-Zinn's (1982) MBSR or Segal and Teasdale's (2002) Mindfulness-Based Cognitive Therapy protocol.

Allen et al., (2015) further identified seven categories of outcome variables across the twenty-seven studies: 1) stress/strain; 2) physiological indicators; 3) work engagement; 4) performance at work or cognitive performance; 5) health behaviour (e.g. sleep, nutrition); 6) client/patient related outcomes (e.g. client satisfaction); and 7) job satisfaction. Notably, while 24 of the 27 studies examined a variable related to stress or strain, only 10 studies examined a variable related to organizational behaviour (performance, engagement, job satisfaction) highlighting the empirical need for more studies immediately relevant to organizational outcomes. 66.7% of the 24 stress related studies found that mindfulness training reduced stress or enhanced wellbeing. In no category did mindfulness training have a significant non-beneficial effect on these variables (e.g. a decrease in performance); however, six studies found mixed effects or no effect for stress/strain, physiological indicators, performance, and health behaviour. 21 studies found significant beneficial results. Unfortunately, the authors did not report exact effect sizes; however Table 2-2 shows whether mindfulness training had a positive, mixed or null effect on each outcome category.

Table 2-2. Mindfulness Training Outcomes Reviewed by Allen et al. (2015)

	Total Studies	Positive effect	Mixed effects	No effect
Stress/strain	24	16	4	4
Physiological indicators	8	2	4	4

Work engagement	3	2		1
Performance	4	1	2	1
Health behaviour	5	3	1	1
Client/patient outcomes	3	2		1
Job Satisfaction	3	2		1

2.4.2 How Mindfulness Training Works

Broadly speaking mindfulness training cultivates mental concentration (meditation and contemplation) and a particular set of attitudes intended to equip practitioners with a present-moment oriented perspective from which to experience the world. Meditation teaches individuals to concentrate, focus, and still their mind; contemplation involves applying a non-judgmental and curious lens to any thoughts that arise (Zeiden et al., 2010). The attitudinal foundations of mindfulness are well illustrated by Kabat-Zinn's (1990) seven mindful attitudes. The first is *non-judging*, becoming aware of the contents of the mind without analyzing thoughts as good or bad. Second is *patience*, allowing life to unfold in its own time. Third is *beginner's mind,* where experiences are lived anew in the moment rather than from memory, existing knowledge, or past beliefs. Fourth is *trust*, or learning to honour one's own experience, intuition, feelings, and capabilities. The fifth mindful attitude is *non-striving*, a concept that prima facie appears to clash with the current achievement-oriented zeitgeist of the workplace. Non-striving refers to understanding that the present moment is as it should be and any pursuit of an alternate state would be struggling against the circumstances of the present moment. Sixth is *acceptanc*e, or a willingness to see things as they really are without bias or other filters from the past that may skew interpretation of the present moment. The final attitude is *letting go*, or relinquishing the need to control, manage, and hold on to experience.

Mindfulness training promotes a non-evaluative state of mind to nurture awareness of positive or negative phenomenon as it unfolds (Teasdale et al., 2000). Indeed, both meditation and contemplation have been said to cultivate meta-awareness (Zeiden et al., 2010). Mindfulness practices minimize egocentric feelings (Brown, Ryan & Creswell, 2007) by focusing on the self in the absence of judgment, thereby holding the ego at bay (Hahn, 1976). Another way to view an individual's highly egocentric experience is in the brain where the awareness of self can take on one of two distinct neural states: experiential focus or narrative focus (Farb et al., 2007). Narrative focus refers to awareness of self across time. It represents a socially constructed view of self, which activates the ego by choosing to identify with self-preserving and self-enhancing attributes, characteristics, roles, and beliefs (Brown, Ryan, & Creswell, 2007). Experiential focus can be

characterized by awareness of the self through moment-by-moment occurrences. If one considers the analogy of the experience of self in the mind as a box of chocolates, then experiential focus refers to each chocolate on its own (i.e. "this caramel covered chocolate square is divine"), and narrative focus refers to each chocolate in relation to the box as a whole (i.e. "I'm so glad I got a caramel covered chocolate instead of the cherry crème filling I picked last time"). Mindfulness practices develop experiential focus in individuals and combines it with an attitude of unconditional openness so that that each moment can stand on its own with minimal influence from the past or the future (Welwood, 2006).

A key component of how mindfulness training leads to positive behavioural change is by providing participants with an increased ability to choose their own response in any moment, regardless of the adversity a situation presents. This is elucidated beautifully by Viktor Frankl (1985) in his book, Man's Search for Meaning, which catalogues his observations in a concentration camp:

> *We who lived in concentration camps can remember the men who walked through the huts comforting others, giving away their last piece of bread. They may have been few in number, but they offer sufficient proof that everything can be taken from a man but one thing: the last of the human freedoms—to choose one's attitude in any given set of circumstances, to choose one's own way"* (p. 75).

Indeed emotion regulation is one mechanism of mindfulness that has been empirically confirmed (Arch & Craske, 2006). Several other mechanisms of mindfulness training have been studied in the past. Shapiro and colleagues (2006), for instance, proposed a theory of how mindfulness training might impact positive change. The authors argued that mindfulness training would teach participants how to re-perceive their experiences, or reinterpret their experiences through a more open and non-reactive manner. This, they argued, would lead to changes in self-regulation, values clarification, cognitive and behavioural flexibility, and a willingness to be exposed to more situations. Notably, although this model was empirically tested with an 8-week MBSR protocol, re-perceiving did not mediate the relationship between mindfulness and any of the four proposed dependent variables (Carmody et al., 2009).

Vago and Silversweig (2012) proposed another framework for the mechanisms of mindfulness based on a neuroscientific perspective of how mindfulness practices change the networks in the brain representing one's experience of self (integrative fronto-parietal control network). They suggest that mindfulness training cultivates three aspects: 1) self-

awareness, or meta-awareness of one self; 2) self-regulation, the ability to manage effectively their behaviour; and 3) self-transcendence, "a positive relationship between self and other that transcends self-focused needs and increases prosocial characteristics" (p. 296). While the literature has not yet converged on a model of the mechanisms of mindfulness training that promotes positive behaviour change, nor has a full examination of the many possible mechanisms yet taken place, a shared conceptual mechanism is the general enhanced ability to regulate oneself. The next sections of this chapter present the five hypotheses of this study.

2.4.3 Hypothesis 1

Bringing together the empirical base of mindfulness based interventions presented in the previous section and in line with past studies that have found mindfulness interventions to boost trait mindfulness (e.g. Meland, 2015), mindfulness training should increase the level of mindfulness from pre-training to post-training. While short state interventions (e.g. 10-minutes) that induce a state of mindfulness in a laboratory setting have been effective in producing states of mindfulness (e.g. Hafenbrack, Kinias & Barsade, 2014), these shifts are not likely to produce trait-level changes of mindfulness nor long-term changes in behaviour. Longer interventions (e.g. 8-weeks), like the intervention protocol used in this study, are more likely to produce changes in mindfulness traits such that receiving mindfulness training will produce a more mindful individual over time.

> *Hypothesis 1: Mindfulness training (sum of the number of training sessions and amount of formal and informal practice) is positively related to an increase in mindfulness levels over time.*

2.5 Mindfulness and Individual Error Orientation

2.5.1 Hypothesis 2

The error orientations of more mindful individuals are likely to differ from those of their less mindful counterparts. Mindfulness is likely to impact learning from errors, worrying about errors, and hiding errors (Schell, 2012) for several reasons, three of which are presented herein.

First, by providing participants with adaptive cognitive and emotional tools to pause and break automatic reactions, mindful individuals may be able to more effectively respond to error. Applying Relational Frame Theory (Hayes et al., 2001), as an individual becomes

more self-aware of their thoughts and habitual reactions to error, they can learn to adapt their responses by reframing how they related to errors at work. Without the awareness to pause and reflect, mistakes may be automatically associated with failure and as a result, trigger defensiveness. By acknowledging and then distancing themselves from automatic and reactive thought patterns, a process referred to as "response flexibility" (Glomb et al., 2011), mindful individuals may respond less intensely to negative feedback (Good et al., 2015), like errors. By decoupling habitual stimulus-response associations, mindfulness enables the flexibility to provide individuals with a broader variety of cognitive, emotional and behavioral response options (Good et al., 2015) mindful individuals should be better positioned to reframe error in a manner that supports positive error attitudes. In support of this argument is research that has identified greater awareness and control of thoughts (Keith & Frese, 2005) and emotion (Bell & Kozlowski, 2008; Keith & Frese, 2005) as a mediator of error management training on learning outcomes.

Second, mindfulness develops the willingness to allow whatever is occurring in the present moment to be received in an open and accepting manner (Shapiro et al., 2005). Seeing errors through a mindful non-judgmental lens may enable individuals to change a negative error attitude to a more positive one by observing errors from a neutral stance rather than as a source of threat. Engaging in reflection without the burden of defensiveness may support how an individual chooses to frame error by providing the space to consider how and why their appraisal of errors is influencing their response. As individuals become less defensive and more objective, they may begin to form different cognitive relationships to error because the ego is not engaged in the same self-protective neural processing that occurs with the default narrative focus of the mind (Farb et al., 2007). From this place of receptiveness, more mindful individuals may be less likely to criticize themselves (Vago & Silbersweig, 2012) and experience guilt or shame when responding to error. This suggests that worrying about error and hiding errors is likely to be less of a concern once the individual is no longer preoccupied with protecting their self-worth or self-image. Once the barrier of defensiveness is removed, an individual may be more willing to examine the cause of the error thus facilitating learning, or they may be more apt to report that an error has occurred.

Finally, past research suggests that mindfulness may develop an adaptive cognitive process that accesses positive reappraisals of stressful events (Garland, Gaylord & Fredrickson, 2011). The Mindful Coping Model (Garland, Gaylord & Fredrickson, 2011) describes how a simple mindful pause can provide an individual with the ability to recognize an event as stressful before immediately reacting to it. This model coalesces with Relational Frame

Theory (Hayes et al., 2001) by describing the process through which existing cognitive relationships can be identified and then reframed into a different set of cognitive relationships within the same context. In this process, the mindful pause allows individuals to acknowledge, without acting on that knowledge, that an error has occurred and that they hold a negative error attitude. From this more detached state of mind, events can be reappraised in a more beneficial manner, for example instead of being frustrated for forgetting an object in another room, feeling grateful that this error results in more exercise by retrieving it. Such mindful reappraisals of error would begin to neutralize the stressful associations of errors by considering alternative interpretations of the situation, thereby reducing the extent to which individuals worry about errors and attempt to hide their errors. From this less anxious vantage point, an individual may then choose to view errors as neutral event, or even a learning opportunity. Rick Hanson (2009), author of Buddha's Brain: The Practical Neuroscience of Happiness, Love and Wisdom, writes that by labeling life's challenges as "gifts" is a simple neuro-linguistic technique to promote resilience.

Bringing these points together, it is likely that trait mindfulness scores will predict error orientation such that more mindful individuals will be more likely to learn from their errors, be less likely to worry about errors, and be less likely to hide their errors. Further, in the context of mindfulness interventions, more mindfulness training should also predict learning from error, worrying about error, and hiding error and these relationships will be mediated by how mindful they are.

> *Hypothesis 2.1: Mindfulness (T8) is a) positively related to learning from error (T8), b) negatively related to worrying about error (T8) and c) negatively related to hiding error (T8).*

> *Hypothesis 2.2: Mindfulness (T8) partially mediates the a) positive relationship between mindfulness training and learning from error; b) negative relationship between mindfulness training and worrying about error (controlling for error culture); and c) negative relationship between mindfulness training and hiding error when controlling for error culture.*

2.6   The Mediating Mechanisms of Mindfulness on Individual Error Orientation

Learning from errors, worrying about errors, and hiding errors can be related to core self-evaluations, self-compassion, and authentic functioning to explain why those whom are

more mindful may be quicker to disarm the troops of defensiveness and reframe unfavourable reactions to error to yield more positive error orientations.

2.6.1   Hypothesis 3 | Core Self-Evaluation

Previous research has proposed that mindfulness is linked to an individual's self-concept (Rasmussen & Pidgeon, 2011; Carson & Langer, 2006). Core self-evaluation (CSE), also referred to as general self-concept (Judge, Hurst, & Simon, 2009), is a latent construct that underlies self-esteem, generalized self-efficacy, emotional stability (or neuroticism), and locus of control (Judge, Locke, & Durham, 1997). These four facets of CSE represent a unique synergistic process where the relationships between these components are jointly impacted by mindfulness in a way that grouping them together stands to predict more variance than by examining each facet alone.

By reframing experiences within a non-judgmental, non-critical framework individuals can manage their neuroticism by distancing themselves from unproductive thoughts (Pepping, O'Donovan, & Davis, 2013; Thompson & Waltz, 2008) and accordingly, bolster their confidence. Such metacognitive abilities may strengthen one's internal locus of control and further, allow individuals to nurture positive and stable self-concepts as they come to change self-critical thought patterns and increase their self-efficacy. Kernis (2003) has argued that self-esteem "is characterized by the relative absence of defensiveness" (p. 13), which presents a natural overlap with the accepting, non-judgmental attitude of mindfulness and the reduced rumination and ego-identification that occurs with mindfulness training. Consistent with such theorizing, Brown and Ryan (2003) found a .44 ($p < .001$) correlation between mindfulness and self-esteem (with mindfulness assessed using their (2003) Mindful Attention and Awareness Scale (MAAS). Similarly, Thompson and Waltz (2008) found a .39 ($p < .001$) correlation between the MAAS and self-esteem.

It would seem that high core self-evaluation should correspond to a greater likelihood of learning from errors, and lesser likelihood of worrying about errors, and hiding errors when they occur. Individuals with high CSEs also experience less stress (Kammeyer-Mueller, Judge, & Scott, 2009), which may be conducive to worrying about error. Emotional stability impacts how susceptible one is to negative affect and how they cope overall with stressful experiences (Costa & McCrae, 1992), thus higher CSE might lead to more positive interpretation of errors by mitigating the tendency to worry about errors. Worrying less about errors may also support learning from errors since moderate to intense negative emotionality diminishes inclinations to learn (Zhao, 2011). Individuals with higher CSE

have also been shown to persist longer on challenging goals (Erez & Judge, 2001)**,** which supports learning from error in the same line of reasoning as an individual persisting to overcome the challenges that arise during goal-pursuit.

Another reason higher CSE may foster learning from error and decrease both worrying about error and hiding error is that high degrees of self-worth and agency result in more confidence and perceived control when threatened (Greenberg et al., 1992). Kernis and Goldman (2006) found that those with low self-concept are more likely to engage in biased information processing or self-enhancing strategies in order to protect their identity. Along these lines, those with low CSE may be unwilling to view errors as a learning opportunity because they are unwilling to be vulnerable enough to take accountability for their part in the error, or even detect the error to begin with. Applying this logic further, biased information processing and defensiveness would predict a greater likelihood that individuals with low CSE would exhibit more negative error attitudes. Higher CSEs would equip individuals with the agency, emotional stability, confidence, and efficacy to frame errors within a cognitive map that resulted in approach behaviour (Hayes et al., 2001). In sum, the following hypotheses argue for CSE as a mediator between mindfulness and the three facets of individual error orientation.

> *Hypothesis 3a: The positive relationship between mindfulness scores post-training (T8) and learning from error (T8) is partially mediated by core self-evaluation (T8).*

> *Hypothesis 3b: The negative relationship between mindfulness scores post-training (T8) and worrying about error (T8) is partially mediated by core self-evaluation (T8).*

> *Hypothesis 3c: The negative relationship between mindfulness scores post-training (T8) and hiding error (T8) is partially mediated by core self-evaluation (T8).*

2.6.2 Hypothesis 4 | Self-Compassion

Mindfulness training, with its practice on non-judgmental awareness and acceptance of present moment experience, has been associated with increases in self-compassion in both clinical and non-clinical populations (e.g. Shapiro et al., 2005; Birnie, Spectrum & Carlson, 2010; Jazaieri et al., 2012). In one example, Shapiro and colleagues' (2005) study on health care workers found significant differences between an 8-week mindfulness intervention and the control group where self-compassion increased 22% versus 3%. Further, in the mindfulness condition 90% of participants showed increases in self-compassion levels. If mindfulness can increase self-compassion, this may be one

mechanism through which error attitudes are affected. Relational Frame Theory (Hayes, 2004) admits that while reframing is a difficult process as cognition is often well established, the theory finds that reframing become increasingly automatically reinforced when reframing leads to positive outcomes. In this sense, self-compassion leads to positive outcomes because simply put, self-compassion generates a positive experience for the individual that is able to apply it.

Self-compassion replaces self-criticism and judgment with kindness, understanding and acceptance in the face of difficult events (Neff, 2003a). It involves a process of recognizing that one's experience is part of the greater human experience, which in turn resists temptations to over-identify with painful thoughts and feelings (Neff, 2003a). Self-compassion is directly related to feelings of compassion for others and is not to be conflated with being selfish, or prioritizing one's personal needs over those of others (Neff, 2003a). Self-compassion applies metacognition, or awareness of thought, to limit self-absorption (Neff, 2003a) and self-pity (Goldstein & Kornfield, 1987) so that one does not become engrossed with an egoist dramatization of their challenges. Mindfulness practice leads to self-compassion because it applies an open, accepting and non-judgmental stance towards the relationship one has with one's self. It develops the attentional resources to identify self-criticism and then the self-regulatory resources to manage emotions and shift one's cognitive trajectory from self-pity toward acceptance that suffering is part of the human condition (Neff, 2003b).

Since mindfulness leads to lower ego involvement (Heppner & Kernis, 2007) and less judgmental, more compassionate attitudes toward self (Neff, 2003b), it is likely that more mindful individuals may experience lower stress when an error is recognized and further, that they may be more accepting of errors should they occur. Self-compassion then may be another mediator of the relationship between mindfulness and individual error orientation. More specifically, individuals high in self-compassion are expected to worry less about error, be less inclined to hide their errors, and be more likely to exhibit learning behaviours for two main reasons: greater error acceptance and less error aversion. By engaging the metacognitive ability to separate the self from the ego and to appreciate that their experience is shared by many would allow individuals to approach errors in a more accepting manner given errors are ubiquitous and a common, if not inevitable, part of the human experience. This would help to attenuate the effects of ego-identification and defensiveness in the face of negative feedback (Atkins & Parker, 2012). In a less ego-defensive state, individuals are likely to feel less averse to error decreasing the anxiety surrounding error and the anticipation of error. Relatedly, in a less defensive state,

individuals are more likely to be unashamed to report or admit to error and more likely to be comfortable taking a hard look at the error in order to learn more about it. A highly defensive state, in comparison, would lead to more worrying about errors, a proclivity towards hiding errors out of fear or shame, and an unwillingness to face error – let alone learn from it. Finally, since self-compassion and compassion for others is related (Neff, 2003a), hiding errors is likely to run counter to the benefit of the greater good. In sum, self-compassion should mediate the relationship between mindfulness and error orientation.

> *Hypothesis 4a: The positive relationship between mindfulness scores post-training (T8) and learning from error (T8) is partially mediated by self-compassion (T8).*

> *Hypothesis 4b: The negative relationship between mindfulness scores post-training (T8) and worrying about error (T8) is partially mediated by self-compassion (T8).*

> *Hypothesis 4c: The negative relationship between mindfulness scores post-training (T8) and hiding error (T8) is partially mediated by self-compassion (T8).*

2.6.3   Hypothesis 5 | Authentic Functioning

Authentic functioning is defined as "the unobstructed operation of one's true, or core, self in one's daily enterprise" (Kernis, 2003, p. 13). Construed another way, "authentic functioning describes an open and non-defensive way of interacting with oneself and others" (Leroy et al., 2013, p. 239). Brown and Ryan (2003) maintain that mindfulness practices increase receptivity and control of one's internal thoughts, emotions, and behaviours to enhance self-regulated behaviour as a whole. This internal awareness helps individuals to act in accordance with one's "true" self, or put differently, to behave in a more authentic and self-determined manner (Leroy et al., 2013). As self-awareness and self-acceptance increase, individuals are more inclined to act in alignment with their personal values (Shapiro et al., 2006) and manage their behaviour in a way that resonates with their authentic self (Illies, Morgeson & Nahrgang, 2005). Indeed, research has established relationships between mindfulness and authentic functioning. In one case, authentic functioning mediated the relationship between mindfulness and work engagement (Leroy et al., 2013). This study examined the initial relationship between trait mindfulness scores and authentic functioning ($b = .48, p < .05$), and the rate of increase between the two constructs throughout a mindfulness intervention. Importantly, as mindfulness practices increased, so too did authentic functioning ($b = .51, p < .05$).

The third mediating mechanism proposed here is authentic functioning. Individuals with high authentic functioning should be less likely to hide their errors, and less likely to worry about errors because they exhibit less defensiveness and greater commitment to be who they really are. Indeed, authentic individuals may enjoy the benefit of relational cognitive networks, or cognitive relationships formed within the context of their environment (Hayes, 2004), that support positive error orientations because authentic individuals are both accepting of themselves and comfortable showing their "true" self to others resulting in less need to respond defensively to errors. Experiential acceptance of error is likely to hold because authentic individuals would value being their "true" self, even if that person may err from time to time. Authentic individuals are also less likely to engage in ego-defensive behaviours like hiding their mistakes (Leroy et al., 2013) because intentionally denying their true self runs counter to notion of self-acceptance and relational transparency that highly authentic people exhibit (Lakey, Kernis, Heppner, & Lance, 2008). Finally, the lack of defensiveness that authentic individuals show in the face of error creates space for individuals to learn from negative feedback, like errors. Supporting such an argument is subsequent research that has established links between stable high self-esteem, authenticity, and mindfulness to lower levels of defensiveness (Kernis, Cornell, Sun, Berry, & Harlow, 1993; Lakey, Kernis, Heppner, & Lance, 2008). The following hypotheses state that authentic functioning will mediate the relationship between mindfulness and learning from error, worrying about error, and hiding error.

> *Hypothesis 5a: The positive relationship between mindfulness scores post-training (T8) and learning from error (T8) is partially mediated by authentic functioning (T8).*

> *Hypothesis 5b: The negative relationship between mindfulness scores post-training (T8) and worrying about error (T8) is partially mediated by authentic functioning (T8).*

> *Hypothesis 5c: The negative relationship between mindfulness scores post-training (T8) and hiding error (T8) is partially mediated by authentic functioning (T8).*

This section presented past findings showing that mindfulness training cultivates metacognition and emotion regulation through a combination of awareness and a non-judgmental, accepting attitude that leads to higher self-concepts, self-compassion, and authentic functioning. Based on these established relationships, it was theorized that more mindful individuals could be expected to avoid the ego-activating, highly defensive, and error averse attitudes that lead to negative error orientation and unproductive responses to

error. Mindful individuals would be more accepting of their mistakes because their self-esteem and emotional stability could withstand the threat of error. They would also be kinder to themselves when errors occurred, and they would feel comfortable being who they really were, even if that person had made a mistake. Such cognitive and affective responses to error were proposed to generate an error mastery mindset, or productive responses to error, where errors could be viewed as learning opportunities, and worrying about and hiding errors were less likely to occur. The next section describes how these hypotheses were tested.

Figure 2-1: Research Model
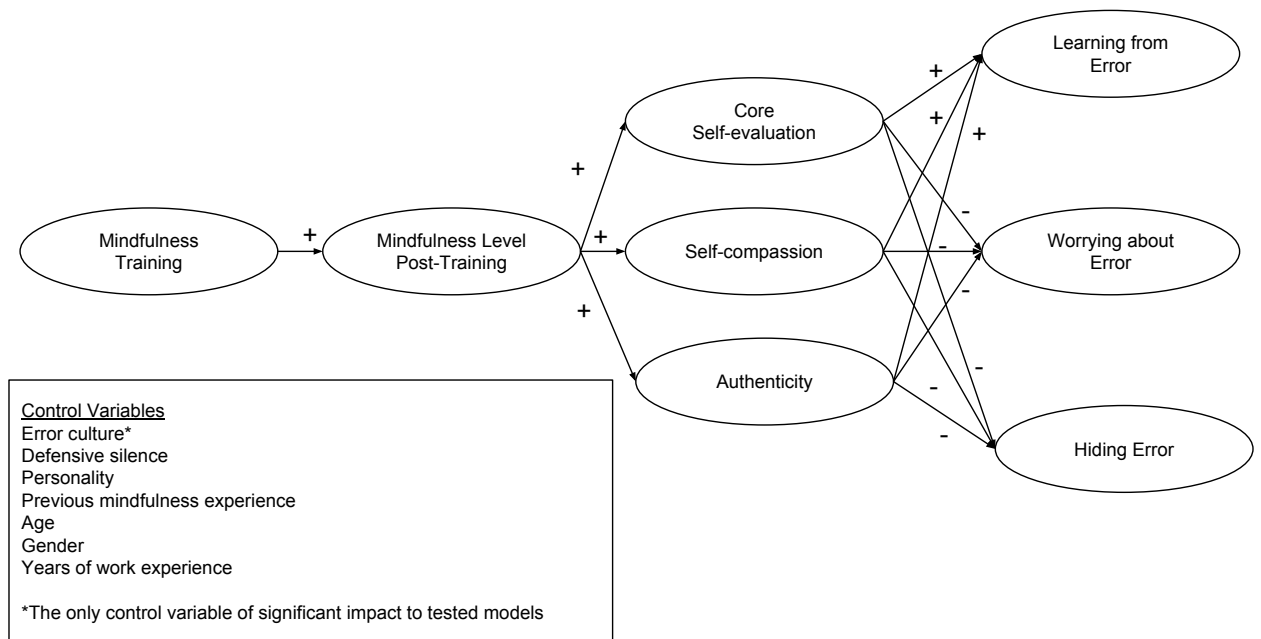
Chapter 3

3 Methodology

The purpose of this study was to see whether a workplace mindfulness training intervention might enhance how mindful an individual was, and further, what the nature of the relationship would be between mindfulness and error orientation. Specifically, it sought to understand if mindfulness was related to three particular facets of error orientation (learning from error, worrying about error, and hiding error) and if core self-evaluation, self-compassion, and authentic functioning would mediate these relationships. In a practical sense, this study empirically investigated the efficacy of wellness initiatives, such as mindfulness training, to impact employees at work and the relationship of mindfulness to work-relevant attitudes and behaviours.

3.1 Study Design & Procedure

An experimental study (randomized control trial) was conducted in a field setting recruiting participants from four hospital sites in downtown Toronto, ON. Participants were randomly assigned to an 8-week mindfulness training group, an 8-week Pilates group, or a no-treatment control group. Between September 2015 and October 2016, there were six sessions of 8-week trainings held at two of the hospital sites. Surveys and interviews were conducted only in the first five sessions resulting in five waves of data collection. For each wave of data collection, participants were asked to complete 9 surveys: one for each week of training (T1 to T8), and one four-weeks after training had been completed (T9) for a total study period of 12-weeks (T1 to T9). The sixth session involved no data collection as it was intended for the sole purpose of providing mindfulness or Pilates training to those that had been assigned to the no-treatment control condition in any of the first five sessions. A detailed schedule of the training sessions and data collection can be seen in below in Table 3-1.

Table 3-1: Timeline of Training Sessions and Data Collected

Time	Data Wave	Session	Mindfulness Data	Pilates Data	Control Data
Sept. 2015 – Dec. 2015	1	1. 8-week Training	Surveys T1 to T9 Interviews between T3 and T9	Surveys T1 to T9 Interviews between T3 and T9	Surveys T1, T8, T9
Sept. 2015 – Dec. 2015	2	2. 8-Week Training	Surveys T1 to T9 Interviews between	Surveys T1 to T9 Interviews between	Surveys T1, T8, T9

			T3 and T9	T3 and T9	
Jan. 2016 – Apr. 2016	3	3. 8-Week Training	Surveys T1 to T9 Interviews between T3 and T9	Surveys T1 to T9 Interviews between T3 and T9	Surveys T1, T8, T9
Feb. 2016 – May. 2016	4	4. 8-Week Training	Surveys T1 to T9 Interviews between T3 and T9	Surveys T1 to T9 Interviews between T3 and T9	Surveys T1, T8, T9
May 2016 – Sept. 2016	5	5. 8-Week Training	Surveys T1 to T9 Interviews between T3 and T9	Surveys T1 to T9 Interviews between T3 and T9	Surveys T1, T8, T9
Sept. 2016 – Oct. 2016	NA	6. 8-Week Training	No data collection	No data collection	No data collection
Oct. 2016 – Nov. 2016	NA	Follow-up attendance survey	Email requesting participants to report how many of the 8 classes they were able to attend	Email requesting participants to report how many of the 8 classes they were able to attend	No data collection

3.1.1   Condition Descriptions

3.1.1.1   Mindfulness Condition

Those in the mindfulness group ($N = 94$) received an 8-week mindfulness training program based on Kabat-Zinn's (1982) MBSR program. Participants received weekly 1-hour classes led by an on-site facilitator trained in MBSR, MBCT (Segal & Teasdale, 2002), and who had been teaching this particular program at the hospital for several years prior to the study. Participants were asked to commit to 6-days of self-practice for approximately 10-minutes per day. Each 1-hour class had a theme reviewing a mindfulness concept that was further explored with the group. Like MBSR, each session integrated at least one guided meditation, followed by a question and answer period led by the facilitator. Guided meditations were aligned with both MBSR and MBCTs three foundational mindfulness practices (body scanning, sitting meditation, and yoga). Specifically, this program included the following mindfulness practices: 1) body scan, shifting attention throughout different parts of the body; 2) breath awareness, sitting and observing the breath; 3) mindful drop-in, a brief 3-minute check-in on one's present moment state; 4) mindful eating, bringing attention to the senses of touch, sound, smell, sight and taste with a food object; 5) mindful movement/yoga, consciously moving the body and bringing attention to subtle sensations in the body; 6) body and breath awareness, shifting attention to different parts of the body and sensations of breath in those areas; 7) mindful listening, an exercise conducted in pairs

where participants converse while being aware of when and what their mind wanders to while listening; 8) mindfulness of breath + body + sound + thought, a practice that shifts attention through different sensory fields; and 9) loving kindness meditation, a practice that sends wishes of happiness and well-being to oneself and others. A summary of the themes and practices are shown below in Table 3-2.

Table 3-2: Mindfulness Protocol Summary

Session	Theme	Mindfulness Practice
1	Introduction to Mindfulness	Body Scan
2	Non-judging	Body Scan, Breath Awareness
3	Patience & "Beginner's Mind"	Body Scan, Mindful Drop-in, Mindful Eating
4	Unpleasant Events & Mindfulness Attitudes	Body Scan, Breath Awareness, Mindful Movement
5	The Anatomy of Stress & Mindful Listening	Body Scan, Body and Breath Awareness, Mindful Listening in pairs
6	Cognitive Distortions, Letting Go & Mindful Responding	Body Scan, Mindfulness of Breath + Body + Sound + Thought
7	Wisdom & Loving Kindness	Loving Kindness Meditation
8	Mindful Future	Review of practices

The total time commitment for the mindfulness condition was approximately 16.5 hours total (8 in-class hours; 30 minutes post-training survey time; 8 hours of self-practice). Although the mindfulness intervention protocol used in this study had shorter class times than the validated MBSR protocol and no full-day session, past research has found significant beneficial effects of truncated MBSR-based training programs conducted in work settings (see Allen et al., 2015 for a review). One meta-analysis of mindfulness-based interventions reducing psychological distress in working adults found evidence to support that brief versions of MBSR developed for organizational contexts were just as effective as original MBSR versions developed for clinical settings (Virgili, 2013). Indeed, even brief online trainings with no live facilitator have been found effective. Cavanagh and colleagues (2013) conducted a 14-day self-guided online mindfulness intervention study where participants were provided with reading content, videos, and guided meditations. The mindfulness training had multiple sections that participants could navigate to once they logged into the website. These sections provided background on the history and benefits of mindfulness, daily guided mindfulness practices, answers to frequently asked questions about practice, and daily journaling prompts that asked participants to reflect on their mindfulness experiences. Compared to the waitlist control group, those in the mindfulness condition increased their perception of how mindful they were as demonstrated by a

significant increase in mindfulness scores (t (53) = 3.56, p = .001, d = .27, 95% CI for d = (.11, .42)). The mindfulness condition had a significant decrease in perceived stress scores over time (t(53) = 3.73, $p < 0.001$, d = 0.37, 95% CI for d = (0.16, 0.57)) compared to the waitlist control group.

3.1.1.2   Pilates Condition

Those in the Pilates group (N = 76) participated in an 8-week Pilates training program that involved 1-hour classes of core strengthening exercises and gentle stretching. Participants were also provided with 10-minute's worth of core strengthening or stretching exercises to practice in their own time for 6 days a week. The Pilates group served as an active control group for mindfulness such that any effects of the mindfulness training could be compared to more than a no-treatment control group. In this way, effects of mindfulness could be attributed to factors over and above taking an hour break from work, meeting in a group setting, lying down on a mat, or relaxing physical movement. The total time commitment for the Pilates condition was approximately 16.5-hours total (8 in-class hours; 30-minutes post-training survey time; 8-hours of self-practice).

3.1.1.3   Control Condition

Participants in the control group (N = 61) completed the surveys but received no training of any kind. The use of a no-treatment control group was necessary to compare the effects of training (mindfulness or Pilates) against a group that undergoes no training. In this way any change could be attributed to the mindfulness or Pilates training and its mechanisms. All participants in the no-treatment control group were able to take the 8-week training (mindfulness or Pilates) at a later date. The total time commitment for the control group was approximately 1.5 hours (30 minutes of survey time x 3 surveys).

3.1.2   Recruitment Process

Employees and volunteers from the hospital were invited to join a study on "Building Resilience in Work and Life" and had to be willing to commit to an 8-week training program over a 12-week period. The hospital's wellness centre promoted the study on their internal website as well as sending out mass emails to their subscription list in an effort to advise employees of the study. Posters were put up in approved zones at the hospital sites, for example, in staff lounges and the hospital's Wellness Centre. Information sessions were held approximately one month prior to the start of the first class for each of the

sessions. Finally, a website for the study was created and hosted on the hospital's server. There was no participant compensation; however, participants did not have to pay to receive the training. Participants were informed that they could withdraw at any time by informing any member of the research team and further, if requested, any data collected related to them could be removed from the dataset.

3.1.3 Inclusion Criteria

Inclusion criteria required participants to be healthy individuals that were employed or volunteered at the hospital, and over the age of 18. Full-time and part-time employees and volunteers in all divisions of the hospital were eligible to participate. Any potential participants that were being treated for a psychological condition (e.g. depression, eating disorders, drug/alcohol addiction, anxiety disorder, psychosis, schizophrenia) were responsible for consulting their healthcare provider(s) and obtaining their approval before signing up for the study. Participants were required to be at least 18-years old so that they could provide their own consent to participate. There was no specific exclusion criteria.

3.1.4 Consent Process

A copy of the Letter of Information and Consent was posted on the study's website so that potential participants had sufficient time to read and review the letter. Prior to the start of the first in-class training session, participants were given an opportunity to ask questions, verbally confirmed that they met the eligibility criteria with the researcher either in-person or on the phone, and submitted the signed Letter of Information and Consent either via email or by handing them in at the hospital's wellness centre. The Letter of Information and Consent can be found in the Appendices (Appendix P).

3.1.5 Randomization Process

As participants signed up for the study, they were able to select which session date they wanted to participate in. This was intended to maximize attendance and convenience for the participants. Prior to the start of a session, all participant names allocated to that session were randomly assigned to the mindfulness, Pilates, or no-treatment control condition by drawing names out of a hat. Participants were informed of which condition they had been assigned to just prior to the start of their session via email.

3.1.6 Survey (Quantitative) Data Collection Process

For each of the five waves of data collection, participants in the mindfulness and Pilates conditions completed 9 surveys in total: a pre-training survey (T1), weekly surveys conducted throughout the training (T2-T7), a post-training survey (T8), and a final follow-up survey held 4-weeks after training completion (T9). Surveys were completed in-class via pen/paper, or through an online survey. For the control group, three surveys were completed in T1 and T8 and T9. Refer back to Table 3-1 for a depiction of survey data collection by condition.

3.1.7 Interview (Qualitative) Data Collection Process

Additionally, but of no obligation, participants in the mindfulness or Pilates conditions were invited to participate in a brief interview with the researcher. With the participants' consent, interviews were audio recorded, and/or note recorded by hand, and transcribed. A total of 88 interviews were conducted in-person at the hospital, or by phone at the participant's discretion. 11 of these interviews did not result in transcriptions due to technical failures. 77 interviews were transcribed and coded. 45 of these interviews were with mindfulness participants and 32 with Pilates participants. Interviews were typically scheduled between week 3 and week 12 of the participant's session and lasted approximately 20 minutes.

3.1.8 Debriefing Process

Upon completion of the study, participants were provided with a debriefing letter (Appendix Q) that summarized the general overview of the research and directed participants to additional resources if needed or of interest.

3.1.9 Participant Sample

Following recommendations by Kirby, Gebski and Keech (2002), at least 30 participants per cell ($N = 90$) were required for adequate statistical power, with an ideal number of 50 per cell ($N = 150$). Previous mindfulness interventions have studied less than 50 participants per condition. For example Williams et al. (2001) conducted an 8-week intervention versus control study on healthy volunteers ($N = 75$) and yielded a significant effect size ($d = 0.67, p < .05$). Another example comes from Shapiro et al., (1998) who conducted an 8-week intervention versus control study on 73 pre-medical and medical students and found a significant effect of $d = 0.50, p < .02$. Baer (2003) also conducted a

meta-analyses of mindfulness interventions where studies with control groups smaller than 50 participants per condition found significant effect sizes at follow-up (typically one-month after course completion) ranging from $d = 0.08$ to $1.35, p < .05$. Based on these past studies, it was expected that this sample size would be a reasonable estimate from which to find a significant effect. Due to an anticipated 50% attrition rate based on practical advice obtained from mindfulness facilitators in the field, target recruiting numbers were doubled ($N = 300$).

3.1.9.1   Measures

This section presents the measures used to represent the constructs of this study and relatedly, the results of the confirmatory factor analyses. When reporting model fit indices for confirmatory factor analysis, Jaccard and Wan (1996) recommend using multiple indices to avoid the limitations inherent in each. This study follows the recommendations of Byrne (1994) and reports the following indices: the root mean residual (RMR), where less than .03 represents a good fit and greater than .07 moves toward a poor fit; the goodness of fit measure (GFI), which should exceed .90; and the root mean square error of approximation (RMSEA), which should be .08 or below to be acceptable (MacCallum et al, 1996). Items, factor loadings, correlations of error terms, and factor structures are presented in the Appendices.

3.1.9.1.1 Mindfulness

Trait mindfulness was assessed with the Mindful Attention and Awareness Scale (MAAS: Brown & Ryan, 2003) at T1, T8 and T9. The MAAS (Brown & Ryan, 2003), a commonly used uni-dimensional measure of mindfulness for general populations (e.g. Hülsheger, Alberts, Feinholdts & Lang, 2013), has been previously validated (e.g. Brown & Ryan, 2003; MacKillop & Anderson, 2007) and has demonstrated good reliability with an alpha coefficient of .86 (Brown & Ryan, 2003). A one-factor structure of the MAAS has also been confirmed in the past (MacKillop & Anderson, 2007). Items include: "I was doing something automatically, without being aware of what I was doing" and "I find it difficult to stay focused on what's happening in the present". Important to note is that a lower mindfulness score depicts a more mindful person.

Confirmatory factor analysis revealed that the single factor structure provided a good to adequate fit to the data after modifications correlating several of the error terms together (E1 to E12, E6 to E9, E6 to E11, E6 to E14, E7 to E8, E9 to E10, E11 to E13, E12 to E5,

E12 to E15): RMR = 0.051; GFI = 0.918; RMSEA = 0.063. All items exhibited significant factor loadings (.252 to .819, $p < .05$) and an alpha coefficient of .87.

3.1.9.1.2 Mindfulness Training

Each week participants were asked to describe how often they engaged in formal practice on their own (1 = Never to 5 = Daily) and how often they were able to informally apply the concepts/techniques learned in class (1 = Never to 5 = Daily). Mindfulness training was calculated by compiling and averaging the participant's weekly self-rated scores of formal home practice and informal application.

3.1.9.1.3 Error Orientation

Schell's (2012) Error Orientation and Motivation Scale (EOMS), a reliable and valid measure (Cikrikci et al., 2014), was used to assess individual error orientation. 9-items were measured including: "When I make an error, I make it my goal to understand completely why it happened" (learning from error); "I often worry about making mistakes when I am engaged in some task" (worrying about error); and "When I make an error, I find ways to hide it so I don't suffer any consequences" (hiding error). In a previous examination of the scale's validity, Schell (2012) found alpha coefficients for each of the three factors ranged from 0.82 to 0.93.

Confirmatory factor analysis confirmed a three factor structure provided a good fit to the data and no modifications were made to the model: RMR = .026; GFI = .967; RMSEA = .046. All items loadings were significant and ranged from .595 to .927, $p < .001$. The alpha coefficient was .89 for learning from error, .70 for worrying about error, and .82 for hiding error.

3.1.9.1.4 Self-Compassion

Self-compassion was measured using 12-items from Neff's (2003a) Self-Compassion Scale. The scale measures the three components of self-compassion (kindness, common humanity, and mindfulness) with six sub-components : self-kindness vs. self-judgment, common humanity vs. isolation, and mindfulness vs. over identification with ego. To avoid any conflation with the Mindful Attention and Awareness Scale, items were selected solely from self-kindness, self-judgment, common humanity, and isolation. Items include: "When I'm going through a very hard time, I give myself the caring and tenderness I need" (self-

kindness); "When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people" (common humanity); "When I see aspects of myself that I don't like, I get down on myself" (self-judgment); and "When I fail at something that's important to me I tend to feel alone in my failure" (isolation)". This measure has been used widely in the past (e.g. Shapiro et al., 2005; Birnie, Spectrum & Carlson, 2010; Jazaieri et al., 2012) and has demonstrated good internal consistency in its different factors with alphas ranging from .85 to .93 (Neff, 2003a; Raes et al., 2011).

The confirmatory factor analysis showed that a four factor structure provided an adequate fit to the data after implementing changes based on the modification indices (correlating error terms E1 to E4, E2 to E4, E2 to E5, E2 to E5 to E8, E7 to E10, E7 to E11, E7 to E12; E8 to E12, E9 to E11, E9 to E12): RMR = 0.069; GFI = 0.957; RMSEA = 0.059. Factor loadings ranged from .393 to 1.02 and all loadings were significant. Alpha coefficients were lower than what past studies found but still adequate ranging across .71 for self-kindness, .72 for common humanity, .64 for self-judgment, and .85 for isolation.

3.1.9.1.5 Core Self-Evaluation

Judge, Locke, and Durham (1997)'s core self-evaluations scale measures how worthy, competent, and capable an individual considers themselves. This 12-item scale integrates four widely used psychological facets into one construct that has been previously validated (e.g. Judge, Erez, Bono & Theoesen, 2003; Judge, Van Vianen, & De Pater, 2004). The four facets are self-esteem, or how individuals value themselves; self-efficacy, the degree to which individuals believe they are capable across a variety of scenarios; emotional stability or neuroticism, the tendency to focus on negative aspects; and locus of control, the extent to which one believes outcomes are contingent on one's own behaviour. Items include "Overall I am satisfied with myself" (self-esteem); "Sometimes when I fail, I feel worthless" (emotional stability); "I determine what will happen in my life" (locus of control); and "When I try, I generally succeed". Reliability estimates have shown alphas of .84 in the past (Judge & Hurst, 2007).

Applying confirmatory factor analyses, the single factor structure revealed an adequate fit to the data after six modifications (correlating error terms E1 to E6, E2 to E3, E2 to E4, E2 to E12, E3 to E4, E3 to E4): RMR = 0.047; GFI = 0.925; RMSEA = 0.078. All factor loadings were significant (.274 to .769, $p < .05)$ with an alpha coefficient of .80.

3.1.9.1.6 Authenticity

Authentic functioning was measured using 12-items from the previously validated (Lakey et al., 2008) four-factor Authenticity Inventory (Kernis & Goldman, 2006). This scale captures four facets of authenticity: awareness, unbiased processing, behaviour, and relational orientation. Awareness refers to self-awareness of intentions, feelings, and their role in one's own behaviour. Unbiased processing represents a willingness to be objective as information is processed. Behaviour refers to acting authentically, or in accordance with one's values. Relational orientation refers to a desire to be genuine in one's relationships. Items include: "I am aware when I'm not being my true self" (awareness); "I try to block out any unpleasant feelings I might have about myself" (unbiased processing); "I frequently pretend to enjoy something when in actuality I really don't" (behaviour); and "My openness and honesty in close relationships are extremely important to me" (relational orientation). In past studies, these four subscales resulted in alpha coefficients of .79 for awareness, .64 for unbiased processing, .80 for behaviour, and .78 for relational orientation (Kernis & Goldman, 2006).

Confirmatory factor analysis found the four factor structure provided an adequate fit to the data with five modifications (correlating E1 to E5, E2 to E8, E3 to E9, E6 to E11 and E11 to E10): RMR = 0.069; GFI = 0.933; RMSEA = 0.080. Factor loadings ranged from .100 to .925, and all loadings were significant ($p < .05$) except for the factor loading for Item 9 ("I try to block out any unpleasant feelings I might have about myself"). In this study, alpha coefficients were lower than what Kernis & Goldman (2006) found in the past: .68 for awareness, .66 for unbiased processing, .48 for behaviour, and .62 for relational orientation.

3.1.9.1.7 Control Variables

Error Culture: Taking into consideration past research that has established that the environment in which errors are conducted can affect how errors are perceived at the individual level (e.g. Edmondson, 1996, 2003), perceptions of the work culture were measured with Van Dyck, Frese, Baer & Sonnentag's (2005) error management culture scale. This scale has two dimensions, error management culture and error aversion culture. Items include "When people are unable to correct an error by themselves, they turn to their colleagues" for error management culture and "Employees who admit their errors are asking for trouble" for error aversion culture. Reliability for the Error Management Scale

has shown alphas of .92 and .88 for the Error Aversion Scale in the past (Van Dyck et al., 2005).

Confirmatory factor analysis revealed that the two factor structure provided a good fit to the data with two modifications (correlating E1 to E2, and E8 to E10): RMR = 0.037; GFI = 0.941; RMSEA = 0.087. All item loadings exhibited significant factor loadings (.29 to .96, $p = .001$). Alphas for each factor were .73 for error management culture and .89 for error aversion culture. For the purposes of analysis, error aversion culture was reverse scored such a higher error culture score reflected a culture that was more positive and receptive to errors overall. The alpha coefficient for error culture scored in this way was .84.

Personality: Since error orientation may be a function of one's underlying personality traits, personality was controlled for (but did not show any significant relationships with the model variables). The Mini-IPIP (Donnellan, Oswald, Baird, & Lucas, 2006) was used as a brief measure of personality. The Mini-IPIP is a 20-item measure of the Big Five personality traits encompassing extraversion, conscientiousness, neuroticism, agreeableness, and openness. The authors have validated the scale as a psychometrically sound measure in five studies with alphas at or above .60 (Donnellan et al., 2006). In this study, the alpha coefficient was .93 for extraversion, .57 for conscientiousness, .66 for neuroticism, .54 for agreeableness, and .81 for openness.

Defensive Silence: Defensive silence is described as silence motivated by self-protection (Van Dyne, Ang & Botero, 2003) and is distinct from acquiescent silence, which is driven by resignation or disengagement, and pro-active silence, which refers to silence due to a desire to protect the interests of others. To address the fact that defensive silence may interact with how likely an individual is to report or cover up error, defensive silence was controlled for using five items put forth by Van Dyne, Ang and Botero (2003). Defensive silence is assessed by items such as "When I realize I have made a mistake at work, I do not speak up and suggest ideas for change, based on fear", and "I omit pertinent facts in order to protect myself." Past studies have found an alpha coefficient of .86 (Zehir & Erdogan, 2011).

A one-factor model in confirmatory factor analysis provided a good fit to the data with two modifications (correlating E2 to E3, and E4 to E5) resulting in RMR = 0.029 and GFI = 0.964; however, the RMSEA = 0.167 indicated a poor fit. All items loaded

significantly and exhibited rather high factor loadings (.622 to .924, p = .001) with an alpha coefficient of .89.

Previous Experience: Participants were asked what past experience they had with mindfulness or Pilates respectively (0 = no experience; 1 = some experience).

Demographic Variables: Data on age (1 = under 25; 2 = 26-34; 3 = 35-44; 4 = 45 -54; 5 = over 55), ethnicity (1 = Caucasian; 2 = East Asian; 3 = South Asian; 4 = Hispanic; 5 = Middle Eastern; 6 = First Nations; 7 = Other), gender (1 = male; 2 = female), and occupational tenure (1 = under one year; 2 = 1 to 5 years; 3 = 6 to 10 years; 4 = 11 to 15 years; 5 = 16 to 20 years; and 6 = over 20 years) was also collected for analysis.

3.2   Risks and Benefits

There were no imminent risks to participation other than the extensive time commitment, which was quite significant for the experimental and alternative treatment conditions. It was, however, possible participants might experience adverse effects if they had any physical or psychological conditions that might induce stress during meditation or exercise. To address this concern, the Letter of Information and Consent that participants completed required that the participant obtain the appropriate approvals from their physician prior to signing up for the study if they were at risk of any physical or psychological conditions that might induce stress.

With respect to benefits, participants stood to benefit from the mindfulness training in myriad of ways. Benefits of mindfulness programs have been conceptualized along four categories: physical wellbeing, mental wellbeing, behavioral self-regulation; and interpersonal relations (for a more comprehensive overview see Brown & Ryan, 2003, and Brown et al., 2007). The application of such categories of benefits has positive implications for individuals, their colleagues and families, and their organizations. Overall, the greater societal benefit lies in the generation of techniques that allowed individuals to develop, maintain and improve their overall wellbeing. Pilates participants were subject to the benefits of the Pilates exercises, for example strengthened core muscles.

Chapter 4

4 Results

This section includes a description of the participant characteristics and conditions, sample group differences, preliminary analyses, and the results of the hypotheses-testing analyses.

4.1 Demographic Characteristics of Participants

Overall there were 231 participants (93.5% women) that completed surveys at T1, T8, and T9 (note: while surveys were completed, not all participants filled out every item as was their prerogative). There were 94 people were assigned to the mindfulness condition, 76 to the Pilates condition, and 61 to the no-treatment control condition. A summary of the participant enrolment through the study is presented in Figure 4-1. 90% of participants were between the ages of 25 and 54 (40% between the ages of 35 and 44, 30% were between 25 and 34, and 20% were between 45 and 54). Most participants were Caucasian (51%), followed by East Asian (27%), South Asian (10%), and other (12%). In terms of occupational tenure, 10% of participants had held their role for under one year, 30% for 1 to 5 years, 14% for 6 to10 years, 13% for 11 to 15 years, 8% for 16 to 20 years, and 11% for over 20 years. 30% of participants held clinical positions interacting with patients (e.g. nurse, physician, social worker, physiotherapist), 53% held administrative positions (e.g. management, project management, human resources, accounting), and 17% elected not to report their professional role. Slightly over half of participants (64%) had had some experience with mindfulness or Pilates prior to the study.

Figure 4-1: Participant Flow Chart
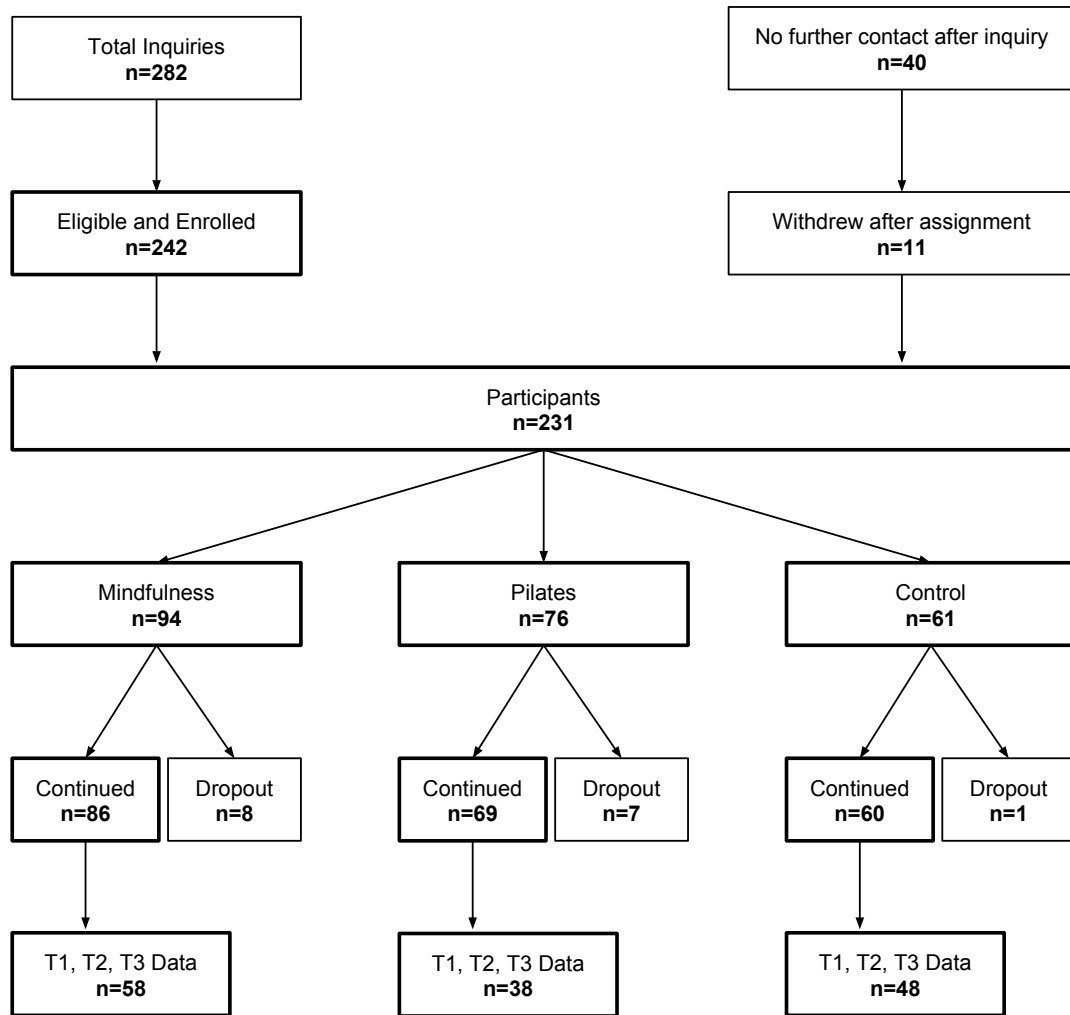
Note: Dropout refers to participants who withdrew from the study and data was removed; Continued refers to participants who attended any number of the 8 training sessions.

4.1.1 Sample Group Differences

Significant differences were tested for between the participants' ethnicity, gender, age, years of experience in occupation, previous mindfulness or Pilates experience, and personality. There were no significant differences at baseline between groups except for past experience with mindfulness or Pilates. Here, the control group had slightly more experience with either mindfulness or Pilates than the mindfulness condition (M = .43, SE = .12, $p < .001$) and the Pilates condition (M = .40, SE = .12, $p = .001$). This reveals that any changes in outcomes may be interpreted as a conservative test given the control

condition, more than the mindfulness condition, had the advantage of past experience. Past experience potentially reduces the difference in mindfulness training dosage between the control condition and the mindfulness condition.

In addition to assessing demographic variables, group equivalence was assessed after randomization on all other model variables (mediators, covariates, and outcomes) and no significant differences were found between groups after conducting a one-way test of ANOVA (See Table 4-1). Self-compassion scores between groups were close to being significantly different ($p = .058$). Here the control group (M = 2.88, SE = .51, $p < .001$) was slightly lower than the mindfulness group ((M = 2.91, SE = .54, $p < .001$) and the Pilates group (M = 2.92, SE = .52, $p < .001$). Overall, analyses of group differences following randomization suggest very few differences.

Table 4-1. Sample Group Differences (ANOVA)

		Sum of Squares	df	Mean Square	F	Sig.
Ethnicity	Between Groups	4.292	2	2.146	.785	.457
	Within Groups	620.595	227	2.734		
	Total	624.887	229			
Gender	Between Groups	.069	2	.035	.601	.549
	Within Groups	13.079	227	.058		
	Total	13.148	229			
Age	Between Groups	.631	2	.316	.336	.715
	Within Groups	213.369	227	.940		
	Total	214.000	229			
Years of experience in occupation	Between Groups	.876	2	.438	.173	.841
	Within Groups	495.295	196	2.527		
	Total	496.171	198			
Past experience with mindfulness or Pilates	Between Groups	6.453	2	3.227	7.483	.001
	Within Groups	79.776	185	.431		
	Total	86.229	187			
Extraversion	Between Groups	.200	1	.200	3.451	.081
	Within Groups	.984	17	.058		
	Total	1.184	18			
Agreeableness	Between Groups	.033	1	.033	.297	.593
	Within Groups	1.901	17	.112		
	Total	1.934	18			
Conscientiousness	Between Groups	.043	1	.043	.228	.639
	Within Groups	3.194	17	.188		

	Total	3.237	18			
Neuroticism	Between Groups	.099	1	.099	.556	.466
	Within Groups	3.026	17	.178		
	Total	3.125	18			
Openness	Between Groups	.247	1	.247	.849	.370
	Within Groups	4.938	17	.290		
	Total	5.184	18			
Core self-evaluation	Between Groups	.871	2	.435	1.807	.166
	Within Groups	54.950	228	.241		
	Total	55.821	230			
Authenticity	Between Groups	.251	2	.125	.799	.451
	Within Groups	35.803	228	.157		
	Total	36.054	230			
Self-compassion	Between Groups	1.485	2	.743	2.886	.058
	Within Groups	58.671	228	.257		
	Total	60.156	230			
Mindfulness	Between Groups	.058	2	.029	.082	.981
	Within Groups	80.679	228	.354		
	Total	80.737	230			
Defensive Silence	Between Groups	1.092	2	.546	.922	.399
	Within Groups	135.034	228	.592		
	Total	136.126	230			
Error culture	Between Groups	.155	2	.078	.240	.787
	Within Groups	55.801	172	.324		
	Total	55.956	174			
Learning from error	Between Groups	.126	2	.063	.260	.771
	Within Groups	45.470	188	.242		
	Total	45.596	190			
Worrying about error	Between Groups	1.939	2	.970	1.197	.304
	Within Groups	152.272	188	.810		
	Total	154.211	190			
Hiding error	Between Groups	.531	2	.265	.405	.667
	Within Groups	123.089	188	.655		
	Total	123.620	190			

4.2   Preliminary Analyses

4.2.1 Missing Data and Removal of Data

Data from the pen and paper surveys were merged with data from the online surveys for
T1, T8, and T9 using the participant's unique ID number. For HLM analyses conducted in
Hypothesis 1, any participant that did not have a complete data for all three times was
removed. For regressions conducted in SPSS, incomplete data sets were still included.
Otherwise, participant data was removed only if they had withdrawn from the study and
requested removal of their data (*N*=16). There were no significant differences between
retaining and removing data of participants that failed to pass attention checks as such their
data was not removed from the study. In total there were only 9 participants that did not
pass the attention checks.

4.2.2 Descriptive Statistics

SPSS was used to compute descriptive statistics and correlations. The table of means,
correlations, and standard deviations of model variables can be found in Appendix R.

4.2.3   Model Variable Changes Over Time by Condition

In addition to the analyses conducted for the hypotheses, ANOVAs were run on the
mediating variables (core self-evaluation, self-compassion, and authenticity) and the
outcome variables (learning from error, worrying about error and hiding error) to see if
changes occurred over time by condition. It is possible that certain mediating mechanisms
might be activated sooner than others, for example, self-compassion may be developed
sooner because self-compassion involves one's immediate relationship with them self and
thus, it may change more readily than one's overall self-concept or authenticity. There
were, however, no significant within group differences between time and condition for the
mediating variables. Error orientation was also examined to see if there was a direct
relationship between receiving mindfulness training and changes to error orientation but
there were also no significant within group differences between time and condition.
Changes over time by condition are presented below in Table 4-2 for mindfulness and the
mediating variables, and in Table 4-3 for error orientation outcome variables.

Table 4-2. Changes Over Time by Condition for Mindfulness, Core Self-Evaluation, Self-Compassion, and Authenticity (ANOVA)

		Mindfulness			Core Self-Evaluations			Self-Compassion			Authenticity		
	Time	N	M	SD	N	M	SD	N	M	SD	N	M	SD
Mindfulness	Time 1	58	3.30	.59	53	3.89	.45	52	2.91	.54	51	3.55	.43
	Time 2	58	3.45	.57	53	3.62	.52	52	2.60	.45	51	3.67	.40
	Time 3	58	3.52	.59	53	3.68	.54	52	2.70	.58	51	3.71	.51
Pilates	Time 1	38	3.20	.54	35	3.50	.57	34	3.11	.51	34	3.51	.43
	Time 2	38	3.32	.58	35	3.62	.54	34	2.92	.52	34	3.62	.40
	Time 3	38	3.37	.50	35	3.63	.54	34	2.83	.62	34	3.58	.49
Control	Time 1	48	3.40	.67	42	3.49	.58	42	3.05	.51	42	3.64	.39
	Time 2	48	3.41	.58	42	3.40	.70	42	2.88	.56	42	3.52	.39
	Time 3	48	3.43	.60	42	3.60	.51	42	2.94	.58	42	3.63	.41

Table 4-3. Changes Over Time by Condition for Learning From Error, Worrying About Error, and Hiding Error (ANOVA)

			Learning from Error		Worrying about Error		Hiding Error	
Condition	Time	N	M	SD	M	SD	M	SD
Mindfulness	Time 1	59	4.41	.58	3.37	.82	2.31	.79
	Time 2	59	4.31	.53	3.38	.89	2.20	.88
	Time 3	59	4.27	.44	3.29	.85	2. 21	.84
Pilates	Time 1	41	4.28	.60	3.50	.70	2.25	.74
	Time 2	41	4.33	.51	3.38	.90	2.22	.70
	Time 3	41	4.25	.47	3.43	.81	2.46	.84
Control	Time 1	43	4.40	.47	3.48	.78	2.34	.70
	Time 2	43	4.33	.43	3.10	.77	2.26	.83
	Time 3	43	4.22	.44	3.25	.83	2.42	.77

4.3 Results of Hypothesis-Testing Analyses

The experimental design allowed this research to address a set of questions specific to the efficacy of the training; as such the first hypothesis evaluates the relationship between mindfulness training and mindfulness levels over time. Despite the experimental design of this research, the remaining analyses were not run by condition. This decision was motivated by a desire to focus on the theoretical relationships between variables.

4.3.1 Data Analyses

Dependent Variable: Hierarchical Linear Modeling was used to examine the relationship between mindfulness training and mindfulness scores over time (H1). Linear regressions were conducted in SPSS to analyze hypothesized relationships in H2, H3, H4 and H5.

Mediating Variables: The PROCESS Macro in SPSS was used to test the indirect effects proposed in H2, H3, H4, and H5.

4.3.2 Hypothesis 1 Results

For H1, a two-level Hierarchical Linear Modeling (HLM2) was used to examine the growth curve of mindfulness scores pre-training measured in the first class of week 1 of training (T1), post-training measured at the end of the class in week 8 of training (T8), and a follow-up post-training measurement taken four-weeks after the completion of the 8-week training (T9). Because measures were obtained at multiple time points for participants, it is possible that within-person residuals might be highly correlated compared to between-person residuals. Correlated errors reduce the standard error and increase the likelihood of a Type I error, or in this case, finding a significant effect of mindfulness training when one does not exist. HLM, however, is a powerful method for analyzing correlated data (Ferron et al., 2006) because it separates the regression analysis into two levels (time and individual differences) and thereby avoids violating the assumption of independence (May et al., 2014).

A further benefit that analysis with HLM afforded was the ability to consider whether mindfulness scores over time would show a linear or curvilinear trend. Since mindfulness training and practice commitment took place only during the 8-week training (between T1 and T8), it is possible that participants became more mindful only during the 8-week training (between T1 and T8), before becoming less mindful once the course ended (between T8 and T9). As such, both a linear and curvilinear model was fit to the data to see which growth curve would be more appropriate (see Table 4-5 for summary of models). The *TIME_SQ* variable was not statistically significant ($\beta_{20} = 0.03$, SE= 0.04, $p = 0.52$) in the curvilinear model, and as such, the linear curve was a better fit and these results are reported herein.

Table 4-4. Summary of Models Specified

Curvilinear Model	Linear Model
Level-1 Model $MFN_{ti} = \pi_{0i} + \pi_{1i}*(TIME_{ti}) + \pi_{2i}*(TIME\_SQ_{ti}) + e_{ti}$	Level-1 Model $MFN_{ti} = \pi_{0i} + \pi_{1i}*(TIME_{ti}) + e_{ti}$
Level-2 Model $\pi_{0i} = \beta_{00} + r_{0i}$ $\pi_{1i} = \beta_{10} + \beta_{11}*(MFNTRAIN_i)$ $\pi_{2i} = \beta_{20}$	Level-2 Model $\pi_{0i} = \beta_{00} + r_{0i}$ $\pi_{1i} = \beta_{10} + \beta_{11}*(MFNTRAIN_i)$
Mixed Model $MFN_{ti} = \beta_{00}$ $+ \beta_{10}*TIME_{ti} + \beta_{11}*MFNTRAIN_i*TIME_{ti}$	Mixed Model $MFN_{ti} = \beta_{00}$ $+ \beta_{10}*TIME_{ti} + \beta_{11}*MFNTRAIN_i*TIME_{ti}$

$+ \beta_{20} * \textit{TIME\_SQ}_{ti}$ $+ r_{0i} + e_{ti}$

$+ r_{0i} + e_{ti}$

The Level 1 (within-person) independent variable was time and the dependent variable was mindfulness. Each person's regression equation predicting an outcome across time points was summarized using a slope (change in mindfulness over time). To account for differences in mindfulness versus control conditions, the Level 2 (between-person) independent variable was mindfulness training, a score that represented the number of sessions a participant attended plus the amount of formal and informal practice a participant engaged in over the 8-week training period. The Level 2 independent variable was used as a predictor of the Level 1 slope to determine whether mindfulness training scores differed in their rate of change over time. In all analyses, Level 1 slopes were allowed to vary from person to person, as it was reasonable to expect that people might differ in their rate of mindfulness change over time. Grand mean centering was used, which reduces the correlation between the level of mindfulness at time zero and change in mindfulness over time reducing multi-collinearity (Hofmann & Gavin, 1998).

Following Raudenbush and Bryk's (2002) recommendations, all theoretically relevant control variables were included in the model and removed one-by-one according to the highest p-values. In this case, control variables included: age, as lived experience may contribute to wisdom complimentary to mindfulness; previous experience with mindfulness, as prior exposure may influence how mindful an individual is; gender, as there may be differences between genders in openness to mindfulness concepts and emotional exploration given socialization norms (Eagly, 1987); and finally ethnicity, as mindfulness is originally a construct that arose out of Eastern contemplative traditions and some cultural groups may be more or less receptive to mindfulness as a result. None of these variables were significant and were removed from the model in the following order: age, gender, past experience, ethnicity.

Hypothesis 1 argued that mindfulness training, operationalized as the sum of the number of training sessions a participant attended and the amount of time that the participant reported practicing and applying mindfulness, would be positively related to mindfulness scores over time. The average mindfulness score for the group at baseline was $\beta_{00} = 3.34$, SE = .06, $p < .001$, and mindfulness scores increased over time, $\beta_{10} = .12$, SE = .02, p= .01. Analyses showed that mindfulness training had a small but positive effect on mindfulness scores over time, $\beta_{11} = 0.001$, SE = .004, $p < .05$ (Table 4-6). These results confirm the hypothesized

arguments that mindfulness training produces more mindful individuals.

Table 4-5. Estimation of Fixed Effects (change in mindfulness scores over time based on individual differences in amount of mindfulness training)

Fixed Effect	Coefficient	Standard error	t-ratio	Approx. d.f.	p-value
For INTRCPT1, π_0					
INTRCPT2, β_{00}	3.346725	0.057492	58.212	85	<0.001
For TIME slope, π_1					
INTRCPT2, β_{10}	0.119526	0.024481	4.882	164	<0.001
MFNTRAIN, β_{11}	0.0010243	0.004502	2.275	164	0.024

4.3.3 Hypothesis 2 Results

The remaining hypotheses (2 to 5) were analyzed using linear regression in SPSS. Given there were no significant between group differences related to personality, age, gender, ethnicity, and occupational tenure, and because these variables were insignificant to the model tested in H1, these covariates were therefore removed from the model. This decision to apply a "less is more" approach to the remaining hypothesis-testing analyses was further supported by recommendations that overuse of statistical controls can lead to less accurate interpretations of results (Spector & Brannick, 2011). Analyses of all models testing H2, H3, H4 and H5 controlled for two other theoretically relevant covariates (error culture and defensive silence) and insignificant covariates were removed one at a time by the highest p-value (Raudenbush & Bryk, 2002). Error culture was the only covariate significant in some of the models involving worrying about error, hiding error, mindfulness, and mindfulness training; as such, it was included in every model that involved these variables even when it was not significant in the event error culture was acting as a suppressor variable.

4.3.3.1 Hypothesis 2 Results

Hypothesis 2.1 argued that more mindful individuals would be more likely to learn from their errors, and less likely to worry about and hide their errors; thus, mindfulness (T8) would be a) positively related to learning from error (T8), b) negatively related to worrying about error (T8) and c) negatively related to hiding error (T8).

In Hypothesis 2.1a, the results did not confirm the hypothesis. Analysis showed that mindfulness was a non-significant positive predictor of learning from error, $b = .058$, $t(173)$ = -.87, $p = .39$ and moreover, did not explain a significant proportion of variance in learning about error, $R^2 = .005$, $F(2, 171) = .47$, $p = .63$.

For Hypothesis 2.1b, error culture[2] was a significant control variable (b = -.42, t(171) = -3.66, p = .001). Mindfulness was a significant negative predictor of worrying about error when controlling for error culture, b = -.38, $t(171)$ = -3.33, p = .001. Mindfulness also explained a significant proportion of variance in worrying about error, R^2 = .15, $F(2, 171)$ = 15.45, $p < .001$. The negative link between mindfulness and worrying about error thus confirms hypothesis 2.1b.

Hypothesis 2.1c was also confirmed. Error culture was a significant covariate to the model, b = -.53, t(171), $p < .001$. Results found that mindfulness significantly and negatively predicted hiding error, b = -.36, $t(171)$ = -3.81, $p < .001$, and also explained a significant proportion of variance in hiding error, R^2 = .25, $F(2,171)$ = 27.77, $p < .001$.

4.3.3.2 Hypothesis 2.2 Results

Hypothesis 2.2 purported that mindfulness would mediate the a) positive relationship between mindfulness training and learning from error; b) negative relationship between mindfulness training and worrying about error (controlling for error culture); and c) negative relationship between mindfulness training and hiding error (controlling for error culture). A regression analyses was run using the PROCESS macro in SPSS to investigate whether mindfulness mediated the relationships between mindfulness training and a) learning from error; b) worrying about error; and c) hiding error. Results are reported below.

For Hypothesis 2.2a, error culture was an insignificant positive covariate, b = .01, t(170) = .19, p = .85. Mindfulness training was not a significant predictor of mindfulness, b = .005, t(171) = .57, p =.57; F(2,171) = 4.06, R^2=.05, $p < .05$, nor was mindfulness training a significant positive predictor of learning from error, b = .007, t(171) = 1.04, F(171) = .63, R^2=.007, p =.54. Mindfulness did not predict learning from error, b = .06, t(170) = .83 p = .41; F(3,170) = .64, R^2=.01, p = .59, and mindfulness training did not predict learning from errors, b = .007, t(170) = 1.0, p =.32. The Sobel Test (z = .33, p = .74) indicates that the indirect effect through mindfulness does not explain a significant portion of the relationship between mindfulness training and learning from error (e.g. Baron & Kenny, 1986). As such, the mediation hypothesis cannot be confirmed.

In testing Hypothesis 2.2b, when controlling for error culture, b= -.43, t(170)=-3.72, p

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[2] Error Culture was reversed scored such that higher sores reflect a culture that is more positive about and receptive to errors

=.001, mindfulness training was an insignificant positive predictor of mindfulness, $b =$ .005, t(171) = -.57, p = .57; F(2,171) = 4.06, R^2 =.05, p < .05, and an insignificant positive predictor of worrying about error, b = .014, t(171) = 1.12, p = .27; F(2,171) = 9.99, R^2 =.10, p =.001. Mindfulness significantly and negatively predicted worrying about error, b = -.38, t(170) = -3.39 p = .001; F(3,170) = 10.90, R^2 =.16, p < .001; but the direct path from mindfulness training to worrying about errors was neither negative nor significant, b = .02, t(170) = 1.30, p =.20. The Sobel Test (z = -.54, p = .59) indicates a non-significant indirect effect between mindfulness training on worrying about error through mindfulness, thus the mediation hypothesis cannot be confirmed.

For Hypothesis 2.2c, when controlling for error culture, b = -.53, t(170) = -5.46, p = .001, mindfulness training was a positive and insignificant predictor of mindfulness, b = .005, t(171) = .57 p = .56; F(2,171) = 4.04, R^2=.05, p < .05, as well as an insignificant positive predictor of hiding error, b = .001, t(171) = .10, p =.92; F(2,171) = 18.88, R^2=.43, p = .001. Mindfulness significantly and negatively predicted hiding error, b = -.36, t(170) = -3.81, p = .001; F(3,170) = 18.41, R^2=.25, p = .001, but the direct path from mindfulness training to hiding errors was positive and non-significant, b = .001, t(170) = .10, p =.78. The Sobel Test (z = -.55, p = .58) confirms that mindfulness does not significantly mediate the effect of mindfulness training on hiding error, thus, this hypothesis cannot be confirmed.

4.3.4 Hypothesis 3 Results

Hypothesis 3a argued that the positive relationship between mindfulness scores post-training (T8) and learning from error (T8) would be partially mediated by core self-evaluations (T8). Error culture was a non-significant control variable, b = .008, t(170) = -.11, p = .91. Results found that mindfulness was a significant positive predictor of core self-evaluations, b = .31, t(171) = 3.95 p = .001; F(2,171) = 10.97, R^2=.11, p = .001, and that mindfulness was a non-significant positive predictor of learning from error, b = .06, t(171) = .87 p =.38; F(2,171) =.47, R^2=.005, p = .63. Core self-evaluations significantly and positively predicted learning from error, b = .18, t(170) = 2.82, p < .05; F(3,170) = 4.10, R^2=.05, p < .05, and mindfulness was an insignificant positive predictor of learning from errors, b = .002 t(170) = .03, p =.97. While there was no significant direct effect, the Sobel Test confirms that core self-evaluations mediates the relationship between mindfulness and learning from error (z = 2.25, p < .05). This confirms the mediation

hypothesis that more mindful individuals will have higher core self-evaluations, which are linked to how likely one is to learn from their errors.

Hypothesis 3b predicted that the negative relationship between mindfulness scores post-training (T8) and worrying about error (T8) would be partially mediated by core self-evaluations (T8). When controlling for error culture ($b = -.41$, t(170) = -3.53, $p = .001$), results found that mindfulness was a significant positive predictor of core self-evaluations, $b = 31$, t(171) = 3.95 $p = .001$; F(2,171) = 10.96, $R^2 = .11$, $p = .001$, and that mindfulness was a significant negative predictor of worrying about error, $b = -.38$, t(171) = -3.33 $p = .001$; F(2,171) = 15.45, $R^2 = .15$, $p < .001$. Core self-evaluations was a negative but insignificant predictor of worrying about error, $b = -.09$, t(170) = -.81, $p = .42$; F(3,170) = 10.49, $R^2 = .16$, $p < .001$; and mindfulness was a negative and significant predictor of worrying about error, $b = -.35$, t(170) = -2.95, $p < .05$. The Sobel Test confirms that mediation did not occur (z= -.77, $p = .44$) demonstrating that core self-evaluations do not partially mediate the relationship between mindfulness and worrying about error.

For Hypothesis 3C, error culture was a significant covariate, $b = -.51$, t(170), =-5.24, $p < .001$. Here it was purported that the more mindful an individual was, the less likely they would be hide their errors and that this relationship would be partially mediated by the individual's core self-evaluation. Mindfulness scores were a significant positive predictor of core self-evaluations, $b = .31$, t(171) = 3.95 $p = .001$; F(2,171) = 10.96, $R^2 = .11$, $p = .001$. Mindfulness scores were also a significant negative predictor of hiding error, $b = -.36$, t(171) = -3.82, $p = .001$; F(2,171) =27.77, $R^2 = .25$, $p = .001$. Core self-evaluations insignificantly and negatively predicted hiding error, $b = -.17$, t(170) = -1.84, $p = .07$; F(3,170) = 19.91, $R^2 = .26$, $p = .001$, while the direct path from mindfulness to hiding error was significant and negative, $b = -.31$, t(170) = -3.15, $p < .05$. The Sobel Test confirms that core self-evaluation does not explain a significant portion of the indirect effect between mindfulness and hiding error (z = -1.63, $p = .10$) thus H3c is unsupported by the results.

4.3.5 Hypothesis 4 Results

Hypothesis 4a argued that the positive relationship between mindfulness scores post-training (T8) and learning from error (T8) would be partially mediated by self-compassion (T8) but this was not confirmed by the results. Error culture was an non-significant covariate, $b = .02$, t(170) = .27 $p = .79$. Mindfulness was a significant negative, not positive, predictor of self-compassion, $b = -.25$, t(173) = -.389, $p = .001$; F(2,171) = 11.47, $R^2 = .11$, $p = .001$; and mindfulness was a non-significant positive predictor of learning

54

from error, $b = 06$, $t(171) = .87$, $p = .38$; $F(2,171) = .48$, $R^2=.005$, $p =.63$. Self-compassion negatively and insignificantly predicted learning from error, $b = -.02$, $t(170) = -.30$, $p = .76$; $F(3,170) = .34$, $R^2=.006$, $p =.80$; and the path from mindfulness to learning from error, while positive, was statistically insignificant, $b = .06$, $t(170) = .92$ $p = .36$. The Sobel Test confirms the rejection of the hypothesis that self-compassion mediates the relationship between mindfulness and learning from error ($z = -.29$, $p = .77$).

Hypothesis 4b stated that the negative relationship between mindfulness scores post-training (T8) and worrying about error (T8) would be partially mediated by self-compassion (T8). Error culture was a significant control variable, $b = -.38$, $t(170) = -3.29$, $p = .001$. Mindfulness was a significant negative predictor of self-compassion, $b = -.25$, $t(171) = -3.88$ $p = .001$; $F(2,171) = 11.48$, $R^2=.12$, $p = .001$, and mindfulness was also a significant negative predictor of worrying about error, $b = -38$, $t(171) = -3.33$, $p = .001$; $F(2,171) =15.45$, $R^2=.15$, $p =.001$. Self-compassion also significantly and positively predicted worrying about error, $b = .35$, $t(170) = 2.67$, $p < .01$; $F(3,170) = 13.04$, $R^2=.19$, $p =.001$; and mindfulness was a significant and negative predictor of worrying about error, $b = -.29$, $t(170) = -2.49$, $p < .05$. The Sobel Test confirms mediation ($z = -2.15$, $p < .05$); however, as self-compassion did not relate to mindfulness nor worrying about error in the hypothesized direction, this hypothesis cannot be confirmed.

Hypothesis 4C predicted that the negative relationship between mindfulness scores post-training (T8) and hiding error (T8) is partially mediated by self-compassion (T8). Including error culture as a control variable ($b = -.48$, $t(170) = -5.07$, $p = .001$), mindfulness was a significant negative predictor of self-compassion, $b = .-26$, $t(171) = -3.89$ $p = .001$; $F(2,171) = 11.48$, $R^2=.12$, $p = .001$, and mindfulness was also a significant negative predictor of hiding error, $b = -.36$, $t(171) = -3.82$, $p = .001$; $F(2,171) =27.78$, $R^2=.25$, $p =.001$. Self-compassion was a significant positive predictor of hiding error, $b = .38$, $t(170) = 3.58$, $p = .001$; $F(3,170) = 24.06$, $R^2=.30$, $p =.001$. Mindfulness was significantly and negatively related to hiding error, $b = -.26$, $t(170) = -2.76$, $p < .01$. The Sobel Test confirms mediation ($z = -2.59$, $p < .01$) showing that a significant indirect effect exists; however, mindfulness does not relate to self-compassion, nor does self-compassion relate to hiding error as theorized. This prevents the confirmation of this hypothesis.

4.3.6 Hypothesis 5 Results

Hypothesis 5a expected the positive relationship between mindfulness scores post-training (T8) and learning from error (T8) to partially mediate authentic functioning (T8). Error

culture was an insignificant covariate, $b = -.01$, t(170) = -.21, $p = .83$. Mindfulness was a significant positive predictor of authenticity, $b = .23$, t(171) = 4.68, $p = .001$; F(2,171) = 17.43, $R^2 = .17$, $p = .001$; but mindfulness did not predict learning from error, $b = .06$, t(171) = .87, $p = .38$; F(2,171) = .47, $R^2 = .005$, $p = .63$. Authenticity significantly and positively predicted learning from error, $b = .24$, t(170) = 2.30, $p < .05$; F(3,170) = 2.08, $R^2 = .04$, $p = .001$; but the direct path from mindfulness to learning from error was insignificant, $b = .004$, t(170) = -.06, $p = .95$. Despite no main effect between mindfulness and learning from error, the Sobel Test finds a significant indirect effect of mindfulness on learning from error through authenticity (z = 2.02, $p < .05$) and this hypothesis is confirmed.

In Hypothesis 5b, it was argued that the negative relationship between mindfulness scores post-training (T8) and worrying about error (T8) would be partially mediated by authentic functioning (T8). This hypothesis was confirmed. When controlling for error culture ($b = -.37$, t(170) = -3.19, $p = .01$), mindfulness was a significant positive predictor of authenticity, $b = .23$, t(171) = 4.68, $p = .001$; F(2,171) = 17.43, $R^2 = .17$, $p = .001$, and mindfulness was a significant negative predictor of worrying about error, $b = -.38$, t(171) = -3.33, $p = .001$; F(2,171) = 15.45, $R^2 = .15$, $p = .001$. Authenticity significantly and negatively predicted worrying about error, $b = -.41$, t(170) = -2.36, $p < .05$; F(3,170) = 12.43, $R^2 = .18$, $p = .001$, and mindfulness was a significant negative predictor of worrying about error, $b = -.28$, t(170) = -2.38 $p < .05$. The Sobel Test confirms the mediation hypothesis that the negative relationship between mindfulness and worrying about error is partially mediated by authenticity (z = -2.07, $p < .05$).

Hypothesis 5c theorized that authenticity would mediate the negative relationship between mindfulness scores post-training (T8) and hiding error (T8). This hypothesis was also confirmed. Controlling for error culture ($b = -.46$, t(170) = -4.86, $p = .001$), mindfulness was a significant positive predictor of authenticity, $b = -23$, t(171) = 4.68, $p = .001$; F(2,171) = 17.43, $R^2 = .17$, $p = .001$, and a significant negative predictor of hiding error, $b = -.36$, t(171) = -3.81, $p = .001$; F(2,171) = 27.77, $R^2 = .25$, $p = .001$. Authenticity significantly and negatively predicted hiding error, $b = -.51$, t(170) = -3.59, $p = .001$; F(3,170) = 24.09, $R^2 = .30$, $p = .001$; and mindfulness significantly and negatively predicted hiding error, $b = -.24$, t(170) = -2.51, $p < .05$. The Sobel Test confirms that the indirect path through authenticity between mindfulness and hiding error is significant (z = -2.81, $p < .01$) thereby confirming that mediation is present. A summary of the hypotheses results is presented in Table 4-7.

Table 4-7. Summary of Hypotheses Results

Hypothesis	Result	Rationale for Rejected Hypotheses
1. Mindfulness training is positively related to growth in mindfulness over time.	Confirmed	
2.1 a) Mindfulness is positively related to learning from error	Rejected	Mindfulness is not significantly related to learning from error.
2.1 b) Mindfulness is negatively related to worrying about error	Confirmed	
2.1 c) Mindfulness is negatively related to hiding error	Confirmed	
2.2 a) The positive relationship between mindfulness training and learning from error is partially mediated by mindfulness	Rejected	Sobel Test is insignificant: mindfulness training is positively but not significantly related to mindfulness; mindfulness is positively but not significantly related to learning from error.
2.2 b) The negative relationship between mindfulness training and worrying about error is partially mediated by mindfulness	Rejected	Sobel Test is insignificant: mindfulness training is positively but not significantly related to mindfulness; mindfulness is negatively and significantly related to worrying about error.
2.2 c) The negative relationship between mindfulness training and hiding error is partially mediated by mindfulness	Rejected	Sobel Test is insignificant: mindfulness training is positively but not significantly related to mindfulness; mindfulness negatively and significantly related to hiding error.
3a) The positive relationship between mindfulness and learning from error is partially mediated by core self-evaluation	Confirmed	
3b) The negative relationship between mindfulness and worrying about error is partially mediated by core self-evaluations	Rejected	Sobel Test is insignificant: mindfulness is significantly and positively related to CSE; CSE is negatively but not significantly related to worrying about error.
3c) The negative relationship between mindfulness and hiding error is mediated by core self-evaluations	Rejected	Sobel Test is insignificant: mindfulness is significantly and positively related to CSE; CSE is negatively but not significantly related to hiding error.
4a) The positive relationship between mindfulness and learning from error is partially mediated by self-compassion	Rejected	Sobel Test is insignificant: Mindfulness is significantly but negatively related to SC; SC is negatively and not significantly related to learning from error.
4b) The negative relationship between mindfulness and worrying about error is partially mediated by self-compassion	Rejected	Sobel Test is significant but relationships are not in the predicted direction: Mindfulness is significantly but

		negatively related to SC; SC is significantly but positively related to worrying about error.
4c) The negative relationship between mindfulness and hiding error is partially mediated by self-compassion	Rejected	Sobel Test is significant but relationships are not in the predicted direction: Mindfulness is significantly but negatively related to SC; SC is significantly but positively related to hiding error.
5a) The positive relationship between mindfulness and learning from error is partially mediated by authenticity	Confirmed	
5b) The negative relationship between mindfulness and worrying about error is partially mediated by authenticity	Confirmed	
5c) The negative relationship between mindfulness and hiding error is partially mediated by authenticity	Confirmed	

4.3.7 Qualitative Summary of Findings

The qualitative summary of findings conceptualizes conclusions drawn from the interviews and short-answer open questions to address three general questions: 1) How does mindfulness training impact individual error orientation; 2) What are the broader effects of a workplace mindfulness intervention; and 3) What design aspects of a mindfulness workplace intervention contribute to an effective training? While mindfulness training does not appear to impact participants towards positive change based on the quantitative data, the interviews portray another perspective. These discrepancies are elaborated on further in the Discussion (Chapter 5).

4.3.7.1   Qualitative Data Analysis

There were three main data sources: interview transcripts (N=77), open-ended responses on the surveys, and the researcher's own separate journal used to record observations and any general themes that arose from the day's interviews. 45 interviews were held with mindfulness participants and 32 interviews were held with Pilates participants. The qualitative analyses presented below are largely based on the 45 mindfulness interviews as this study was primarily concerned with the effects of mindfulness training rather than Pilates.

Interviews and open-ended responses were transcribed with transcription software (Express Scribe) and coded in NVivo. Journal entries were made directly into NVivo within 24-hours of interviews. All data were read in entirety to get a general sense of the information as a whole. Based on recommendations of Gioia and colleagues (2013), all data were "open coded", meaning that initial codes were created using keywords based on the language of the participants. Data were continually coded as a new theme, or as an existing theme if it had previously emerged from the data. An undergraduate student who was not involved in the original coding process compared these first codes to the raw data. Any disagreements were discussed until consensus was met and there were very few discrepancies overall. Themes were established based on the first codes that emerged from the raw data. A similar process was undertaken to establish the 2nd order themes and again to determine the aggregate dimensions. Aggregate dimensions represent the key concepts based on a synthesis of the 2nd order and first order themes/categories and an overall interpretation of the data. Additionally, both mindfulness and Pilates interviews were coded and quantified to identify whether there was any impact of training on error responses or any broader positive change (versus no change). Any broader effects of training were then coded and quantified according to the 2nd order themes from the data structure.

4.3.7.2   Qualitative Results: How does mindfulness training impact individual error orientation?

Figure 4-2 depicts the emergent data structure. First-order categories depicting terms and concepts that arose from the language of the participants is presented on the left side of the figure. Second-order themes aggregating the first-order categories are represented by the boxes in the middle. The boxes on the right, the over-arching aggregate dimensions, represent the interpretation of the data. There were two aggregate dimensions that emerged from the data. First, how the training impacted how individuals processed error; and second, what moderated how impactful mindfulness training was on an individuals error orientation altogether. Table 4-7 shows representative quotes to support the data structure.

While 45 interviews with mindfulness participants were conducted and analysed, 9 of these interviews did not include questioning on error responses as the decision to add a line of questioning directly related to error responses was made only after interviews had already begun. As such, error specific questions were added to the interview plan after ethics approval had been obtained for participants in Sessions 3, 4 and 5. Of the 36 interviews that included error questioning, 80.5% of mindfulness interviewees reported some positive change in their error response that they attributed to mindfulness training. This is in rather

stark contrast to the Pilates group where 90% of the 21 people asked about their error responses reported no training related change. 2 people described that participating in Pilates training had made them more aware of their responses to error; however, they attributed the change to the survey questions. (Note: 11 of the 32 total Pilates interviews did not include questioning on error responses.)

There was a widely shared acknowledgement that a natural human response to error is one of initial dislike; however, how one proceeds after that initial reaction depended on several factors. Interviews revealed that mindfulness training appears to encourage individuals to pause and regulate emotions in a manner that allows them access to a wider perspective. By pausing, however briefly, individuals are able to re-group and approach their scenario with further equanimity. 48% of those that experienced change in their error response found mindfulness training facilitated the ability to detach from the error itself and simply accept that an error had occurred. This attitude can perhaps best be illustrated by the saying "no use crying over spilt milk". Emotional reaction was a theme that emerged to capture the experiences of 41% of individuals that articulated that while there was typically an initial wave of panic when detecting error, this reaction could be interrupted to prevent one's response to error from continuing along this trajectory of panic and unease. Emotion regulation was identified by 79% of participants as a tool that allowed them to separate their emotional response from an intellectual one. Here participants found that the ability to pause and take a breath might be enough to create the space to allow intellectual reasoning to overcome the emotional reaction. Similarly, while some participants experienced errors in relation to themselves and the consequences that might directly impact them, others experienced errors in relation to the context or in relation to others (e.g., patients and patient consequences). Mindfulness training, which was said to increase empathy and compassion for others, may be an active component facilitating changes from self to contextual or other-orientation such that the initial negative response to error was overcome when participants became more concerned with the impact of their error on others and finding a solution, rather than how the error might impact themselves. This shift from self to other-orientation or problem-solving was reported by 38% of participants who experienced a change in their error response due to mindfulness training.

The extent to which mindfulness training was able to impact individual error orientation seemed to depend on antecedent and contextual factors. First, some individuals were simply not open to acknowledging or recognizing error. When probed about making errors in interviews, they would take on a slightly defensive view denying that any errors had occurred in work (or in life), or they would describe an error but then attribute its

occurrence to others. Mindfulness training may help in such circumstances by allowing individuals to accept their part in an error that has occurred; however, the more open one is to accepting the situation from the onset, the more foreseeable application there would be for mindfulness training to support a productive interpretation of error. Past training was another antecedent that impacted error attitudes. For example, some individuals had received error management training, or had worked in a culture where errors were encouraged as a learning opportunity. Others had accumulated greater confidence from the extended tenure of their work roles or from general life experiences such that when errors occurred, they were not threatened by the negative task feedback. Finally, in line with the error management culture literature (e.g., Van Dyke et al., 2005), the amount of influence the work group had on the individual's perception of error was a theme that moderated how impactful mindfulness training would be on error orientation. Even when an individual held a more positive attitude towards errors, if the group culture exhibited an aversion to errors, the benefits of mindfulness training were difficult to apply in the moment.

Figure 4-2. Data Structure – "How does mindfulness training impact individual error orientation?"

First-Order Categories	Second-Order Themes	Aggregate Dimensions
• Oh well, mistakes happen • Life goes on • Let go of what can't be undone	Detachment from error	
• Initial emotional reaction of aversion to error • Automatic responses to error of "panic" or "uhoh" • Subconscious trigger reaction	Emotional Reaction	Mechanisms of Training on Processing of Error
• Conscious intellectual override of emotional reaction • Pause or reflexivity to obtain a rational view of the situation • More perspective and clarity when emotions are managed	Emotion Regulation	
• Worried or anxious about consequences to self and how others will view them • Blames self, repudiates self and beats self up over committing an error • Feels guilt, shame, and embarrassment • Shift to solution-orientation • Concerned with outcomes for others • Context drives the error response	Self-focused vs. Other or Solution-focused	
• Refusal to recognize that mistakes occur at all • Unsavoury view of error in any context • Defensive response to error detection • Unwilling to accept or take responsibility for error	Openness to Error	Moderates Effect of Training on Error Orientation Plasticity
• Has developed the confidence for errors not to be threatening • Has been trained formally or informally to view errors as a learning experience • Previous experiences with errors have been positive	Past training/experience	
• Supportive colleagues • Unthreatening managers • General error culture is open to errors	Group Influence on Individual	

Table 4-6. Representative Quotations – "How does mindfulness training impact individual error orientation?"

First and Second-Order Categories	Representative Quotations
Aggregate Dimension: Mechanisms of Training on Processing of Error	
Detachment from error	
• Oh well, mistakes happen • Life goes on • Let go of what can't be undone	• I guess I address it [the error] and shrug it off as one of those things that happens. I don't get stressed or down on myself about it, penalize myself about it. I don't know if I learn from my mistakes and do things differently to avoid the mistake in the future. I always say I will but I don't. I think mistakes are a part of life. • I guess my overall attitude is it is what it is. You can't change it once it's already done. You can change if it happens in the future and once you correct it, you correct the mistake and you recognize when the situation comes up again then you learn from the mistakes and you can deal with it

right away. It is what it is, I don't know where it comes from. I don't think my parents were ever big on, you know they let you know when you make a mistake but they don't dwell on it. You correct them if you can and move on.

Emotional Reaction
- Initial emotional reaction of aversion to error
- Automatic responses to error of "panic" or "uh-oh"
- Subconscious trigger reaction

- With mindfulness there's definitely an element of anxiety when you make a mistake but I felt like I was also able to recognize that it's not just me that makes mistakes – everybody makes mistakes. Also I think making mistakes like that is ok because it's an opportunity to step back and think about what happened and think in the future what to do to avoid the situation. It's part of human nature. Before mindfulness I'd feel just so awful and put all the responsibility on me.
- I'm less likely to just react and mistake things usually causes this reaction of self-blame, and so I just didn't go into that reaction again. It could be any reaction, all my reactions have become less trigger-happy, and have a little more space around them, and I think that's because of fundamental self-care and the calm that it brings me. When I'm aroused with anxiety I'm more reactive.
- I don't like making mistakes at all. Intellectually I don't mind, but emotionally I totally don't like it. So I often have very intense feelings when I make mistakes.

Emotion Regulation
- Conscious intellectual override of emotional reaction
- Pause or reflexivity to obtain a rational view of the situation
- More perspective and clarity when emotions are managed

- My typical response is I'm not happy about the mistake. I usually look to find out if there was anything I could have done to avoid it, or mitigate it. And then afterwards I look to see if this situation comes up again how I'd be able to react to it better
- My initial tendency is to get overwhelmed, which I do. But what I've noticed is, that piece where I become overwhelmed was becoming shorter in time. So I was able to step out of the feeling of being overwhelmed and see it, and then go back into it because that's what happens, but again step out of it. So instead of feeling overwhelmed for a long period of time I was able to feel that but then step out of it repeatedly. And then have more clarity of mind with it.
- I had an upsetting situation happen when someone was telling me some information and it really upset me to the point where I wanted to cry. And I took a deep breath and said I'm going to excuse myself because I can go in there for a few minutes, and I did deep breathing and a meditation, because it wasn't an appropriate place to get emotional at work. And I can come out, I even had a smile on my face even though on the inside I was sad. It was a good tool to help me know I coped and I didn't have to expose myself to everybody with the tears at work and the whole thing. So that was, it's a part of me now. I know I have a tool that if I can't cope or thing are becoming overwhelming I can use that to deal with a situation.

Self-Focused vs. Other or Solution-Focused
- Worried or anxious about consequences to self and how others will view them
- Blames self, repudiates self and beats self up over committing an error
- Feels guilt, shame, and embarrassment
- Shift to solution-orientation
- Concerned with

- My immediate reaction was "Oh crap." But then just kind of move on from it, there's not really anything… what are the implications, what do I need to do about it – it was more of a practical response after the initial realization. What's the fall out going to be, how can I correct it, if I can? How can I mitigate some of the impacts, how to prevent it from happening again?
- In terms of feeling, I guess I feel bad initially, but then I usually come up with a solution to resolve the issue.
- When I make a mistake, it happens so fast. I'm not really someone that beats myself up over a mistake, it's just kind of like "Ugh, this isn't working, what do I need to do, who do I need to talk to, who can help me fix this?" I guess I go quickly into problem-solving mode. And to be honest I'm not sure I always know exactly what I'm feeling. It's like something's not right, and I move quite quickly towards problem-solving.

outcomes for others • Context drives the error response	• Obviously if I did something like paralyze a patient of course I would be devastated. But day-to-day ups and downs don't really stress me that way. • I think we're just so trained, if something goes wrong automatically we talk about it because it's really not about me, it's about the patient who it may have impacted in some way.

Aggregate Dimension: Moderates Effect of Training on Error Orientation Plasticity

Openness to Error • Refusal to recognize that mistakes occur at all • Unsavoury view of error in any context • Defensive response to error detection • Unwilling to accept or take responsibility for error	• I would have felt really guilty about it, and worried about the people inconvenienced by this. Whereas this time I'm like "I'm sorry I missed this, can we expedite this and get approval for this now?" I feel like I don't have to be perfect, people make mistakes, it's ok. • I sometimes think, overreact and panic a bit. I kind of feel, if it's something work-related, I have this feeling of incompetence or something, like if it was something avoidable I should have avoided it. That kind of thing. • I know everybody makes mistake in their life but I (thank god) haven't done anything at work that made me go "uh oh" so I wasn't quite sure how to answer that question. I'm a pretty resilient person anyway, I've been living on my own since I was 18 and working since 14, so I kind of have learned to roll with the punches in terms of big things that happen in your life anyway. So anything at work would just be sort of a panic, "oh my god did I hurt somebody" but I haven't made those errors. And I'm really fussy with my students and watch them, so they haven't made any errors, so I wasn't sure how to answer that question honestly because I haven't done any.
Past Training and/or Experiences • Has developed the confidence for errors not to be threatening • Has been trained formally or informally to view errors as a learning experience • Previous experiences with errors have been positive	• Just perspective. 20 years ago I wouldn't have know that everybody makes mistakes. 20 years ago I wouldn't have had the confidence to say – I found the problem, I found the mistake, because of things that even other people can't remember, other people who should know it but wouldn't necessarily apply it. • I'm 45 years old, I've been around for a bit. But I'd say as I gain more self-awareness and self-confidence and self-love, that those become things that I can acknowledge I'm human and know that they're mistakes. And I'd understand the role I'd need to take and the accountability I'd need to take for it and have the appropriate actions. • I remember when I was a new grad, anything that went wrong whatsoever was devastating. But I guess with experience I learned that not everything is 100% perfect all the time and the best thing we can do is be open about it and try it and fix the error as fast as possible.
Group Influences on Individual • Supportive colleagues • Unthreatening managers • General error culture is open to errors	• Part from impact on the patient, I think I really don't stress much about errors because in our work environment we're actually very open to dealing with things like that. I guess I by and large work on the computer, so if I make a mistake or get stuck, by and large it's very easy just to discuss it will a colleague, ask her advice, and just try again. So we do have a very open work environment to discuss that thing. • I think our team's professional enough to acknowledge when you make a mistake you own up to it so when things are done you don't address it again. I don't think there's been mistakes people have felt threatened for or anything. Everyone makes mistakes, doctors too. No one likes mistakes because it ends up being more work but we don't have a culture where people are pushing, I wouldn't feel apprehensive about it. I would say I made a mistake and this is the problem and our team will address it, fix it, and move on.

4.3.7.3 Qualitative Results: What are the broader effects of a workplace mindfulness intervention?

Mindfulness training at work appears to offer a wide array of effects individuals that can be applied in the workplace, beyond error orientation alone. The data structure in Figure 4.3 presents these themes and is further supported by Table 4-8, which shows representative quotes from the participant responses. All 45 participants that received mindfulness training reported having a positive experience and at least some form of positive change. 8 out of the 45 participants reported attending three or fewer classes and even these individuals found the classes they attended to be helpful in reducing their stress level while in class, and helping them be more aware of their experience outside of class. The majority of Pilates participants (88%) also described benefiting positively from the their training in some manner; however, whereas all interviews related to mindfulness training mentioned positive change, 4 Pilates interviewees noted they received no benefit from their training. 2 of these interviewees attended two or fewer classes.

There were seven second-order themes that emerged depicting the change participants described grouped under the aggregate dimension of effects of mindfulness training at work: cognitive; behavioural and/or attitudinal; emotional; interpersonal; physical; relationship with self; and fulfillment. 71% of mindfulness interviewees described cognitive changes where individuals described an improved ability to focus or think clearly. 21% of Pilates interviewees also described similar cognitive benefits where they felt more energized and more productive after participating in the class. Behavioural and attitudinal changes were experienced by 58% of mindfulness interviewees exemplified by reports of improved work-life balance, increased work engagement and decreased procrastination. 91% of those mindfulness interviewees reported emotional changes including being less reactive, more calm, and feeling more in control. 32% of Pilates interviewees also attributed a greater state of calm or relaxation to their training. Interpersonal effects referred to changes in how participants communicated with others and/or provided care for others. 82% of mindfulness interviewees described some form of enhanced interpersonal connection. 84% of mindfulness interviewees (versus 54% of Pilates interviewees) described physical changes from increased awareness of the body, be it sensations of pain or relief from pain to improved sleep quality. Past research corroborates the positive relationship between sleep and mindfulness (e.g., Carlson & Garland, 2005; Winbush, Gross & Kreitzer, 2007). In 68% of mindfulness interviews, participants described changes

65

in their relationship with themselves such that they became aware of how critical they were of themselves, become more inclined to enact self-care, or were more willing to follow their intuition. A key word that surfaced often was "permission", such that participants were giving themselves the permission to enact self-care or take a break. 1 person (3.5%) from the Pilates training noted an increase in self-confidence from engaging in a form of exercise she had never before attempted. Fulfillment was another theme that described the broader effects of mindfulness training at work. Here individuals described feeling more present for events and interactions in their life, began reprioritizing what really mattered to them, or described a sense of renewed purpose. 55% of people reported this level of positive impact. One participant articulated this change as follows: "I think that [being more mindful] makes for a more satisfied life, you're not going at the whim of your emotions, you're more grounded, doing what's good for you rather than being drawn into your perceptions of what you think other people are thinking of you." A need for change was the final theme under this aggregate dimension. This theme denotes that there is an acknowledgment by the individual that some feature of their current state or situation at work is sub-optimal, for example they are overwhelmed and operating at high levels of stress, and express a desire to change their work experience. To some degree, all study participants acknowledged that their baseline state of well-being could be improved.

The second aggregate dimension refers to the change process and further breaks down into two sub-themes: 1) how and 2) when changes related to the effects of mindfulness training at work occur. With respect to how, individuals reported increased awareness of themselves and their situation, along with the capacity to pause and regulate their emotions so that they could gain more perspective. In terms of when changes occur, there was a sense that mindfulness concepts and effects unfolded over time. There was no consistent trend that suggested the effects of training were noticed at one consistent and particular point in time. For participants who had been exposed to mindfulness in the past, be it through formal training or in a book they had read, they described that they understood mindfulness more with repeated exposure. Others mentioned that while concepts felt foreign in the first classes, after they had a chance to apply some of the content and practices from the earlier classes, despite any initial aversion, they began to notice some changes as the course progressed. Mindfulness benefits were noticed over time as a process of continual learning and application of mindfulness concepts.

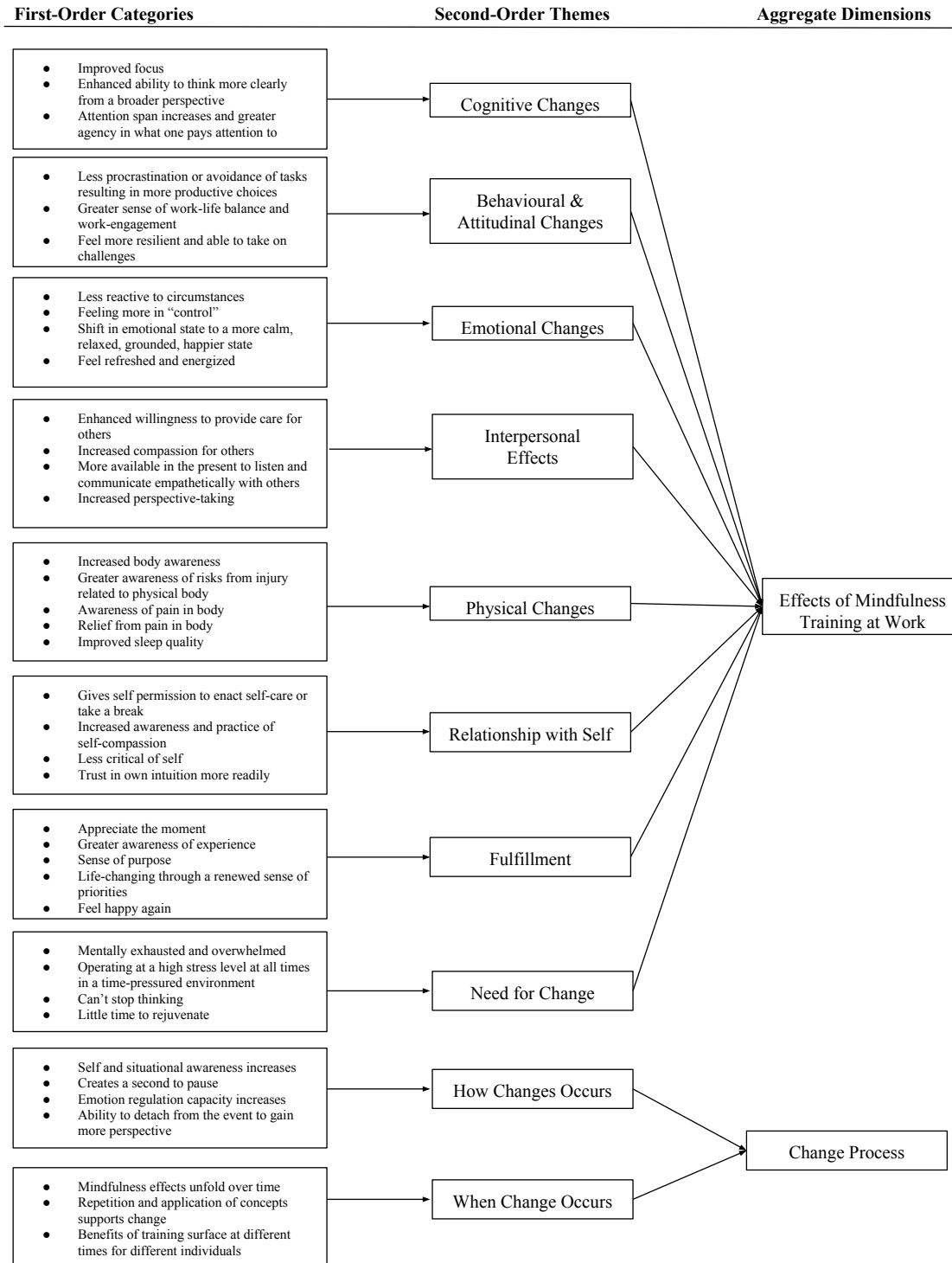**Figure 4-3. Data Structure – "What are the broader effects of a workplace mindfulness intervention?"**

First-Order Categories	Second-Order Themes	Aggregate Dimensions

- Improved focus
- Enhanced ability to think more clearly from a broader perspective
- Attention span increases and greater agency in what one pays attention to

→ Cognitive Changes

- Less procrastination or avoidance of tasks resulting in more productive choices
- Greater sense of work-life balance and work-engagement
- Feel more resilient and able to take on challenges

→ Behavioural & Attitudinal Changes

- Less reactive to circumstances
- Feeling more in "control"
- Shift in emotional state to a more calm, relaxed, grounded, happier state
- Feel refreshed and energized

→ Emotional Changes

- Enhanced willingness to provide care for others
- Increased compassion for others
- More available in the present to listen and communicate empathetically with others
- Increased perspective-taking

→ Interpersonal Effects

- Increased body awareness
- Greater awareness of risks from injury related to physical body
- Awareness of pain in body
- Relief from pain in body
- Improved sleep quality

→ Physical Changes

- Gives self permission to enact self-care or take a break
- Increased awareness and practice of self-compassion
- Less critical of self
- Trust in own intuition more readily

→ Relationship with Self

- Appreciate the moment
- Greater awareness of experience
- Sense of purpose
- Life-changing through a renewed sense of priorities
- Feel happy again

→ Fulfillment

- Mentally exhausted and overwhelmed
- Operating at a high stress level at all times in a time-pressured environment
- Can't stop thinking
- Little time to rejuvenate

→ Need for Change

→ Effects of Mindfulness Training at Work

- Self and situational awareness increases
- Creates a second to pause
- Emotion regulation capacity increases
- Ability to detach from the event to gain more perspective

→ How Changes Occurs

- Mindfulness effects unfold over time
- Repetition and application of concepts supports change
- Benefits of training surface at different times for different individuals

→ When Change Occurs

→ Change Process

Table 4-7. Representative Quotations - "What are the broader effects of a workplace mindfulness intervention?"

First and Second-Order Categories	Representative Quotations
Aggregate Dimension: Effects of Mindfulness Training at Work	
Cognitive Changes • Improved focus • Enhanced ability to think more clearly from a broader perspective • Attention span increases and greater agency in what one pays attention to	• I'm recognizing I can last longer, I can get more done, I'm feeling more energized and motivated, I don't feel so drained. I guess throughout different activities throughout the last couple of weeks, and just noticing like oh it's 3 and I don't feel as tired, and oh I've accomplished way more today than I thought I was going to. And I guess feeling more focused too. The ability to focus on studying after coming home from working a full day is less a challenge or fight than it once was. • I can concentrate better. I'm more productive. I always make a list of things that I need to do, so part of it's my attitude – instead of looking at it and sighing and feeling frustrated about how long my list is, or how many things are still on my list from the day before, and procrastinating from doing some of those things, I don't feel as frustrated. I feel like there are less things on my list, whether because I'm accomplishing them or because I realize that I don't need to micromanage myself as much <laughs>. I get things done as I need to get them done, so I'm not as hard on myself as well. But I also am better able to accomplish the things that I've been avoiding accomplishing. • Being aware what's happening with me has allowed me to identify, hey, I'm tired maybe I should rest a little more. Which is essentially a very basic survival skill. But again when you're used to be detached to yourself it's less obvious. And that's it, I'm happier, I think I'm living life more and living life – I'm just really aware of what's happening.
Behavioural and Attitudinal Changes • Less procrastination or avoidance of tasks resulting in more productive choices • Greater sense of work-life balance and work-engagement • Feel more resilient and able to take on challenges	• I'm motivated, I feel motivated. I feel that I can deal with issues. I feel that I can separate my work from my life, and not take things on a personal level. I think I can think a little clearer on how I'm going to negotiate. A lot of my work is solving issues, problem-solving, and I spend a great amount of time doing that for my projects. And it's all about a negotiation technique, all about talking, the way I communicate with people. And I find that with these exercises, I'm able to bring a clear brainstorm in my mind how I'm going to tackle issues or negotiate • Before this, I was in a place where I was not feeling very positive about my work. And now I feel less like that negative sort of energy or sentiment around things. I'm like "I can control my own actions or thoughts or feelings about my work, I can't control how others give me work or how I might be managed." So I feel my own approach to my work has probably changed a bit. • I'm able to give work its proper place now, which is very important and very difficult for me to do. And I'm able to enjoy my work and feel passionate about the work I do, but at the same time it's no longer the center of my life. • I lost my mom to cancer two years ago, so it's very quick, very sudden, you know, it's very strong events in life. Maybe it's the combination of the experience with my mom, which was a very peaceful process, I find that I'm able to function still, I feel fine, no bad words or things like that, but I feel stronger, more resilient, like I'm able to cope with all of this.
Emotional Changes • Less reactive to circumstances • Feeling more in "control" • Shift in emotional state to a more calm, relaxed, grounded,	• I think just a quiet break, like a stop, think, react kind of break that we sometimes, I think in this setting we just react, react, react. And I didn't need to do that for the one [consult with a patient] I had after the class. I was very calm and quiet and that was exactly what I needed to be for a consult. And really that's what you probably have to be for any consult, even when it's a crisis, or especially for a crisis. • Overall I feel more at ease with myself, I feel more grounded and relaxed. I

| happier state | think it really helps me to deal with this kind of situations. |
| • Feel refreshed and energized | • I'm happy. I've gone from being very frustrated and angry at things that were going on here to – you know, there are things I can't change and there are things that I can control. I don't want to be an angry frustrated person. That's not good for me, or the people I work with, and I feel more peaceful. And I'm happy. |

Interpersonal Effects

• Enhanced willingness to provide care for others	• There are other aspects of it [value of mindfulness training]….Like getting along with my children, and I didn't talk about my wife. One thing was my relationships with my wife has improved.
• Increased compassion for others	• So during our neurological assessments people talk to me during the break, just listening to the story of what they're going through…I just take the time to reflect a little bit and take the time to talk to the person… I think I'm making sure I empathize… that I hear the participants a bit more. I have been listening a little bit more.
• More available in the present to listen and communicate empathetically with others	• Compassion to myself, to my own person and saying "yeah, I'm ok, I'm a person, I need help. I've been going through very difficult things right now". And you know what? My little kid is no different – he must be dealing with his own things as well. And I think that really allows me to be more generous, just more understanding.
• Increased perspective-taking	• The unit I work on, our patients can be very, very challenging. So for example if I'm on the unit and we're dealing with some challenging patient situations and I'm realizing I'm starting to feel tense or the physical sensations of stress, in those moments I'll be more aware of it and either take some deep breaths right there and then, and be able to realize why I'm stressed out and in the moment, not become more flustered, which is probably what I would have done before.

Physical Changes

• Increased body awareness	• I realized that by the third week I had stopped having headaches.
• Greater awareness of risks from injury related to physical body	• You can feel the slight difference in your body and you can tell something's wrong. This week I had a stomach problem and being in tune with my body it helped me pick it up very quickly.
• Awareness of pain in body	• When I do the mindfulness before bed I sleep a lot better. It's still challenging for me to do it in the morning
• Relief from pain in body	• I think this [mindfulness training] increased my body awareness somewhat. I'm noticing little differences one side to the other. I'm noticing my lack of symmetry I guess. I'm noticing areas that are tight; it's been wonderful I've really enjoyed it.
• Improved sleep quality	

Relationship With Self

• Gives self permission to enact self-care or take a break	• I feel shame, tightness in my chest, unhappy with … "how did this come to be? Why am I so mindless, so stupid? What did I miss, I'm always missing things?" So a lot of unkindness. Whether it's spilling coffee or whatever, it could be anything…. So somehow mindfulness…it counters that super ego part of your brain that tells you that you're doing things wrong, you've got to do it better and all of a sudden it's like there's permission… and your kind self, or some sort of authority is giving you permission to be okay with your mistakes or be nice to yourself.
• Increased awareness and practice of self-compassion	
• Less critical of self	• It seems like it gave a permission to do a bit of … I don't know maybe two minutes of centering myself …. But perhaps before this I wouldn't give my permission to use my time to do that.
• Trust in own intuition more readily	• I feel like I'm more respectful of myself. Those moments when I'm hard on myself or criticizing myself have gone from daily to 5 times a day to once a month or something like that. I'm practicing self-acceptance a lot more, and recognizing my weaknesses and embracing them.

Fulfillment

• Appreciate the moment • Greater awareness of experience • Sense of purpose • Life-changing through a renewed sense of priorities • Feel happy again	• There are so many different filters and ways you can look at the world, and I think a lot of them, living in this city I approach things with "How dangerous are you, how smelly or dirty, do I need you in my space right now, are you going to harm or annoy me?" Just trying to navigate all this like it's a game system. But you want to be human again, "Who am I and what do I see in people?" • In my work I have certain goals for myself and I want to attain those goals, and now I'm looking at all of my life, not just these little segments, like oh my work/home/family goals, I look at all my life and put it all together, and look at how I want to be in the total of it. Instead of thinking oh I got to push harder at my work to make this goal possible. I'm relaxing even more, sitting in a place of acceptance, probably going with the flow, waiting for something like a natural opening to occur, you know, I feel that's what I'm doing. • It's just appreciating everything now and not thinking about the next step. Enjoying the moment fully and not just fly past it.
Need for Change • Mentally exhausted and overwhelmed • Operating at a high stress level at all times in a time-pressured environment • Can't stop thinking • Little time to rejuvenate	• I guess it has made me aware of just how much babble goes on in my mind, which in a sense is a bit concerning, because I think I'm really not mindful, I really don't live in the moment, I'm just juggling 500 things at any given second, which in a sense is a bit frightening or worrying. • I think everybody knows that breaks are important and that your own mental health and stress levels are important to be reduced in order to be more productive. Whether or not people actually put these things into practice, I doubt. Or whether or not they're open enough to say "yes I'm doing this and I'm taking this amount of time for me" I don't think so. People do it in the privacy of their own offices, or steal away for a half an hour during the day. • I was overwhelmed at the beginning of the sessions. It was a combination of very large workload and also responsibilities have – parenting responsibilities and some things like that. In the meantime, neither does my wife, I don't have family in the city, which makes it a very difficult situation at home. And my particular precision within the constitution, my work, is quite demanding, it's one of the jokes in which work never actually stops. So I'm working all the time. • I find that sort of the never-ending workload, suffocating, in the sense that at some point it was difficult for me to get it done. And it was just the nature of the very long processes of what I have to go through. Like that but just never ending. And it comes to a point at which I lose motivation and it's just difficult to complete anything, unless it's exciting and of course I'll do it out of discipline.

Aggregate Dimension: Change Process	
How Change Occurs • Self and situational awareness increases • Creates a second to pause • Emotion regulation capacity increases • Ability to detach from the event to gain more perspective	• I've stated to practicing detachment from the emotion and also when I have a negative thought, about myself, I consciously decide to go back to present. So I'm thinking about those things a lot less. • I focus on myself for a few moments and understand exactly what I was feeling for the moment and what I'm concerned about. • Being able to address feelings as they come to me, rather than when it's too late, or when it's reaching a stressed state. Realizing those irritations and comforts earlier, so they're not building up and I'm not suppressing them so much anymore. And then a big thing I've gained is definitely a sense of self compassion in terms of recognizing how I'm feeling but being ok with it, and taking a step back and just addressing it for what it is rather than judging myself. • With mindfulness I've learned a lot about how to stop, how to take a break, how to think about observing myself. So if it's stressing me, I stop what I'm doing and then I can analyze what is bothering me and how I can change that. How can I change my thoughts for a moment? I notice that with this mindfulness practice I'm less reactive. So I'm not just reacting and going on

a panic attack to solve something. I'm actually taking a step back, I clear myself, and then I proceed. So just taking that little time to acknowledge how I feel and how I'm doing things, and how to replace with better communication techniques… that's the way it's been helping me. Just by stopping, pausing, taking time to myself to screen my feelings and emotions and just try to relax. And then I can go back and tackle my work better.

When Change Occurs

- Mindfulness effects unfold over time
- Repetition and application of concepts supports change
- Benefits of training surface at different times for different individuals

- By the third week, if not for concrete actions, at least I was able to better cope, perhaps, with emotions that would maybe upset or were angry.
- I have a very specific incident where I realized on the fourth week that as I was walking to work, I was intentionally, I was aware, that I was walking slower to work. Because I know that walking faster is only going to get me to my office about two minutes earlier <laughs> than if I just walk slowly. And my overall sense of tension and anxiety was less. I was happier.
- After listening a few times I appreciated the actual meetings and I found them helpful and practical. The more I realized it wasn't going to be like a therapy loosey-goosey thing and there were tangible results, then maybe a few weeks into it I was noticing a difference and I appreciated it more.
- It does take a while, I guess, of repetition to hear or see something and note that it's something I should look into. I've got to see or hear it [mindfulness] a few times, but I can't change all at once so it's always a process, and that was maybe six or seven sessions. I can't remember…. I feel like it's something I'm still working at.
- I noticed it right away because I was really open to it, craving this. For me it happened by the second class.

4.3.7.4   Qualitative Results: What design aspects of a mindfulness workplace intervention contribute to an effective training?

When it comes to what components might contribute to an effective workplace mindfulness training program, there were several illuminating findings that surfaced. First, opportunities to apply training at work surfaced as an important aspect of effective training as participants described a gap between learning the concepts presenting in class and feeling lured back into the busyness of work once they were back in their typical work context. Additionally, they felt that if others in their work culture did not appreciate such mindfulness concepts as non-judgment and present-moment awareness, it was isolating because there was no shared language to enact mindfulness with others. The actual physical accessibility to training was another design consideration that was mentioned often by participants. Due to the nature of shift work, multi-site buildings, and confusing building layouts characteristic of this set of hospitals, just attending class was a major barrier to training efficacy. Individuals suggested that it would be helpful to have classes scheduled at multiple times and locations during the week so that they could have the flexibility to attend classes based on their own dynamic schedules. Another barrier to the accessibility of the training was more psychological in that without the support of

71

management or colleagues, it was uncomfortable for individuals to leave work to attend a wellness related course during work hours. Finally, the group aspect of mindfulness training at work generated mixed responses from participants. Some felt that the shared experience created more learning opportunities and accountability to attend classes and maintain the practice of mindfulness; however, others felt that discussing topics like self-compassion and being distracted at work was difficult in front of their peers. Other mindfulness training programs that are conducted off-site and attended by individuals that have no affiliation with each other or with any particular organization may not feel such constraints as those mentioned herein since the need to be professional might not be as salient. Figure 4-4 shows the data structure of these themes and categories and Table 4-9 depicts representative quotations supporting the data structure.

Figure 4-4. Data Structure – "What design aspects of a mindfulness workplace intervention contribute to an effective training?"
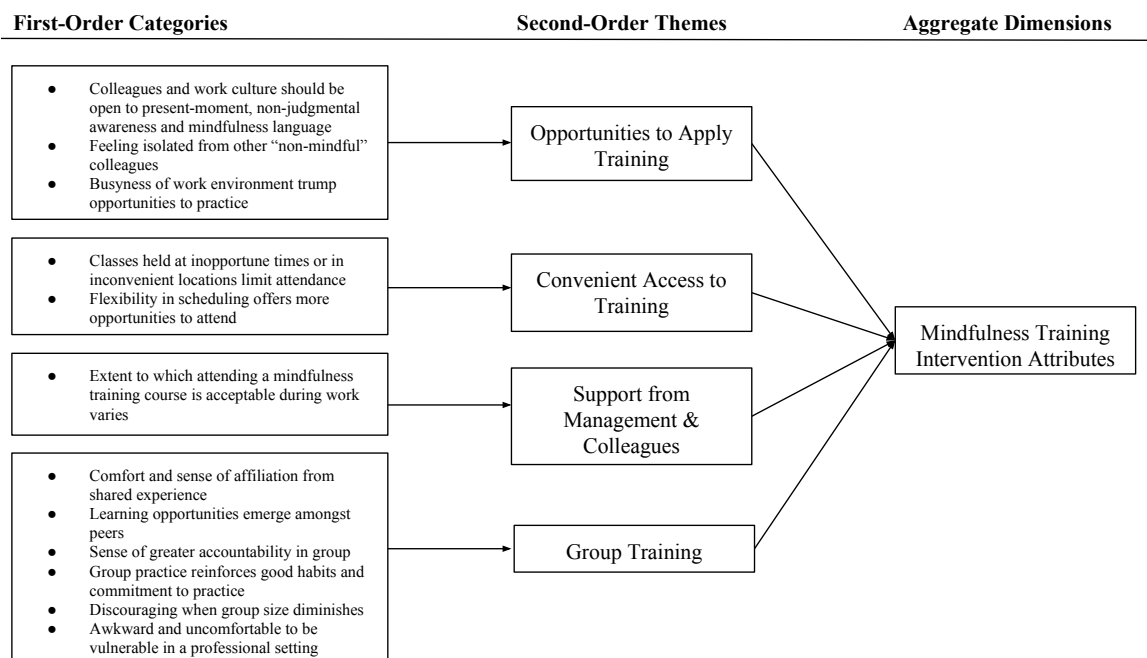

Table 4-8. Representative Quotations – "What design aspects of a mindfulness workplace intervention contribute to an effective training?"

First and Second-Order Categories	Representative Quotations
Aggregate Dimension: Mindfulness Training Intervention Attributes	
Opportunities to Apply Training	
• Colleagues and work culture should be	• I came out of the session thinking that was great and that is definitely wonderful to learn. And then I just didn't apply it and I don't know why. I

open to present-moment, non-judgmental awareness and mindfulness language • Feeling isolated from other "non-mindful" colleagues • Busyness of work environment trump opportunities to practice	think the tendency is going into the workshop and then you come out and go straight back into work and it might not give you a chance to reflect or to put more thought into it, in order to be able to start actually integrating it. So I think it's kind of that immediate distraction of "Oh I have to get back to work now," and then your mind is pulling at something else, and you forget to really take home what we did at the workshop. • Being the one talking about mindfulness and going into a "let's be aware of our intentions" kind of thing, it's not necessarily understood by everybody. So it's not something that everybody around you knows what you're doing or what the benefit is, and you're constantly either having to explain it, or you feel judgment of other people. That decreases the value and likelihood of doing it. It diminishes the strength or value of that training. So if it's something that was more societal level, like everybody knows it, everybody does, it… not everybody has to practice it, but if people are aware of what it is and the benefits of it, and that it's available to people who prioritize self-care – great. • Like right now I wouldn't reach out to a co-worker and say "Just take a breath." Right now I probably wouldn't. But to reach out and say "remember what we learned, take a moment to see where we are right now, before you need to rush off and see the next patient." We could go bowling as a group and I suppose that would bring us together, but this is more on-going and lasting.
Convenient Access to Training • Classes held at inopportune times or in inconvenient locations limit attendance • Flexibility in scheduling offers more opportunities to attend	• I think that after work would be better. I know people want to go home but if you're going to an activity that you find enjoyable, which I do, I would be happy to go to it end of day. Like I go to yoga class or something like that at the end of the day so I'd find it more beneficial for me at the end of the work day. In the middle I find it too stressed and it's too hard to pull away from that work time. • They [colleagues] don't always do the wellness courses because they have structured days and the times to do these courses are not always optimal for us. • A lot of people eat lunch, run errands, phone calls, have half an hour to eat. And a lot of people don't have an hour for lunch so people can only take 30 minutes and then two 15 min breaks as far as I know.
Support from Management & Colleagues • Extent to which attending a mindfulness training course is acceptable during work varies	• I technically have backup coverage, but that would be outrageous to ask for coverage to go to Pilates. Like it would be absolutely unacceptable. • I think it would be amazing if we could do this as a team. No one from my team that I'm aware of has participated. In my work setting there's not a lot of encouragement to pause, slow down. It's like the opposite – how much faster can you get this done or see these patients? • I do have great support here with my teammates. They cover when I'm away, they're there for when I ask them. Sometimes I just don't. I feel like I have so much on my plate I just don't want to leave my desk. Even if I have someone taking care of my desk, as long as donors was involved. I mean in terms of direct work with donors, I won't be missing anything if I'm gone for an hour, but I don't have anyone to cover me per se. • The first three weeks I probably snuck away without telling anybody that I was actually going down to participate in this study. I sort of justified taking that break because I was still doing something.
Group Training • Comfort and sense	• I think the challenge is doing it at work with strangers. I know there's

of affiliation from shared experience
- Learning opportunities emerge amongst peers
- Sense of greater accountability in group
- Group practice reinforces good habits and commitment to practice
- Discouraging when group size diminishes
- Awkward and uncomfortable to be vulnerable in a professional setting

definitely times when we're doing whatever type of meditation that we're being guided to, where I am like absolutely, he asks how we're feeling and how we're feeling whatever, and I know I'm not doing well, so whether I'm too agitated or whatever it is that's going on. And I think the challenge is allowing that to be. I don't come to work to completely let go and be with, so I find that challenging, so if there ever is a day where I really feel unhinged, I'm ok with that. But it doesn't feel like it's a setting I can be unhinged.

- Maybe adult learning trusts that you can go away and do it [meditation] and come back and report, but I feel that in this field of meditation, the experts and long-time practitioners often practice together in groups. Right, there's something about the power of the group that really is part of meditation in addition to doing it on your own, there's that piece. And so you have in-built possibility to give people that portion of what meditators can take advantage of, that group work and hearing back live.

- I'm not sure if this has been offered at the hospital outside of the study, but I think it's probably very beneficial if more people have access to it, especially the group thing. If I had just been given this notebook and said "go read this and do this" I probably wouldn't have gotten very far. But I think I felt obligated to come once a week and answer questions and talk about it, so that raised a bit of accountability there.

Chapter 5

5   Discussion & Conclusion

5.1   Discussion

This research applied a mindfulness training program in a work setting to assess whether such training might increase how mindful an individual was, and accordingly, equip individuals with the skills to effectively manage their responses to error. In more depth, this dissertation examined the relationship between mindfulness and individual error orientation predicting that mindfulness would be positively related to learning from error, and negatively related to worrying about error and hiding error. Theoretically, mindful individuals are less reactive and defensive in the wake of errors because they have higher self-concepts and are both more self-compassionate and authentic. By studying mindfulness in the field this study surmounted the limitations of previous mindfulness research conducted either on students in laboratory studies (e.g., Hafenbrack, Kinias & Barsade, 2014), research that remained theoretical in nature (e.g., Glomb et al., 2011), and quantitative research that was not able to explore the phenomenological experience of participants. By attending to these issues, the internal and external validity of the study is strengthened to give more credence to the practical implications of this study.

Results found that mindfulness training increased mindfulness levels. This finding is aligned with existing research that has found that mindfulness training increases perceptions of how mindful individuals perceive themselves to be (e.g., Hülsheger et al., 2013; Meland, 2015).

While the study did not always reveal a direct link between mindfulness and learning from error, there were significant positive relationships found between mindfulness and both worrying about and hiding error. There were also several significant mediating relationships that were detected between mindfulness and error orientation for core self-evaluations, self-compassion, and authenticity suggesting that that these three constructs may offer promising prospects as mediators of other workplace relevant outcomes related to learning and defensive behaviours. Even the non-significant findings extend the literature, as clarifying mediators of mindfulness and workplace outcomes has been deemed worthy of further exploration by scholars in the field (Arch & Craske, 2006; Choi & Leroy, 2015; Shapiro, Carlson, Astin & Freedman, 2006). Relatedly, while many of the

hypotheses were rejected, these findings contribute to an understanding of how core self-evaluation, self-compassion and authenticity may predict the different dimensions of error orientation.

It could be argued that mindfulness training is an ineffective means of error management training since there were no significant relationships found between mindfulness and learning from error, an important aspect of error training theoretically and practically speaking. Yet, while there was no main effect, the confirmation of core self-evaluations and authenticity as partial mediators of the relationship between mindfulness and learning from errors is interesting as it suggests that mindfulness training bolsters other characteristics that indirectly impact error orientation. The qualitative data offered additional insights about how workplace mindfulness training might influence the generation of more positive responses to error. Interviews revealed that mindfulness training appears to develop emotion regulation skills, a capacity to better manage emotional reactivity, and an ability to see a situation with a wider perspective. One participant shared an anecdote that while she initially felt defensive when her manager pointed out an error, she took a moment to collect herself by taking a few breaths before responding to her manager such that their overall interaction was more productive than if she had responded immediately. This less emotional interpretation of errors suggests that the error is more likely to be reframed such that errors can be acted on in a manner that does not originate from a defensive or shameful experience.

Relatedly, another participant noted that when she pointed out mistakes to her own staff, she now took great care to engage in some perspective taking so that she could deliver the message more gently to the recipient. Given the importance of high cognitive functioning in high performance and complex environments like health care, this study shows how cognition, attitudes, and interpersonal interactions can be impacted by effectively managing one's emotional reactions. Additionally, by identifying the aspects of training that make a workplace program more efficacious, for example, making multiple sessions available for employees to attend, and by exploring how and when changes occur, this research extends the field's understanding of workplace mindfulness training and provides managers with some empirical data to guide their decisions about which training to implement for their organizations. Interviews also unveiled a wider set of effects from mindfulness training, for example, a sense that interpersonal interactions could be impacted when individuals were more present with their patients (or family members) thus improving the quality of their listening and the overall exchange.

5.1.1 Implications for Theory

Theoretically, this study attempted to integrate research from mindfulness and individual error orientation research to that suggest that how mindful one was would predict more optimal cognitive, emotional and behavioural responses to error and that this would occur through higher core self-evaluation, self-compassion, and authenticity. In an effort to contribute to research on why individuals have certain error attitudes, an area that has remained underdeveloped in the literature (Zhao & Olivera, 2006), this study provides more clarity on what predicts an individual's error orientation and how to cultivate positive error attitudes. Additionally discovering that some constructs were significantly related to certain dimensions of error orientation but not to others suggests that the dimensions of individual error orientation are quite distinct from each other. Considering each dimension on its own may be a valuable when conducting further research in this area.

It this vein, it is interesting to find that core self-evaluation was significantly and positively related to learning from error, but was not predictive of the other dimensions of error orientation. Surprisingly, self-compassion was significantly and positively related to worrying about error and hiding error, and not at all related to learning from error. This finding runs counter to what theory might suggest and in some ways, contradicts qualitative findings: in the interviews participants described being more open to errors once they acknowledged, in the spirit of common humanity characteristic of self-compassion, that everyone makes mistakes sometimes. Authenticity was significantly and negatively related to worrying about error and hiding error, as well as significantly and positively related to learning from error. It may be that finding ways to bolster core self-evaluation and authenticity, like fostering nurturing work environments that encourage employees to bring their whole selves to work, might be one way to support positive error orientation.

In this study no distinction was made along theoretical differences in the typology of error (e.g. slips, rule-based mistakes, and knowledge-based mistakes) or the error handling process (Bagnara & Rizzo, 1989; Reason, 1990). Yet, it is plausible that an individual's error orientation might be more richly understood by examining how one's proclivity to worry about error, hide error, or learn from error might be specifically related to different types of human error and how they are ultimately handled. Presently, neither Rybowiak et al.'s (1999) Error Orientation Questionnaire (EOQ) nor Schell's (2012) Error Orientation and Motivation Scale account for these typology distinctions and use language that refers to both errors and mistakes synonymously. Both measures are also highly ambitious in that

they examine cognitive, affective, and behavioural aspects within multiple stages of the error handling process (Bagnara & Rizzo, 1989; Reason, 1990).

Whereas existing research has focused on error management training as a means of teaching employees how to respond productively to error, this study offered mindfulness as another framework to view how error attitudes can be impacted. Relational Frame Theory (RFT) suggests that how an individual thinks or feels about errors in a particular context will drive their error response because ensuing actions are based on the preceding thought or emotion that has occurred (Hayes et al., 2001). If an individual were able to reframe how they think or feel about errors at work, then it would follow that their behavioural response would change in accordance with that thought or emotion. The qualitative findings suggest that mindful awareness supports a moment of pause that allows for one's initial error reaction to be observed and then reframed through a less defensive, or more solution oriented, lens. This reframing process follows RFT, which says that experiential acceptance of the initial experience (e.g., "ok, I just made a mistake") coupled with awareness of that experience (e.g. "I am embarrassed that I just made that mistake") is the first step towards changing the contexts that support a thought or emotion. When an individual detects an error but is unaware that he or she is experiencing thoughts or emotions that lead to avoidance behaviour, they do not change their behaviour because they believe their experience to be a stable fact that cannot be changed (Hayes et al., 1986). By pausing to bring attention to present moment experience and the realities of immediate situation an individual can begin reframing the context and more productive behavioural regulation (Hayes et al., 1986).

Finally, error management can be considered from the individual level to implement strategies that limit human error or from a multi-level approach that considers how the larger system (i.e. individual, task, group, organization) can be resilient to errors when they occur (Reason, 1997). Mindfulness training may be a program that supports error management in both of these components. By increasing self-awareness and the willingness to invest in self-care, for instance, mindfulness training may prevent the occurrence of errors at the individual level. Workers that notice increased focus or concentration from mindfulness training may also make fewer mistakes. From a systems outlook, imbuing individuals, groups, and the wider organizational culture with an open, curious stance towards errors provides an objective space for errors to be detected, discussed, and improved upon. There is, in fact, a group-level conceptualization of mindfulness referred to as *mindful organizing*. Mindful organizing is the collective capability to detect and correct errors and/or unexpected events (Weick et al., 1999) in

contexts that are technically complex, dynamic, interdependent and time pressured (Vogus, 2011). It refers to an organizational process that is pre-occupied with failure (Vogus, 2011) and directs attention and resources to anticipate and plan for error. Cultivating individual mindfulness, as it has been defined in this paper, may be a relevant attitudinal precursor to develop positive error orientations, error management cultures (van Dyck et al., 2005), and processes of mindful organizing.

5.1.2 Limitations

While best attempts were made to uphold the methodological rigour of the study, there were several notable limitations related to 1) survey measures, 2) data collection and 3) the mindfulness training intervention. Perhaps most paramount are the survey measures, in particular, the complexity of self-reported mindfulness. The downfalls of self-report measures, particularly in cross-sectional methodologies, have been noted by previous scholars who have suggested they are vulnerable to social desirability bias, recall bias, misinterpretation of the question, response tendencies (e.g. always selecting the central option) and systematic measurement error (Nisbitt & Wilson, 1977). While others have contended that longitudinal studies might yield more reliable conclusions that overcome these threats to self-report (Spector, 1994), this longitudinal study may not have surmounted the limitations of self-report measures. While mindfulness scores remained relatively flat over time for both participants in the no-treatment control conditions (T1 = 3.40, T2=3.41, T3=3.43) and the Pilates condition (T1 = 3.20, T2 = 3.32, T3 =3.37), mindfulness scores increased for those in the mindfulness condition depicting more mindful perceptions of self (T1 = 3.20, T2 = 3.32, T3 = 3.52). An alternate explanation might be that that as mindfulness training progressed, participants felt demand effects to merely report being more mindful despite not becoming more mindful. Implementing a social desirability control measure would be a valuable addition for future research.

This study may be subject to other additional forms of measurement error. Presently it is not certain whether formal and informal practice have the same effects on outcomes. Some studies have found that informal practices have no significant effects on changes in their dependent variables, for instance psychological distress (Carmody and Baer (2008), while others have found informal practices to be significant predictors of positive outcomes, for example sleep quality (Shapiro and colleagues (2003). Thus, there may be differences that the mindfulness training score does not capture between 1) a participant whom reported high scores of informal practice (e.g., applying mindfulness at work by being aware of the task at hand) but did not engage in formal practice (e.g. 10-minutes of breath awareness

meditation); 2) a participant that did not informally practice mindfulness but meditated for 30-minutes daily; 3) a participant that did attended every class but did not practice formally or informally; or 4) any combination of the three facets of mindfulness practice.

Self-compassion is another measure that may have confounded the study's findings. Theoretically self-compassion would be expected to increase over time with mindfulness training; however, scores reflected a flat (if not slight downward) trend over time in all three conditions (Mindfulness: T1 = 2.91, T2 = 2.6, T3 = 2.7; Pilates: T1 = 3.11, T2 = 2.92, T3 = 2.83; No-treatment: T1 = 3.05, T2 = 2.88, T3 = 2.94). This pattern in self-compassion exposes the possibility that self-compassion may decrease with more self-inquiry into the topic. First, an accurate assessment may be more a function of how self-aware one is and how willing they are to honestly report on their relationship with themselves. For all the time people spend being concerned about themselves (e.g. "what is my next career move?" or "what am I going to eat for lunch?"), often an individual's own self-talk can be quite critical or harsh (e.g., "I'm not good enough to get that job" or "I'm such an idiot"). While self-interest is a natural part of the human experience and at the very basic level the essence of survival, being kind to oneself can be quite difficult. Tara Brach (2003) contends that self-doubt and the constant drive to achieve more leave many people feeling like they are not enough as they are. She argues that learning to be kind, accepting and unconditionally loving of ourselves is a mindfulness practice of its own and that self-compassion takes time to understand and cultivate. In this way, self-compassion may not have increased over time as expected because as participants become more aware and open, they begin to realize how unkind they really are to themselves.

Secondly, the accuracy of self-rated self-compassion may fluctuate based on the extent to which participants understand what self-compassion really is. Self-compassion is complex and can be conflated with selfishness, self-indulgence, or self-pity (Neff & Germer, 2013). Therefore, it is possible that the participants' understanding of the self-compassion changes over time, or simply remains obfuscated. The inability to distinguish self-compassion from self-indulgence, for instance, may result in the downward trend in self-ratings or a general unwillingness to increase how one evaluates their level of self-compassion. Taking care of oneself and allowing oneself to put his or herself first may be a difficult and potentially undesirable quality, particularly in a healthcare setting where other-orientation and patient care is deeply embedded in the organizational culture. Finally, important to note is that in this data, the CFA results showed that the measurement of self-compassion only adequately fit the data. Future studies might consider using the full long-form of the measure, or the

full short-form measure, so that unreliable items can be removed from the analysis while still retaining a sufficient quantity of items to represent each facet.

A second category of limitations relates to the how much data were collected and/or lost due to error, and the overall confidence inferred about the veracity of these data. First, while pen/paper surveys and online surveys were intended to be identical, due to an error the personality measure (IPIP) and a question requesting participants to confirm the number of classes they attended was omitted on some versions of the online surveys. Many participants ended up preferring to complete surveys online rather than the paper/pen surveys alas, very few IPIP responses were collected. To address the lack of attendance data, which was essential to the analysis as number of classes was a component of the mindfulness training score, a follow-up email was sent out requesting participants to recall the number of classes they attended. Beyond the complications of recall bias alone, it is possible that participants inflated the number of classes they attended in an effort to appear more compliant with the study criteria.

Second, with respect to group-level characteristics, no data were collected linking participants to specific work groups or departments. Given the possibility that error culture might be influenced by group characteristics, this was a concern. Yet, all four hospital sites were under the management of the same CEO, whom was explicitly carrying out a culture wide campaign to raise safety awareness and improve the error management culture. This should further allay concerns that there would be wide differences between hospital cultures that would otherwise affect findings. Indeed, individual perceptions of their error culture, showed little variance across individuals (M = 3.52, SD = .57, Variance = .322). Indeed, 70% of participants rated their perceptions of error culture between a 3 or 4 and the remaining 30% of participants were evenly split between scores below 3 to 1.89 or above 4 to 4.89. While there is quite a wide range of variation at the individual level (1.80 to 4.89), the fact that 70% of the participants fell within a score of 3 to 4 suggests that perceptions of error culture at the organization are reasonably cohesive. While no measure of culture strength was taken throughout the study, given that the majority of participants reported an error culture score with little variation, it would seem that the measure of error culture perception as rated by individuals can be interpreted as reasonably representative of the organization as a whole.

Third, given the qualitative data found that participants perceived benefits to partaking in the mindfulness training, it should be noted that it is possible that there were researcher demand effects influencing participant responses. Furthermore, it may be that individuals

being interviewed embellished their stories because they enjoyed the human connectivity of speaking and being attentively listened to by the researcher. Loneliness has been called a modern workplace epidemic (Kileen, 1998) but has received very little scholarly attention (Ozcelik & Barsade, 2011). Finally, since only 45 out of the 93 mindfulness participants volunteered for interviews, it is plausible that those who volunteered were uncharacteristic of the sample capturing those participants that were most enthusiastic about a positive mindfulness training experience. Indeed, the fact that 100% of mindfulness interviewees reported some positive change from mindfulness training should encourage readers to interpret these results with some caution. It is highly probable that interviewees were prone to describing what they thought an ideal mindful response to error would be and it is difficult to ascertain the extent to which interviewees are truly and consistently enacting these mindful behaviours in the field. Despite this likelihood, the qualitative aspect of this study was crucial to understanding how mindfulness is trained and assessed, and how mindfulness training may impact life and work-related outcomes. Even if mindfulness does not produce monumental shifts in behaviour, simply understanding the concept of mindfulness and having a set of goal behaviours related to one's error response may bring individuals and organizations closer to the benefits of positive error orientation.

A final limitation may be attributable to the mindfulness training intervention used in this study given it employed a shortened version of MBSR adapted to the workplace. Here, participants met for one-hour per week and were assigned 10-minutes of formal home practice compared to a typical MBSR program that involves meeting for three-hours per week and being assigned 45 to 60-minutes of formal practice. Past research, however, suggests the length of the intervention should not be the causal factor for the negative mindfulness scores that this study discovered post-training. Khoury and colleagues (2013) found that the duration of classes and the amount of home practice does not consistently moderate the efficacy of mindfulness training. Other moderating factors to consider might be the amount of attendance (Khoury et al., 2013), the type of meditation practiced (Piron, 2001), how motivated the individual is to learn (Carmody & Baer, 2008), and how cohesive the group is over the training period (Imel, Baldwin, Bonus, & Maccoon, 2008).

MBSR is often attended in settings outside of work; however, this intervention was held during work hours at hospital site. Mindfulness training encourages exploration and acceptance of the total human experience as represented by thoughts, feelings, bodily sensations, and behaviours. The workplace, conversely, is largely an organization that functions on a cognitive level and often the role of emotions is under featured (Fisher & Ashkanasy, 2000), which may have restrictive implications for an emotional exploration of

error. It may be that mindfulness training is more effective in contexts where participants are able to more openly address emotions and not feel vulnerable should they need to act contrary to cultural norms of emotional expression or typical standards of professionalism. In support of the importance of mindfulness and context is a recent study on mindfulness and parenting that found that how mindful one is may vary by context rather than as a trait that can be generalized across all situations (Laurent, Duncan, Lightcan & Khan, 2016). In this way, it may be that mindfulness training at work would benefit from being highly contextualized to the specific work environment and its organizational culture rather than a broader training aimed at increasing dispositional levels of mindfulness.

Ultimately, this short-form of workplace mindfulness training appear to have been impactful. Of the 45 interviews, every person felt they had a positive experience and 25 people recounted anecdotes of substantive and meaningful change. For example, one parent shared that before the mindfulness training he used to rush his children through breakfast encouraging them to hurry up and finish their cereal while his mind wandered to the different meetings he had that day. After the training, he decided to savour their breakfast time together acknowledging that in the not too distant future his children would likely not want to spend time with him and that in the grand scheme of things, there was more to life than meetings at work. No participants in the Pilates condition described receiving benefits that occurred at this depth of transformation.

5.1.3 Implications for Future Mindfulness Intervention Research

Several important questions remain when considering how mindfulness interventions work. It remains unclear exactly how much practice, contact hours, and sessions are required to bring about changes in participants and further, how long these changes last. Carmody and Baer (2008) found that the amount of meditation practice time significantly predicted the decrease of psychological distress, $R = .30$, $F = 11.39$, $p < .01$; and an increase in mindfulness (measured by Baer and colleagues' (2006) Five Facet Mindfulness Questionnaire), $R = .42$, $F = 21.95$, $p < .001$. Indeed, the authors found that more practice was correlated with larger effect sizes, for example meditation practice had a .26 correlation with pre-post changes in perceived stress ($p < .01$) and a .42 correlation with psychological well-being ($p < .01$). More research along this trajectory, specifically in work contexts where training programs tend to be more condensed than the traditional 8-week MBSR protocols and on work-related outcomes, would benefit the field of organizational behaviour to further contextualize mindfulness in work settings.

When changes emerge from mindfulness training and why change occurs for some but not others are topics that also remain ambiguous at present. The qualitative findings in this study suggest that more time and exposure to the practices and concepts were beneficial; however, there was no obvious and reliable spike in value received over time that emerged from the data. Philosophically, there are arguments suggesting that mindfulness training depends on the readiness of the individual as characterized by the old adage "when the student is ready, the teacher appears". In the contemplative traditions, it has been said that unless the student is receptive, authentic spiritual transmission cannot take place (Tsong-Kha-pa, 2004). Authentic spiritual transmission requires a qualified spiritual teacher (a "right" teacher), to offer the teachings to a "right" student, one who is willing to devote themselves to the practice and is committed to developing the appropriate moral characteristics (e.g. faith, humility, compassion, patience, joy, generosity) (Tsong-Kha-pa, 2004). This suggests that a student must develop a certain amount of character before the teachings can be influential.

Mindfulness training may impact participants differentially for several reasons. It could be that the efficacy of mindfulness is a function of a person's intention coming into the training; someone who engages in mindfulness training for stress-reduction or self-exploration is likely to be more receptive to the training than someone who attends at their manager's request. Alternatively, there may be a developmental component to how impactful mindfulness training is because mindfulness practices require a certain amount of attentional control that improves over time with practice. Buddhist based mindfulness practices, like Shamatha mediation or Vipassana mediation for instance, describe such processes of progression. These traditions outline stages related to 1) developing attentional control and sustaining attention; 2) developing non-reactivity, clarity and stillness; and 3) developing equanimity, joy, and peace (Rinpoche, 2003). Transcendental Meditation, a particular meditation technique that focuses attention on a mantra that is silently repeated by the practitioner, also references progressive states of consciousness (Dillbeck & Orme-Johnson, 1987). While sleep, dreaming, and waking represent the first three states of consciousness, in this tradition the fourth state is described as pure or transcendental consciousness and requires practice to obtain (Cranson et al., 1991). Bringing these perspectives of cumulative learning effects together, it is possible that mindfulness develops in a non-linear fashion and further, that the effects of mindfulness on outcomes may depend on a progression of skills developed over time. Future research might explicitly measure individual abilities to focus and sustain attention over time to see if attentional capacity predicts changes in dependent variables. Additionally, tracking the

intention of participants that undergo training and whether the training is mandated or voluntary may shed more light on when or why mindfulness training is efficacious.

5.2   Conclusion

In high-reliability organizations, where errors of any kind can have grave consequences, ascertaining how individual error orientation can be optimized has much to offer the overall performance of the organization. This research aimed to contribute to a deeper understanding of the cognitive and affective components of error orientation to see whether and how mindfulness would relate to learning from error, worrying about error and hiding error. While survey results found mindfulness did not demonstrate any significant relationship to learning from error, being more mindful predicted less worrying about error and less hiding error. Interviews suggested that mindfulness training provided emotion regulation skills and access to wider perspectives so that the initial dismay of error detection could be overcome, ultimately facilitating more productive responses to error. In practice, managers and researchers might consider integrating more qualitative sources of information and more objective measures of mindfulness to inform their understanding of mindfulness at work. These might include interviews, journal entries, biomarkers (e.g. measuring cortisol levels or brain waves), third party observations of interpersonal interactions, and supervisor or subordinate ratings of behaviour.

Workplace training programs would be wise to implement training such that participants have an opportunity to translate conceptual knowledge into experiential understanding. The conflicting findings from this study suggest that there may be a gap between knowing what an ideal "mindful" response to error is, and actually enacting that response. Providing time in class to simulate or visualize mindful responses to error is one way to ground the conceptual into lived, contextual experience. Mark Divine, author of Unbeatable Mind (2014), applies mindfulness practices when training Navy Seals teams. He suggests that discussing specific scenarios and then visualizing one's ideal response to that scenario is an effective way of inculcating the lessons learned in class to the field. Another strategy to encourage a deeper experiential grasp of the material could be retrospectively discussing case examples of errors that have occurred within the organization and debriefing as group what a mindful response might be. Based on research that finds mindfulness depends upon the context (Laurent, Duncan, Lightcan & Khan, 2016), knowledge transfer would seem most promising if mindfulness applications were taught within cases and contexts reflective of participants' reality.

When attempting to increase learning from error, or decrease worrying about and hiding error, there may be alternatives to either error management training or mindfulness training. The findings from this study suggest that informal training and/or experiences that bolster self-concept and encourage authenticity at work may be an alternate means of producing positive error attitudes. Managers and researchers might further explore how experiences that might affect self-concept (e.g. managers that express recognition or gratitude vs. abusive supervision), or authentic functioning (e.g. diversity and inclusion programs) might predict error orientation. Since undesirable events, like error, are inevitable in work and life, developing the cognitive and affective resources that facilitate adoption of more open perspectives toward adversity has valuable implications for individuals and organizations.

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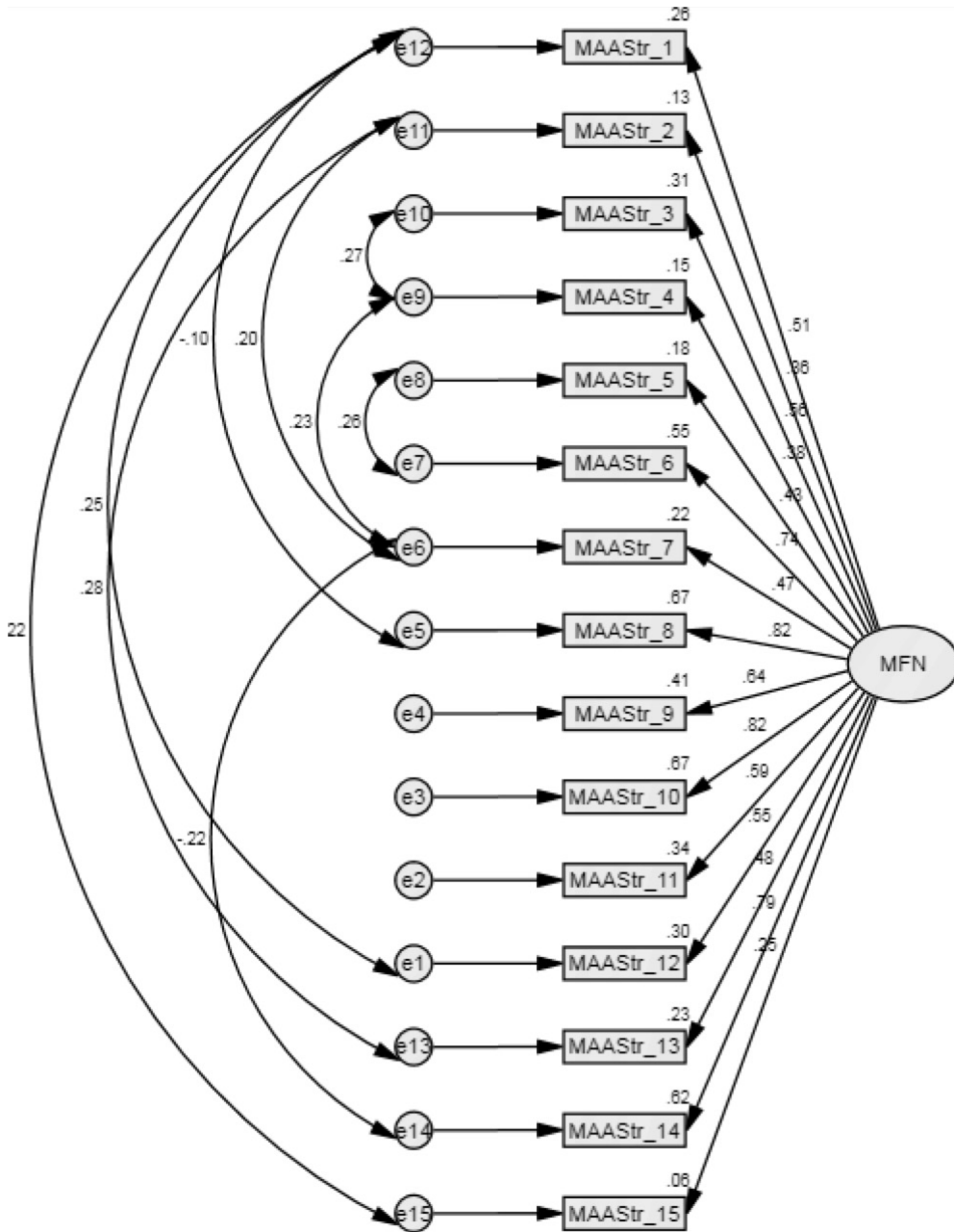
Appendices

Appendix A: Mindful Attention and Awareness Scale Items and Loadings

Below is a collection of statements about your everyday experience. From the options given, please indicate how frequently or infrequently you currently have each experience. Please answer according to what really reflects your experience rather than what you think your experience should be. Please treat each item separately from every other item.

Item	Standardized Loadings Single Factor Model
I break or spill things because of carelessness, not paying attention, or thinking of something else.	.510*
I find it difficult to stay focused on what's happening in the present.	.363*
I tend to walk quickly to get where I'm going without paying attention to what I experience along the way.	.560*
I tend not to notice feelings of physical tension or discomfort until they really grab my attention.	.384*
I forget a person's name almost as soon as I've been told it for the first time.	.428*
It seems I am "running on automatic", without much awareness of what I'm doing.	.739*
I could be experiencing some emotion and not be conscious of it until some time later.	.468*
I rush through activities without being really attentive to them.	.819*
I get so focused on the goal I want to achieve that I lose touch with what I'm doing right now to get there.	.643*
I do jobs or tasks automatically, without being aware of what I'm doing.	.817*
I find myself listening to someone with one ear, doing something else at the same time.	.587*
I drive places on 'automatic pilot' and then wonder why I went there.	.549*
I find myself preoccupied with the future or the past.	.481*
I find myself doing things without paying attention.	.787*
I snack without being aware that I'm eating	.252*

Appendix A-1: Mindfulness CFA

Fit Indices: RMR = 0.051; GFI = 0.918; RMSEA = 0.063

Appendix B: Core Self-Evaluations Items and Loadings

Below are several statements with which you may agree or disagree. Using the response scale below, indicate your level of agreement or disagreement with each statement.

Item	Standardized Loadings Single Factor Model
I am filled with doubts about my competence	.453*
Overall I am satisfied with myself	.769*
I am confident I get the success I deserve	.419*
There are times when things look pretty bleak and hopeless to me	.580*
Sometimes when I fail, I feel worthless	.469*
Sometimes I feel depressed	.501*
I determine what will happen in my life	.346*
I do not feel in control of my success in my career	.461*
Sometimes I do not feel in control of my work	.274*
I am capable of coping with most of my problems	.618*
I complete tasks successfully	.368*
When I try, I generally succeed	.330*

Appendix B-1: Core Self-Evaluations CFA

Fit Indices: RMR = 0.047; GFI = 0.925; RMSEA = 0.078
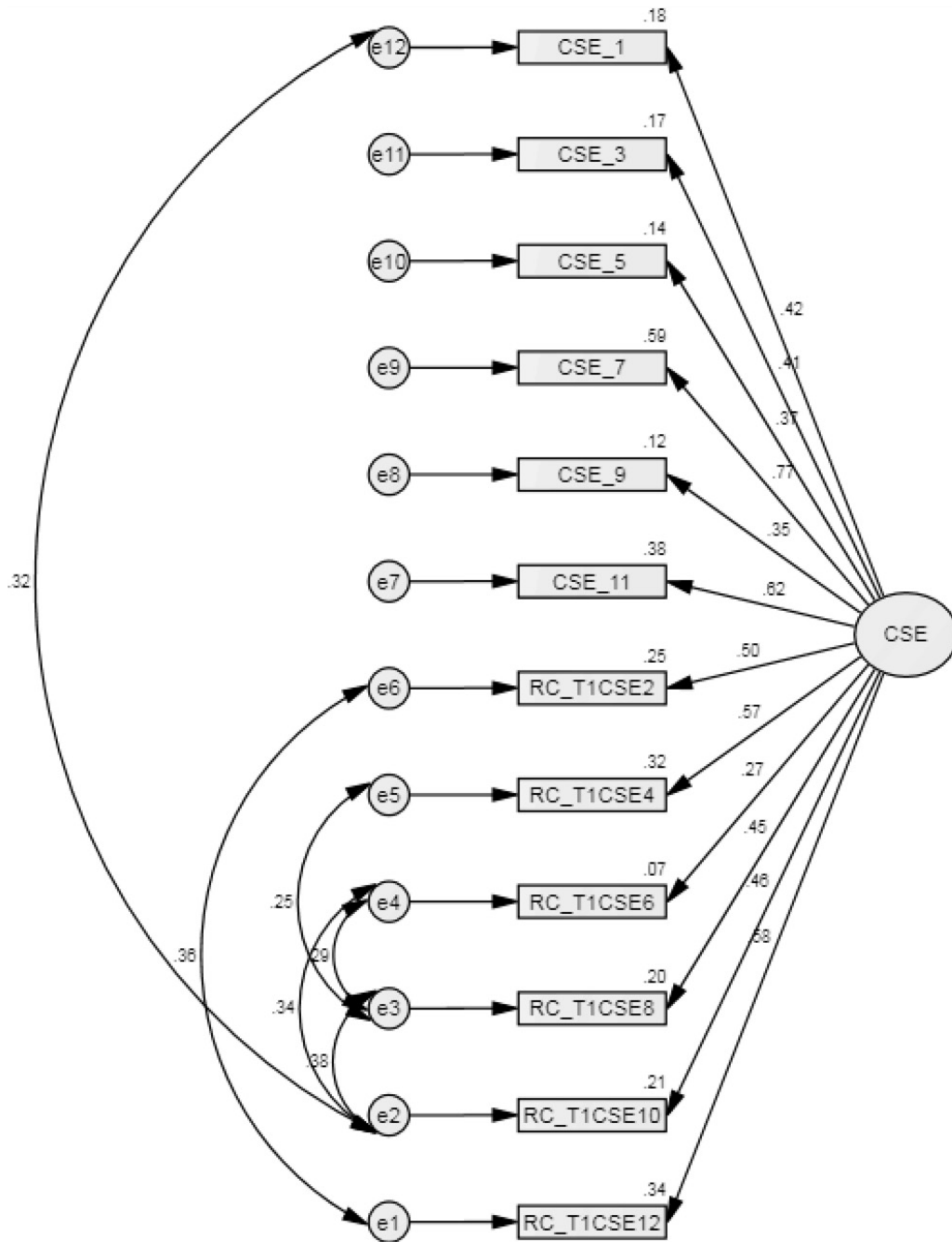
Appendix C: Self-Compassion Items and Loadings

Below is a collection of statements about your everyday experience. Please indicate how frequently or infrequently you currently have each experience. Please answer according to what really reflects your experience rather than what you think your experience should be. Please treat each item separately from every other item.

Item	Standardized Loadings Four Factor Model
Kindness	
I'm kind to myself when I'm experiencing suffering.	.860*
I try to be understanding and patient towards those aspects of my personality that I do not like.	.393*
When I'm going through a very hard time, I give myself the caring and tenderness I need.	.724*
Common humanity	
I try to see my failings as part of the human condition.	.573*
When I think about my inadequacies it tends to make me feel more separate and cut off from the rest of the world.	.454*
When I'm down and out, I remind myself that there are lots of other people who feel this way.	1.018*
Self-judgment	
I can be a bit cold-hearted towards myself when I'm experiencing suffering	.907*
When times are really difficult, I tend to be tough on myself.	.648*
When I see aspects of myself that I don't like, I get down on myself.	.454*
Isolation	
When I fail at something that's important to me I tend to feel alone in my failure.	.733*
When I'm feeling down I tend to feel like most other people are probably happier than I am.	.807
When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people.	.871*

Appendix C-1: Self-Compassion Four Factor CFA

Fit Indices: RMR = 0.069; GFI = 0.957; RMSEA = 0.59
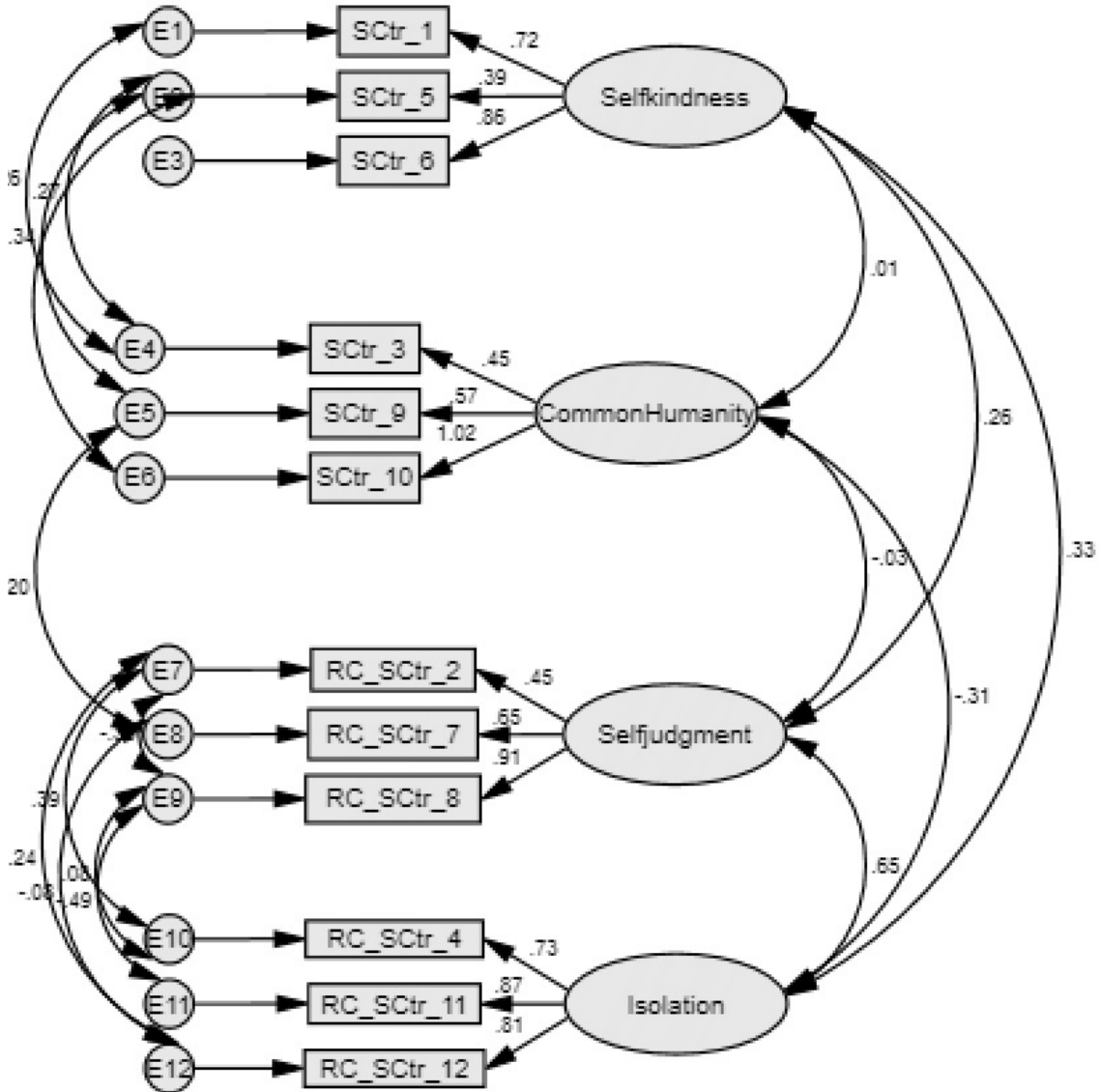
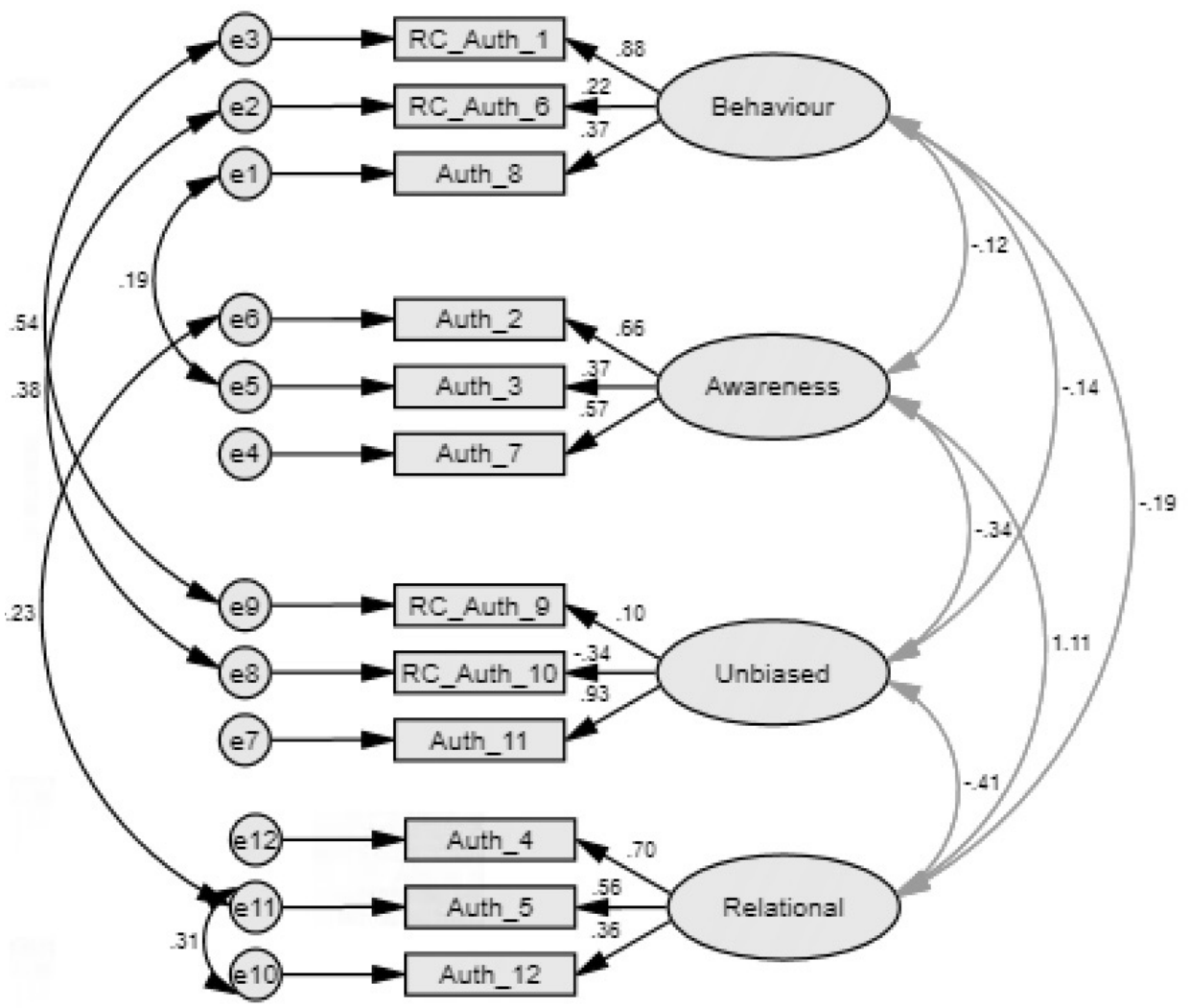## Appendix D: Authenticity Items and Loadings

Below are statements that involve people's perceptions of themselves. There are no right or

wrong responses, so please answer honestly. Use the following scale to indicate your level of agreement or disagreement with each statement.

Item	Standardized Loadings Four Factor Model
Behaviour	
I frequently pretend to enjoy something when in actuality I really don't.	.881*
I've often done things that I don't want to do merely not to disappoint people.	.219*
I find that my behaviour typically expresses my personal needs and desires.	.371*
Awareness	
I actively attempt to understand myself as best as possible.	.571*
I am aware of when I am not being my true-self.	.701*
I have a very good understanding of why I do the things I do.	.662*
Unbiased	
I often deny the validity of any compliments that I receive.	.925*
I often find that I am overly critical about myself.	-.339*
I try to block out any unpleasant feelings I might have about myself.	.100 (*p = .21*)
Relations	
My openness and honesty in close relationships are extremely important to me.	.355*
I want close-others to understand the real me rather than just my public persona or "image".	.564*
If asked, people I am close to can accurately describe what kind of person I am.	.701*

Appendix D-1: Authenticity CFA

Fit Indices: RMR = 0.069; GFI = 0.933; RMSEA = 0.08

Appendix E: Error Orientation and Motivation Scale Items & Loadings

Below are statements that involve people's perceptions of themselves. There are no right or wrong responses, so please answer honestly. Use the following scale to indicate your level of agreement or disagreement with each statement.

Item	Standardized Loadings Three Factor Model
Learning from errors	
I try to learn something from every error I commit.	.803*
I believe that most errors can be used to improve my performance on a particular task.	.851*
I apply the information that I learn from my mistakes to my future work.	.803*
Worrying about errors	
I usually feel embarrassed and foolish when I realize I have made an error.	.682*
I tend to feel a strong sense of concern about making mistakes no matter what I am working on.	.755*
Most of the time I feel really frustrated and angry when I make an error.	.595*
Hiding errors	
I do what I can to make sure that no one knows when I make mistakes.	.816*
I believe that error can do more harm than good to your reputation when others know about them.	.741*
I usually try to avoid discussions about my mistakes with my peers.	.755*

Appendix E-1: Error Orientation CFA

Fit Indices: RMR = .026; GFI = .967; RMSEA = .046
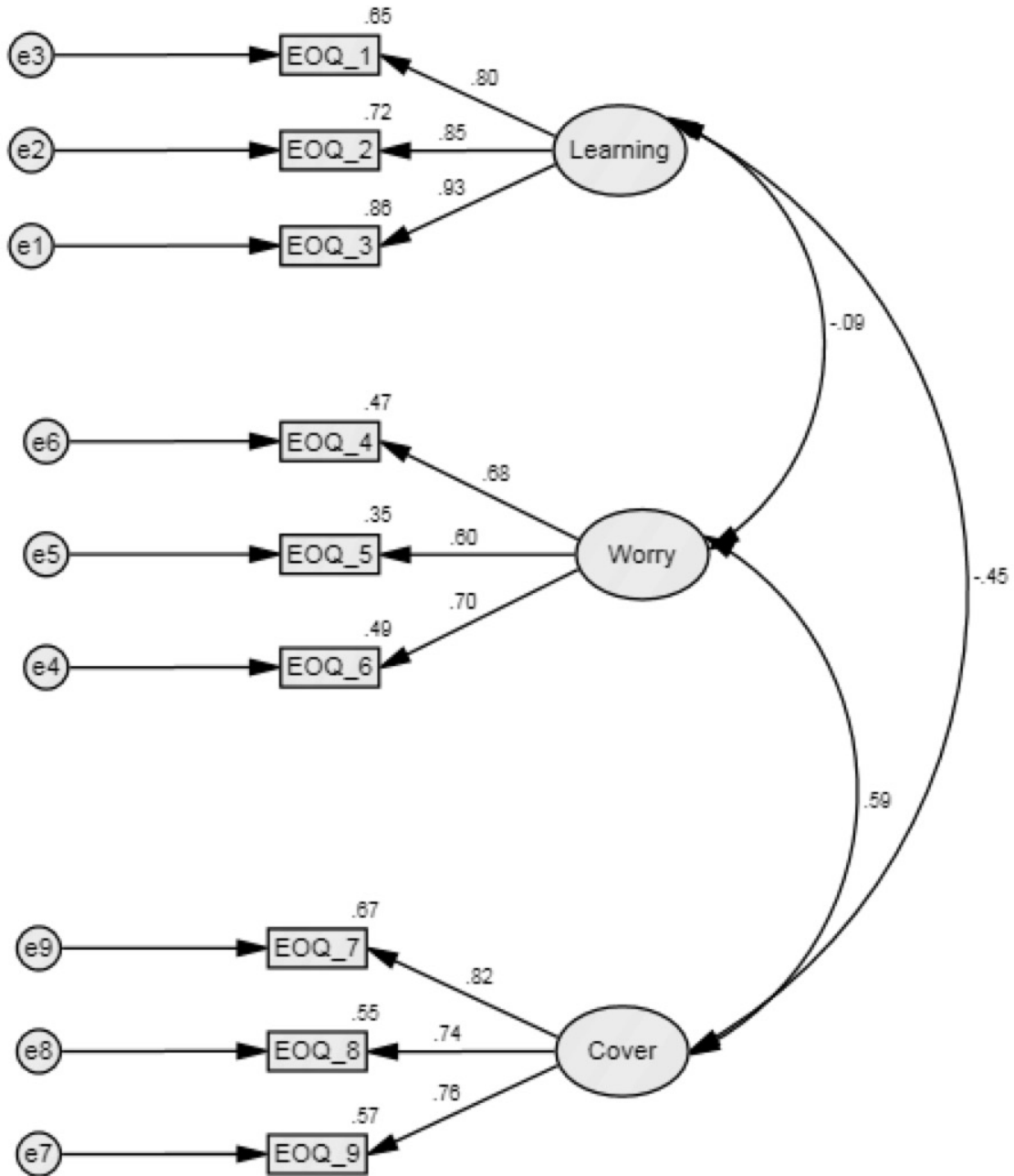
Appendix F: Error Culture Items & Loadings

The following statements reflect your perceptions of your work culture. Please rate to what extent you believe these statements apply.

Item	Standardized Loadings Two Factor Model
Error Management Culture	
After making a mistake, people in this organization try to analyze what caused it.	.678*
Our errors point us at what we can improve.	.773*
When an error has occurred, we usually know how to rectify it.	.584*
When people are unable to correct an error by themselves, they turn to their colleagues.	.293*
When people make an error, they can ask others for advice on how to continue.	.361*
Error Aversion (RC)	
In this organization, people feel stressed when making mistakes.	.557*
In this organization, people get upset and irritated if an error occurs.	.686*
Employees who admit their errors are asking for trouble.	.957*
It can be harmful to make your errors known to others.	.930*

Appendix F-1: Error Culture CFA

Fit Indices: RMR = 0.037; GFI = 0.941; RMSEA = 0.087
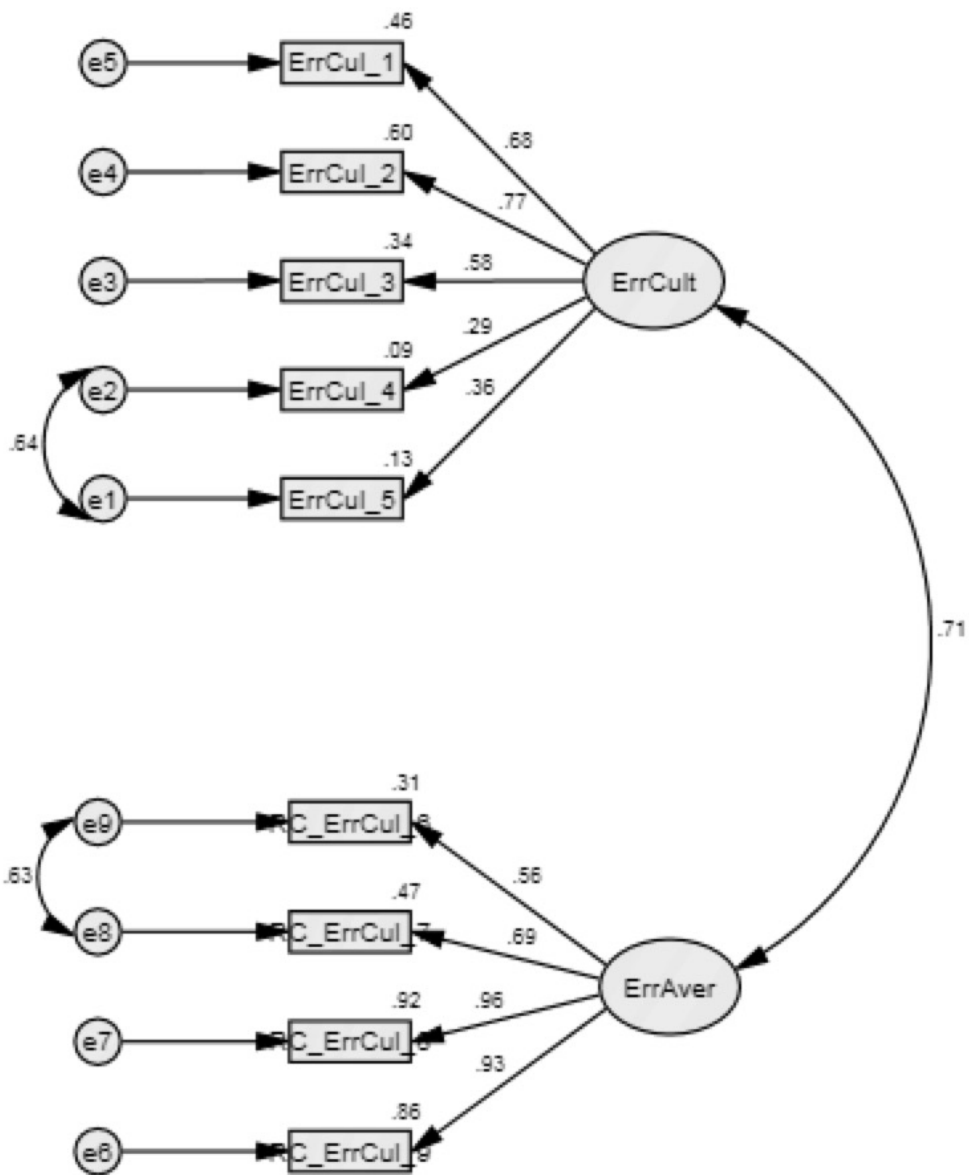
Appendix G: Defensive Silence Items and Loadings

Please describe your characteristic behaviour (spanning across time and situations) by responding to the following items below. When I realize I have made a mistake at work, I...

Item	Standardized Loadings Single Factor Model
Do not speak up and suggest ideas for change, based on fear.	.924
Withhold relevant information due to fear.	.743
Omit pertinent facts in order to protect myself.	.622
Avoid expressing ideas for improvements, due to self-protection.	.655
Withhold my solutions to problems, due to fear.	.702

Appendix G-1: Defensive Silence CFA

Fit Indices: RMR = 0.029; GFI = 0.964; RMSEA = 0.167
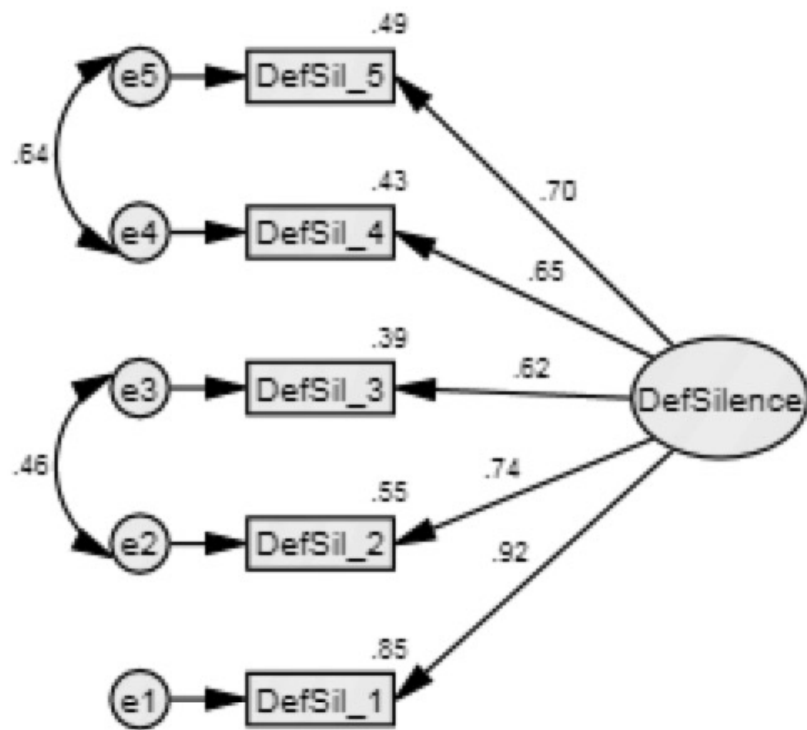
Appendix H: Personality (Mini IPIP) Items

Below are phrases describing people's behaviours. Please use the rating scale below to describe how accurately each statement describes you. Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself as there are no correct responses. I…

Am the life of the party

Sympathize with others' feelings

Get chores done right away

Have frequent mood swings

Have a vivid imagination

Don't talk a lot

Am not interested in other people's problems

Often forget to put things back in their proper place

Am relaxed most of the time

Am not interested in abstract ideas

Talk to a lot of different people at parties

Feel others' emotions

Like order

Get upset easily

Have difficulty understanding abstract ideas

Keep in the background

Am not really interested in others

Make a mess of things

Seldom feel blue

Do not have a good imagination

Appendix I: Demographic Items

What is your ethnicity?
○ Caucasian
○ East Asian
○ South Asian
○ Hispanic
○ African American
○ Middle Eastern
○ First Nations
○ Other

What is your gender?
○ Male
○ Female

Have you ever engaged in any sort of mindfulness practice?
○ Yes
○ No
○ Do not know

How old are you?
○ Under 24
○ 25 - 34
○ 35 - 44
○ 45 - 54
○ Over 55

How many years of experience do you hold in your occupation?

Appendix J: Additional Survey Items

In the past week, how often did you apply the techniques you learned from your training program?
❍ Never
❍ Rarely
❍ Sometimes
❍ Often
❍ Daily

In the past week, how many days did you engage in formal practice on your own?
❍ Never
❍ 1-2 day
❍ 3-4 days
❍ 5-6 days
❍ Everyday

If applicable, please describe an instance when you found the training helpful

If applicable, please describe the immediate reaction you had when you realized you made a mistake in the past week.

Please describe what value, if any, you received from participating in this study.

Please describe why you wanted to participate in this study.

Of the 8 sessions, how many were you able to attend?

Appendix K: Semi-structured interview plan

Contact and Scheduling:

Participants in the mindfulness and Pilates condition will be asked if they are willing to participate in interviews with Ellen Choi on the Letter of Information and Consent. Those that indicate that they are willing to be interviewed will be contacted and an interview will be scheduled at a time/location of their convenience. Interviews will be scheduled between week 3 and week 8 of the participant's session.

Statement read before interviews at the beginning of each interview:
Please be sure not to provide any identifying information in the interview as it will be audio-recorded, if you provided your consent for audio-recording. Should any identifying information be accidently disclosed, it will not be transcribed. Recordings will be transcribed and destroyed after transcription.

Questions:

- Please describe your experience in the training to date.
- What were your expectations going in to the training?
    - How have they been met, or not met, so far?
- What value, if any, have you received from the training?
    - How does the training benefit you?
    - Where and when do you notice these benefits?
- How do you apply the training in your day-to-day life?
- Please describe a recent experience where you've used the training.
- Please describe a recent error and how you responded.
- What does mindfulness/Pilates mean to you?
- What challenges have you experienced related to the training?
    - Please describe your discontents with the experience you've had so far.
- Please describe why you decided to participate in this study?

Appendix L: Recruiting Website

Appendix M: Recruiting Post on Wellness Website

Mindfulness and Performance

Participate in cutting edge research
Read more »

Read more…

The Wellness Centre is collaborating with researchers from the Ivey School of Business to study how employees can be more resilient in their work and life. Different wellness initiatives have been shown to improve resilience, reduce stress, enhance positive affect, and decrease anxiety and depression. Participants must be willing to be randomly assigned to a mindfulness training group, a Pilates group, or a no-treatment control group. The study is open to all employees and volunteers (18+ years) that are able to meet for one hour per week for 8 consecutive weeks, plus four hours one evening during the 8-week period. Participants will be asked to complete weekly questionnaires and a final questionnaire approximately 4-weeks after program completion. Additionally but of no necessity, participants will be invited to participate in an interview with the researchers. Any participant that wishes to receive mindfulness or Pilates training but does not get assigned to that group will be able to receive training at a later date.
There is no cost to participate in this study.

For more information, see: [website]

To enroll in this study or for any additional questions, please contact: [email]

Appendix N: Recruitment Email from Wellness Centre

The Wellness Centre is collaborating with researchers from the Ivey School of Business to study how employees can be more resilient in their work and life. Different wellness initiatives have been shown to improve resilience, reduce stress, enhance positive affect, and decrease anxiety and depression. Participants must be willing to be randomly assigned to a mindfulness training group, a Pilates group, or a no-treatment control group. The study

is open to all employees and volunteers (18+ years) that are able to meet for one hour per week for 8 consecutive weeks, plus four hours one evening during the 8-week period. Participants will be asked to complete weekly questionnaires and a final questionnaire approximately 4-weeks after program completion. Additionally but of no necessity, participants will be invited to participate in an interview with the researchers. Any participant that wishes to receive mindfulness or Pilates training but does not get assigned to that group will be able to receive training at a later date.

There is no cost to participate in this study.

For more information, see: [website]

To enroll in this study or for any additional questions, please contact: [email]

Appendix O: Recruitment Poster

PARTICIPATE IN A RESEARCH STUDY ON
RESILIENCE
IN WORK AND LIFE

The ▇▇▇ **Wellness Centre** is collaborating with researchers from the **Ivey** School of Business to study how employees can be more resilient in their work and life. Different wellness initiatives have been shown to improve resilience, reduce stress, enhance positive affect, and decrease anxiety and depression. Participants must be willing to be **randomly assigned** to a **mindfulness training** group, a **Pilates** group, or a **no-treatment control** group. The study is open to all ▇▇▇ employees (18+ years) that are able to meet for 1-hour per week for 8 consecutive weeks. Participants will be asked to complete weekly questionnaires and a final questionnaire approximately 4-weeks after program completion. Additionally, but not required, participants will be invited to participate in an interview with the researchers. **Any participant that wishes to receive mindfulness or Pilates training but does not get assigned to that group will be able to receive training at a later date.** There is **no cost** to participate in this study.

For more information, see: **resilience.▇▇▇esearch.ca**. To enrol in this study or for any additional questions, please contact **ellen.choi@▇▇▇esearch.ca.**

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124

Appendix P: Letter of Information and Consent

Note: Names and contact information have been removed for anonymity

<u>CONSENT FORM TO PARTICIPATE IN A RESEARCH STUDY</u>

Project Title: Building Resilience in Work and Life

Principal Investigator:
Co-Investigator and IVEY Principal Investigator:
Co-Investigator and IVEY Co-Investigator:

1. **Introduction**
   You are being asked to take part in a research study. Please read the information about the study presented in this form. The form includes details on study's risks and benefits that you should know before you decide if you would like to take part. You should take as much time as you need to make your decision. You should ask the study team by emailing [email] to explain anything that you do not understand and make sure that all of your questions have been answered before signing this consent form. Before you make your decision, feel free to talk about this study with anyone you wish including your friends, family, and family doctor. Participation in this study is voluntary.

2. **Purpose and Background of this Study**
   The purpose of this study is to learn about whether wellness programs build resilience in work and life. Current research suggests that wellness programs reduce stress but more research is needed to understand how different types of wellness programs impact stress and ultimately, resilience.

   You are being asked to participate because you have some interest in participating in a wellness program and you are an employee at the [hospital]. We will be comparing how these interventions (mindfulness and Pilates programs) influence resilience in work and life.

   Up to 300 employees will participate in this study. We anticipate it will take 1 year to complete data collection. While mindfulness and Pilates programs are currently offered through the Wellness Centre, no one has participated in this wellness intervention study.

3. **Eligibility**
   Participants who indicated that they are over 18-years old and are employees/volunteers are eligible to participate. All participants should be physically and mentally fit enough to participate in Pilates or mindfulness meditation exercises. If you are personally acquainted with the principal investigator or any co-investigators, you are not eligible to participate.

   If you are currently being treated for a psychological condition such as depression, eating disorder, drug/alcohol addiction, anxiety disorder, psychosis, schizophrenia, mania or any other psychological condition, OR you have frequent pains in your heart/chest, dizzy spells, or any condition that might require medical approval to exercise, please consult your personal physician and obtain their approval before signing up for the study.

4. **Study Procedures**

This is a randomized study. If you decide to participate you will be "randomized" into one of the study groups described below. Randomization means that you are put into a group by chance. It is like flipping a coin. You may not choose what group you will be in. You will have a 1 in 3 chance of being placed in any group. You will receive either an 8-week Pilates training program, an 8-week mindfulness training program, or an 8-week no-treatment/wait-list control group that receives no training. Again, you will not be able to choose which condition you are allocated to. Any participants who get assigned to the control group and wish to enroll in either the mindfulness or Pilates training program will have an opportunity to do so at a later date.

Participants will be asked to complete a series of surveys either on paper or through an online link that will be emailed to them. The final survey will be an online survey. All online surveys will be delivered through Qualtrics. As the Qualtrics servers are located in the United States, any information that you provide will be subject to the Patriot Act and will be accessible by the United States Government. Some of the questions may be of a personal and sensitive nature about your performance at work. Your participation in this study is wholly voluntary as such you may elect not to respond to any question or set of questions at your own discretion. Participants will also be invited to take part in an optional one-on-one interview with a member of the study team. If a participant agrees to be interviewed, they will have the choice of whether or not audio-recording or note taking will be permitted during the interview.

For the mindfulness and Pilates programs participation entails:
- Weekly one-hour meetings, and approximately 10-minutes of daily self-practice of the techniques learned in class for a total of approximately 16.5 hours of participation.
- There will be 8 site visits: one each week
- During the study, you will also be asked to complete a questionnaire at the beginning of each weekly session. The first and last week questionnaire will take less than 30-minutes to complete while the other surveys will take less than 5 minutes to complete. A final survey will be administered online 4 weeks after the completion of your program. If participants are unable to attend a weekly session, an online survey link will be emailed to them.
- The questionnaires will include statements about your perceptions, attitudes, and behaviours, including negative job performance behaviour, and asks you to rate your level of agreement with them. For example, "overall I am satisfied with myself", "I have a good understanding of why I do the things I do", and "I Intentionally worked slower than I could have worked".

For the no treatment/waitlist condition, participation entails:
- Completion of three questionnaires that take approximately 30 minutes each, for a total of 1.5 hours of participation.
- The first two questionnaires will be conducted in person onsite or online to establish a baseline and end of study visit at week 1 and week 8; a third questionnaire will be administered online to establish a post study assessment during week 12 of the study. If participants are unable to attend in person in week 1 or 8, an online survey link will be emailed to them.
- The questionnaires will include statements about your perceptions, attitudes, and behaviours, including negative job performance behaviour, and asks you

to rate your level of agreement with them. For example, "overall I am satisfied with myself", "I have a good understanding of why I do the things I do", and "I Intentionally worked slower than I could have worked".

A no-treatment control group is necessary to reduce the chances that any observed changes are due to the passing of time, or certain context effects taking place at work.

5. **Possible Risks and Harms**
   Taking part in this study has risks. Some of these risks we know about. There is also a possibility of risks that we do not know about and have not been seen in humans to date. Please contact the study team by emailing [email] or [email] if you have any side effects even if you do not think it has anything to do with this study.
   This mindfulness program of study is designed to help individuals learn mind and body awareness techniques to cope with physical or psychological symptoms from stress, chronic pain and illness and/or stress-related illnesses. Previous studies administering mindfulness training have used these meditations without encountering any known negative effects.

   The risks we anticipate may be related to the time consuming nature of the 8-week research program; however, the in-person training takes place within the participants' workplaces, and all measures have been made to provide a training program that is as autonomous and accessible as possible for participants to minimize such inconveniences. Furthermore, some of the items in the questionnaires may cause psychological discomfort such as anxiety, distress, embarrassment, or feelings of sadness.

   There are no right or wrong answers to these questions and we encourage participants to answer honestly. While multiple steps will be in place to protect the anonymity and confidentiality of the data, since you will be asked questions about your job performance behaviours it is possible that if your study information were to be identified, your employment/academic status could be affected. More on confidentiality is explained in this letter.

6. **Possible Benefits**
   You may or may not receive direct benefit from being in this study. Participants may benefit from the Pilates or mindfulness training in a myriad of ways related to their general health and wellness. Pilates is a mode of exercise that cultivates body awareness and builds core strength. Benefits of mindfulness programs have been conceptualized along four categories: physical wellbeing, mental wellbeing, behavioural self-regulation, and interpersonal relations. Those participants that are placed in the control group will have an opportunity to take either the Pilates or the mindfulness training at a later date.

7. **Compensation**
   There is no compensation for your participation. Any participants that get assigned to control condition and wish to take one of either the mindfulness program or Pilates program will be eligible to do so at no cost. There is no cost to participate in this study.

8. **Reminders and Responsibilities**
   It is important to remember the following things during this study:
   - Ask your study team about anything that worries you

127

- Attend all sessions to the best of your ability
- Comply with the home practice to the best of your ability
- Complete the questionnaires to the best of your ability
- Tell your study team if you change your mind about participating in this study

9. **Voluntary Participation**
    Your participation in this study is voluntary. You may refuse to participate, refuse to answer questions, refuse to participate in any interviews, or withdraw from the study at any time with no effect on your employment/academic status. You may decide not to be in this study, or to be in the study now, and then change your mind later. We will give you new information that is learned during the study that might affect your decision to stay in the study.

    Withdrawal From Study
    If you decide to leave the study, you have the right to request withdrawal of information collected about you. Please let your study team know. If you leave the study, the information that was collected before you left the study will still be used in order to help answer the research question unless you indicate otherwise. No new information will be collected without your permission.

10. **Rights as a Participant**
    If you are harmed as a direct result of taking part in this study, all necessary medical treatment will be made available to you at no cost. By signing this form you do not give up any of your legal rights against the investigators, sponsor or involved institutions for compensation, nor does this form relieve the investigators, sponsor or involved institutions of their legal and professional responsibilities.

11. **Confidentiality**
    Your responses are strictly confidential. We will only identify your responses based on your participant identification number. Only the researchers directly involved in the study will have access to the survey responses. The survey data will be stored in a secure database and will be destroyed no more than ten years after publication. If the results are published, your name will not be used. If you leave the study, the information that was collected before you left the study will still be used in order to help answer the research question unless you indicate otherwise. Representatives of the hospital's Research Ethics Board or Western University's Non-Medical Research Ethics Board may contact you or require access to your study-related records to monitor the conduct of the research.

    The study team will keep any personal health information about you in a secure and confidential location for 10 years. A list linking your study number with your name will be kept by the study team in a secure place, separate from your study file.

    Personal Information
    If you agree to join this study, the study team will collect only the information they need for the study. Personal information is any information that could identify you and includes your:
    - Name
    - Email
    - Occupation

- Ethnicity
- Age (no specific reference to date of birth required)

Study Information that Does Not Identify You
Some study information will be sent outside of the hospital to researchers from the Ivey School of Business at Western University, Canada. Any data about you that is sent out of the hospital will be in aggregated form. No identifying information will be shared outside of the hospital's research network; data will include a participant ID number and will not show your name, email address, or any information that directly identifies you.

The Study Team may use the study information and share it with its funding sources (MITACS and Sun Life-Ivey Canadian Wellness ROI study) or with national and international regulatory agencies to help answer the study question, and/or to develop future studies for research related to this study.

All information collected during this study, including your personal information, will be kept confidential and will not be shared with anyone outside the study unless required by law. You will not be named in any reports, publications, or presentations that may come from this study.

12. **Publication**
    If the results of the study are published, your name will not be used. If you would like to receive a copy of any potential study results, please contact [email].

13. **Funding Sources**
    This research is funded jointly by MITACS and Sun Life-Ivey Canadian Wellness ROI study. This research is conducted in collaboration with researchers from the Ivey School of Business at Western University, Canada.

14. **Conflict of Interest:**
    Sun Life-Ivey Canadian Wellness ROI study and MITACS will reimburse the hospital and researcher for the costs of doing this study. All of these people have an interest in completing this study. Their interests should not influence your decision to participate in this study.

15. **Questions About the Study**
    If you have any questions, concerns or would like to speak to the study team for any reason, please call a member of the study team: [name] or [name].

    If you have any questions about your rights as a research participant or have concerns about this study, call the Chair of the hospital's Research Ethics Board (REB) or the Research Ethics office number at [phone number]. The REB is a group of people who oversee the ethical conduct of research studies. The REB is not part of the study team. Everything that you discuss will be kept confidential.

    Please note that the security of e-mail messages is not guaranteed. Messages may be forged, forwarded, kept indefinitely, or seen by others using the Internet. Do not use e-mail to discuss information you think is sensitive. Do not use e-mail in an emergency since e-mail may be delayed.

    You will be given a signed copy of this consent form.

16. **Consent**
    Signing the following consent form indicates that this study has been explained to me and any questions I had have been answered. I know that I may leave the study at any time. I agree to the use of my information as described in this form. I agree to take part in this study.

    To be clear and in your best interest, signing this Consent Form does **NOT** waive any of the legal rights you are entitled to.

    If you agree to participate in a one-on-one interview with a member of the research team during the 8-week training program, please check this box. ☐

    If you agree to be audio recorded during the interview, please provide your consent by checking the box to the right. ☐

    If you agree to allow the researcher to take notes during the interview, please provide your consent by checking the box to the right. ☐

_____   _____   _____
Print Study Participant's Name   Signature   Date

_____
Study Participant's Email address (PLEASE WRITE LEGIBLY)

My signature means that I have explained the study to the participant named above. I have answered all questions

_____   _____   _____
Print Name of Person   Signature   Date
Obtaining Consent

Appendix Q: Debrief Letter

BUILDING RESILIENCE IN WORK AND LIFE

The specific purpose of this research is to determine how a mindfulness training program might impact the way leaders and employees approach error. Past research has found that mindfulness can increase self-compassion, self-concept, attention, focus, and authenticity. This research study sought to understand whether such increases in individuals would translate to more productive leaders and employees with more positive error orientations. It was necessary to wait until the end of the study to provide a full explanation of the purpose of the study because we did not wish to influence participant cognition and/or behaviour by exposing our hypotheses and specific mechanisms of interest. In this study we randomly assigned you to one of three groups: 1) an 8-week mindfulness training; or 2) an 8-week Pilates program; or 3) an 8-week control no-treatment group. This way we could attribute any differences in our collected measures to the different conditions of the control groups. If you are interested in this area of research, the following introductory sources are available at the library:

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*, 822-848.

Lakey, C. E., Kernis, M. H., Heppner, W. L., & Lance, C. E. (2008). Individual differences in authenticity and mindfulness as predictors of verbal defensiveness. *Journal of Research in Personality, 42*, 230-238.

Neff, K. D. (2003b). Self-compassion: An alternative conceptualization of a healthy attitude toward oneself. *Self and Identity, 2*, 85-102.

Reason, J.T. 1990. *Human error*. New York; Cambridge University Press.

Rizzo, A., Bagnara, S. & Visciola, M. 1987. Human error detection processes. *International Journal of Man-Machine Studies*, 27: 555-570.

Rybowiak, V., Garst, H., Frese, M., & Batinic, B. (1999). Error orientation questionnaire (EOQ): Reliability, validity, and different language equivalence. *Journal of Organizational Behavior, 20*, 527-547.

If you have any complaints, concerns, or questions about this research, please feel free to contact a member of the study team:

[name] or [name];
or the Research Ethics Board at [phone number/email]

Thank you again for helping us with this research.

Appendix R: Descriptives Table

Curriculum Vitae

Ellen Choi

PhD Candidate, Organizational Behavior
Richard Ivey School of Business
Western University, Canada
1255 Western Road, London, ON N6G 0N1

Educational History

Phd., Candidate	Western University, Canada
2013 – present	Richard Ivey School of Business
	Organizational Behaviour
	Supervisor: Dr. Alison Konrad
	Estimated completion 2017
MSc., Distinction	London School of Economics, England
October 2012	Institute of Social Psychology
	Supervisor: Dr. Alex Gillespie
	MSc Thesis: The Impact of the Physical Body on
	Attributions in Personnel Selection Decisions
B.Comm, Hons	Queen's University, Canada
May 2004	Queen's School of Business
Exchange Student	University of New South Wales, Australia
2004 – 2004	Kensington Campus

Main Research Interests

Mindfulness in Organizations
      Mindfulness and error orientation
      Mindfulness and performance outcomes under pressure
      Efficacy of mindfulness interventions in the workplace
Emotion Regulation
Intuition and Decision Making

Employment History

University of Western Ontario, DANMOS School of Business
Lecturer, Organizational Behaviour
2016 – Present, Toronto, ON

Taught a second year undergraduate course to 125 students (12 x 3 hour lectures); provided mentorship and guidance to students; grade assignments and exams. Topics included: leadership, ethics, justice, trust, job performance, stress, diversity, teams, motivation.

University of Toronto, School of Continuing Education
Instructor, Mindfulness & Teams
2016 – Present, Toronto, ON
Created a 16-hour course on how mindfulness facilitates the cognitive, affective, and behavioural processes related to team cohesion and performance. Topics included interpersonal relations, personal accountability, information sharing, productive conflict, diversity in teams, team efficacy, and psychological safety.

Dr. Cara Maurer, Western University
Research Assistant
2015 – Present, Toronto/London, ON

Dr. Cara Maurer, Western University
Teaching Assistant
2016-2016, London, ON
Observed class and graded assignments for an undergraduate course called Leading Change at the Ivey School of Business.

Publications

4. Sinclair, M., Tobias, J., Robinson, J., & Choi, E. (2017). More Dynamic than You Think: Hidden Aspects of Decision Making. *Administrative Sciences.*

3. Choi, E. & Tobias, J. (2016). SIOP Commentary - Mind the Gap: The Link Between Mindfulness and Performance Needs More Attention. *Industrial and Organizational Psychology*.

2. Dierynck, B., Leroy, H., Savage, G., & Choi, E. (2016). The Role of Individual and Collective Mindfulness in Promoting Occupational Safety in Health Care. *Medical Care Research and Review*.

1. Corti, K., Geddy, R., Choi, E., Gillespie, A. (2015). The Researcher as Experimental Subject: Using Self-Experimentation to Access Experiences, Understand Social Phenomena, and Stimulate Reflexivity. *Integrative Psychological and Behavioral Science*. DOI 10.1007/s12124-015-9294-6

Conference Presentations

7. Choi, E., Reb, J., Vogus, T., Tobias, J., Cameron, L., Kay, A., Hafenbrack, A., Sguera, F., Lyncnell, L. (2016, August). Mindfulness Research Methods: Different Approaches to Understanding Mindfulness in Organizations. Professional development workshop presented at The Academy of Management Annual Meeting, Anaheim, CA, USA.

6. Sinclair, M., Tobias, J.,.Choi, E., Ping, P., Maimone, F., Robinson, J.L. (2016, August). Innovative Approaches to Improving Organizational Decision-Making: Theory, Method, and Practice. Professional development workshop presented at The Academy of Management Annual Meeting, Anaheim, CA, USA.

5. Kim, G. and Choi, E. (2015, August). The Attenuating Effects of Trait Mindfulness on Episodic Envy and the Potential Mediating Mechanisms. Paper presented at The Academy of Management Annual Meeting, Vancouver, BC, Canada.

4. Choi, E., Rerup, C., Mahalingham, R., Leroy, H., and Kudesia, R. (2015, August). Mindfulness Research Methods: Different Approaches to Understanding Mindfulness in Organizations. Professional development workshop presented at The Academy of Management Annual Meeting, Vancouver, BC, Canada.

3. Choi, E., & Kay, A. (2015, April). Mindfulness, Ego Depletion and Task Performance. Paper presented at The Society for Industrial and Organizational Psychology Annual Meeting, Philadelphia, PA, USA.

2. Choi, E., & Reb, J. (2014, August). The Effects of a Corporate Mindfulness Intervention on Employees. Paper presented at The Academy of Management Annual Meeting, Philadelphia, PA, USA.

1. Corti, K., Gillespie, A., & Choi, E. (2013, August). Milgram's "Cyranic Illusion": A phenomenon and a tool. Presented at the 2013 Obedience to Authority Conference: Milgram's Experiments 50 Years On, Bracebridge, Canada.

Peer Reviewed Book Chapters

2. Choi, E. & Leroy, H. (2015). Methods of Mindfulness: How We Study Mindfulness at Work. In Reb, J. & Atkins, P. (Eds.) *Mindfulness in Organizations*. Cambridge, UK: Cambridge University Press.

1. Reb, J., & Choi, E. (2014). The Practice of Mindfulness in Organizations. In Singh, N. (Ed.). *The Psychology of Meditation*. New York, NY: Nova Science Publishers.

White Papers

1. Choi, E. & Rouse, M. (2014). Mindful Leadership: Cultivating Sagacity and Wisdom in the Workplace. Ivey Publishing: Richard Ivey School of Business, Western University.

Professional Service

Mindfulness
Ad-hoc Journal Reviewer, 2013 – Present

Journal of Occupational and Organizational Psychology
Journal Reviewer, 2016 – Present

Western University
PhDA Treasurer, 2015-2016
PhDA Co-Vice President Social, 2014-2015
PhDA Emergency and Safety Crew, Member, 2013 – 2014

Professional Affiliations

Academy of Management
Society for Industrial and Organizational Psychology

Grants & Awards

3. C.B. (Bud) Johnston Ontario Graduate Scholarship, Ivey Business School, Western University (2016-17). Ontario Graduate Scholarship, Province of Ontario, Canada (2016-17).
2. C.B. (Bud) Johnston Ontario Graduate Scholarship, Ivey Business School, Western University (2015-16). Ontario Graduate Scholarship, Province of Ontario, Canada (2015-16).
1. MITACS-Accelerate Graduate Internship, 2014-2016

References

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