ABSTRACT

Title of Thesis: MEASURING COLLECTIVE MINDFULNESS AND EXPLORING ITS NOMOLOGICAL NETWORK

Andrew Pierce Knight, Master of Arts, 2004

Thesis directed by: Professor Katherine J. Klein
Department of Psychology

Collective mindfulness was conceptualized as a prerequisite to achieving organizational reliability in the face of complexity and tight coupling. However, researchers have yet to measure collective mindfulness, precluding an assessment of its construct validity. In the current study I attempted to fill this gap by quantitatively measuring collective mindfulness and relating it to a number of characteristics and outcomes. I hypothesized that collective mindfulness can predict organizational reliability, with respect to safety and customer service quality. I also investigated the relationship between collective mindfulness and a number of constructs to begin assessing construct validity.

The results of survey data collected from 182 employees, 570 customers, and 330 supervisor reports of 51 community swimming pools suggested that collective mindfulness can be measured in an organizational context and used to predict safety and customer service quality. Further, I found collective mindfulness to be related in expected ways with a number of constructs.

MEASURING COLLECTIVE MINDFULNESS AND EXPLORING ITS NOMOLOGICAL NETWORK

by

Andrew Pierce Knight

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Advisory Committee:

Professor Katherine J. Klein, Chair
Professor Michele J. Gelfand
Professor Paul J. Hanges

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Measuring Collective Mindfulness and Exploring Its Nomological Network.

Contemporary organizations face a myriad of challenges in accomplishing their goals. To succeed, organizations must now contend with complex global markets, large-scale systems, and a hyperdynamic economic context, all which require organizational members to detect and manage unexpected events in a rapidly changing environment (Perrow, 1984; Roberts & Libuser, 1993; Turner, 1978; Brown & Eisenhardt, 1997; Weick et al., 1999). And, success is seemingly more important for organizations now than in the past. The potential severity and widespread consequences of failure in contemporary organizations, as evidenced recently by Enron and Worldcom, impose upon organizations an immense responsibility to operate reliably.

Two specific challenges that make reliable operation, or consistent avoidance of failure, difficult are organizational complexity and tight coupling (Perrow, 1984, 1999; Weick, Sutcliffe, & Obstfeld, 1999). A complex organization is one in which there is a high degree of interrelation among organizational components (Perrow, 1984). A tightly coupled organization is one in which components are directly linked, in a causal fashion, to one another (Perrow, 1984).

Some organizational researchers, such as Roberts (1993) and Weick (1987), have identified a set of organizations, known as "high reliability organizations" (HROs), that consistently avoid failure despite complexity and tight coupling. Weick and his colleagues (Weick et al., 1999; Weick & Sutcliffe, 2001) suggested that a plausible strategy for mitigating the risks of complexity and tight coupling is for organizations to create an organizational state of collective mindfulness. In an organization characterized by collective mindfulness, employees pay active, vigilant attention to their workplace and

communicate with each other about what they perceive (Weick et al., 1999). Employees in collectively mindful organizations scrutinize work situations and interrelate with other employees in heedful ways (Wecik et al., 1999; Weick & Roberts, 1993). They attend to potential errors and accidents and resist becoming complacent with work strategies. Rather than being content with existing strategies, employees continuously reevaluate and renegotiate ways of perceiving and managing complexity and tight coupling (Weick et al., 1999). Weick and his colleagues (Weick et al., 1999; Weick & Sutcliffe, 2001) hypothesized that collective mindfulness generates an enhanced organizational ability to detect and manage unexpected events, such as accidents or errors that threaten reliable operation.

Since its inception, the construct of collective mindfulness has garnered a considerable amount of scholarly attention. In conceptual analyses, organizational theorists have employed the construct to comment on a diverse range of topics, such as CEO bandwagon behavior (Fiol & O'Connor, 2003), innovation (Vogus & Welbourne, 2003), and organization change (Ramanujam, 2003). And yet, since its inception, collective mindfulness has been the focus of surprisingly little empirical research. Thus, very little is known about how collective mindfulness is actually manifest in everyday organizations. Moreover, very little is known about how the construct integrates with broader organizational theory.

In this thesis I attempt to add to the literature on collective mindfulness in four ways. First, I seek to address the lack of empirical research on collective mindfulness by quantitatively measuring it among lifeguards of community swimming pools, which I argue are environments characterized by complexity and tight coupling. Second, I test

Weick and his colleagues' (Weick et al., 1999; Weick & Sutcliffe, 2001) proposal that collective mindfulness is the result of five organizational processes: preoccupation with failure, sensitivity to operations, reluctance to simplify interpretations, deference to expertise, and commitment to resilience. To do so, I create survey measures of collective mindfulness and each of the five processes. Third, I investigate the relationship between collective mindfulness and organizational reliability, which I operationalize in terms of customer satisfaction, safety, and overall performance. Fourth, I begin to map the nomological network of collective mindfulness by exploring how it relates to a number of organizational constructs: climate for safety (Zohar, 1980, 2000), climate for service (Schneider, White, & Paul, 1998), climate for psychological safety (Edmondson, 1999; Baer & Frese, 2003), climate for initiative (Baer & Frese, 2003), loafing, and efficiency orientation. Measuring collective mindfulness and associating it with these constructs will help clarify its place in broader organizational theory.

In the sections that follow I discuss HROs and review theory and research on collective mindfulness. I then describe my research and results and, finally, discuss implications for future mindfulness theory and research.

High Reliability Organizations

In a seminal work, Perrow (1984) concluded from an investigation of the failure of Three Mile Island's nuclear power plant that organizations that operate high-risk technologies will inevitably suffer system-wide failure. He based this conclusion on the interdependent risks created by two characteristics inherent in these organizations: complexity and tight coupling.

Perrow (1984) defined complexity as a high degree of interrelation among the components of a system, evident in interactions that are "of unfamiliar sequences, or unplanned and unexpected sequences, and either not visible or not immediately comprehensible" (p. 78). Tight coupling similarly involves the interrelatedness of the organizational system; however, while complexity describes the quantitative aspects of intrasystemic connections, coupling describes the qualitative aspects of these connections. Tight coupling can be the result of a system connected such that actions in one part of the system rapidly and directly impact other parts of the system. Or, operations requiring invariant sequences can produce tight coupling, such that there is only one path for reaching a goal. A third antecedent to tight coupling in an organization is little slack in the system; if one thing goes wrong, the entire system is thrown off-balance (Perrow, 1984).

Challenging Perrow's assertion that complexity and tight coupling lead inevitably to failure, some organizational theorists (e.g., Roberts, 1990; Weick, 1987) argued that the severe consequences of failure in certain high-risk organizations demand error-free performance, called organizational reliability. Further, they argued that certain high-risk organizations are able to avoid failure despite complexity and tight coupling (Roberts, 1990). They directed attention to a number of high-risk organizations (i.e., air traffic control centers, nuclear power plants, and aircraft carriers) that consistently managed technological risks and called them "high-reliability organizations" (HROs). Based on their qualitative studies of HROs, researchers (e.g., Roberts & Libuser, 1993; Roberts & Bea, 2001) suggested that many organizations could operate high-risk technologies reliably by adopting certain practices and developing certain norms. For example, these

researchers suggested that HROs overcome complexity through frequent training, well-defined job roles, and clear lines of communication (Roberts, 1990; Bigley & Roberts, 2001) and overcome tight coupling through technological and human redundancy and hierarchical authority structures (Roberts, 1990; Weick, 1987). Researchers noted that employees in HROs are given a great deal of responsibility and are held accountable for their decisions and actions (Roberts, 1990; Roberts & Libuser, 1993; Bigley & Roberts, 2001). While useful in describing ways to overcome complexity and tight coupling with respect to high-risk technologies, the literature on HROs remained on the outskirts of organizational theory (Weick, et al., 1999), due primarily to the extreme circumstances of the organizations studied (Scott, 1994; Creed et al., 1993).

Weick et al. (1999) argued that HROs should be better incorporated with organizational theory because "they provide a window on a distinctive set of processes that foster effectiveness under trying conditions" (p. 82). Vogus and Welbourne (2003) also argued for better integration of the HRO literature with broader organizational theory, suggesting that many organizations, such as banks (Roberts & Libuser, 1993) and software firms (Vogus & Welbourne, 2003), "face conditions of tight coupling and interactive complexity in their organization-environment relations" (p. 884).

Thus, complexity and tight coupling should be conceptualized as two continua. All organizations face some degree of complexity and coupling, however some more than others. At the high extreme of the complexity continuum might be aircraft carriers, which face the challenge of coordinating multiple complicated tasks at any one time. At the low extreme of the complexity continuum might be a fruit picking organization, which manages a single task requiring little coordination among organization members.

At the tight extreme of the coupling continuum might be emergency surgery teams, whose actions directly and immediately impact the outcome of patients and in many cases are irreversible. At the loose extreme of the coupling continuum might be research teams in the behavioral sciences, who can take the time to plan their actions and can change the course of actions if necessary.

Although failure in more normal organizations generally does not result in the loss of human lives, as can happen if an HRO fails (Weick, 1993), Weick et al. (1999) argued that the consequences of failures of reliability should be considered relative to the activities being performed. So, for example, financial failures should be considered serious in banks (Roberts & Libuser, 1993) and product-development failures should be considered serious in innovative software firms (Vogus & Welbourne, 2003).

Safety and Customer Service Quality as Indices of Reliability

In this study, I argue that safety and customer service quality are important goals of many contemporary organizations, goals that require reliability with respect to safety and customer service quality. I argue that, by definition, safety and customer service quality cannot coexist with error, and thus both can be used as indices of organizational reliability. Furthermore, I argue that ensuring safety and satisfying customers inherently requires employees to overcome challenges of complexity and tight coupling to and detect and manage unexpected events. Thus, I suggest that safety and customer service quality provide a potential bridge between traditional HROs (i.e., power plants and aircraft carriers) and more ordinary organizations.

Safety as an Index of Reliability

Safety was the index by which researchers (e.g., Roberts, 1990) originally measured the reliability of HROs. This was due, in part, to the organizations that HRO researchers studied, such as aircraft carriers (Roberts, 1990), nuclear power plants (Weick, 1987), and air traffic control centers (Weick, 1993). Errors and accidents in these organizations generally resulted in serious injury or death (Roberts, 1990). So, the absence of errors in these organizations generally led to safe operation, which researchers used as the marker of high reliability. For example, Koch's (1993) measure of high reliability, intended to distinguish between HROs and other organizations, focused on safety as an index of reliability.

Ensuring safety is, in many ways, a complex and tightly coupled task (Roberts, 1990). It is a complex task because accidents can be the result of new combinations and interrelations among components of an organization, or among the relations between the organization and its environment (Perrow, 1984, 1999). Ensuring safety is a tightly coupled task because, in many cases, accidents happen swiftly. Once an accident happens, a chain of events can be set off that is impossible to reverse and/or difficult to stop (Perrow, 1984, 1999). Following the work of HRO researchers (Roberts, 1990; Weick, 1993; Bigley & Roberts, 2001), I contend that safety is a pertinent index of reliability.

Customer Service Quality as an Index of Reliability

Scholars (e.g., Schneider & Bowen, 1995; Lovelock, 2001) have noted that, for a variety of reasons, many contemporary organizations are interested in providing quality customer service. Research has shown that customer service quality is associated with

customer retention and long-term positive outcomes (Christopher, Payne, & Ballantyne, 1991). For service organizations, avoiding and adequately recovering from customer service errors is essential to ensuring positive financial growth and avoiding organization-wide failure. Thus, because customer service quality depends upon the avoidance of error, I argue that it is a meaningful index of reliability. Using customer service quality as an index of reliability provides a potential link between traditional HROs and more ordinary organizations. Strengthening this link, the characteristics that some organizational scholars (Schneider & Bowen, 1995; Lovelock, 2001; Schneider & White, forthcoming) ascribe to the task of customer service bear resemblance to the challenges of complexity and tight coupling. Schneider and White (forthcoming) described heterogeneity and inseparability as two characteristics of customer service that make it a challenging task.

The challenge of heterogeneity results from the distinctiveness of each service encounter (Schneider & White, forthcoming). No two service encounters can be exactly the same because customer service is an interactive process that depends upon employee responses to customer expectations and customer responses to employee actions (Schneider & Bowen, 1995). Lovelock (2001) noted that variability of operational inputs and outputs in customer service organizations makes consistency difficult to achieve. Heterogeneity makes providing quality customer service a complex task.

Schneider and White (forthcoming) defined inseparability as simultaneous production and consumption. Whereas tangible goods can be created and stored for later use, customer service is an interdependent process; customers evaluate, interpret, and use service concurrently with its production. Lovelock (2001) asserted that this characteristic

of customer service makes time a relatively more important factor for service organizations than for organizations producing tangible goods. Because the service product is produced and consumed simultaneously, there is no time for quality inspections (Lovelock, 2001). Inseparability tightly couples service organizations with their environments and their customers. I argue that customer service quality is a meaningful index of organizational reliability. Further, I argue that providing quality customer service is a task requiring organizations to overcome challenges of complexity and tight coupling.

Collective Mindfulness - A Solution for Complexity and Tight Coupling

Weick et al. (1999) proposed that collective mindfulness enables HROs to overcome the complexity and tight coupling inherent in their technologies. Collective mindfulness is the unit level analogue of Langer's (1989) construct of individual level mindfulness. Because collective mindfulness is conceptually distinct from Langer's (1989) individual mindfulness, but still is composed from individual responses, collective mindfulness can be referred to as a referent shift consensus model (Chan, 1998).

At the individual level, mindfulness represents "a heightened state of involvement and wakefulness or being in the present" (Langer & Moldoveanu, 2000, p. 2). Mindfulness is manifest in individuals in a number of ways. First, mindful individuals are highly sensitive to their environments (Langer & Moldoveanu, 2000). Second, mindful individuals are open to new information and different points of view, and they carefully consider context in processing information (Langer, 1989). Third, mindful individuals create new categories in which to classify incoming information, rather than relying on prior classifications (Langer, 1989; Langer & Moldoveanu, 2000). Fourth,

mindful individuals tend to focus on processes rather than outcomes (Langer, 1997), meaning that they attend closely to the steps involved in reaching a goal.

Collective mindfulness similarly involves a heightened state of involvement or being, but at the unit level. Mindful organizations have a collective awareness of detail that "facilitates the construction, discovery, and correction of unexpected events capable of escalation" (Weick, et al. 1999). Collective mindfulness is manifest in organizations in a number of ways. First, mindful organizations are extremely sensitive to fluctuations in their environments (Weick & Sutcliffe, 2001; Fiol & O'Connor, 2003). Second, mindful organizations continuously update their assumptions, perspectives, and classifications of events (Weick & Sutcliffe, 2001). Third, mindful organizations attend to and appreciate the importance of context (Weick & Sutcliffe, 2001). In these ways, collective mindfulness enhances an organization's ability to detect and manage unexpected events and, thus, minimize errors (Weick et al., 1999; Ramanujam, 2003).

Based largely on the qualitative research on HROs (e.g., Roberts 1990; Roberts, Stout, & Halpern, 1994; Bierley & Spender, 1995), Weick and his colleagues (Weick et al., 1999; Weick & Sutcliffe, 2001) suggested that collective mindfulness is the result of five processes: (1) preoccupation with failure, (2) reluctance to simplify interpretations, (3) sensitivity to operations, (4) commitment to resilience, and (5) deference to expertise (called underspecification of structures by Weick et al., 1999). In the sections that follow, I simplify Weick and his colleagues' (Weick et al., 1999; Weick & Sutcliffe, 2001) rather abstract conceptualizations of these processes to provide functional definitions to be used in developing survey measures.

Preoccupation with Failure

A preoccupation with failure is the belief that the system is flawed. It is a belief that errors and mistakes are both highly likely and potentially dangerous. Accordingly, it is a belief that complacency is risky. To counter complacency, employees must continually and carefully monitor operations for even the smallest of errors or mistakes. In HROs, a preoccupation with failure is manifest in a number of practices and procedures, such as rewarding employees for reporting errors (Roberts & Libuser, 1993; Roberts & Bea, 2001). Employees in HROs scrutinize any situation in which an error almost occurred (Weick, 1987; Weick & Sutlcliffe, 2001) and frequently evaluate the efficacy of standard operating procedures (Roberts & Bea, 2001).

Reluctance to Simplify Interpretations

A reluctance to simplify interpretations is a belief that the environment and the tasks of the organization are interactively complex. It is a belief that simplifying this complexity is risky; richness of information and interpretations must match the complexity of the environment. In HROs, a reluctance to simplify interpretations is manifest in a number of practices and procedures, such as constant interaction among organizational members with divergent perspective (Weick et al., 1999) and widespread organizational communication (Roberts, 1990). Furthermore, HROs value skepticism and promote diversity (Weick et al., 1999; Vogus & Welbourne, 2003).

Sensitivity to Operations

Sensitivity to operations is a belief that diverse information and viewpoints should be widely shared so that employees individually and collectively develop the big picture of current organizational operations (Weick et al., 1999; Weick & Sutcliffe, 2001). It is a

belief that individual and collective comprehension of the big picture, in the current moment, will facilitate error detection and prevention. Sensitivity to operations is manifest in HROs in the importance they assign to system-wide knowledge for all employees, regardless of hierarchical position (Roberts & Libuser, 1993; Bigley & Roberts, 2001). HROs encourage all employees to be aware of the big picture (Weick et al., 1999).

Commitment to Resilience

Commitment to resilience is a belief that all errors and mistakes cannot be prevented. It is the belief that once errors and mistakes occur, employees must quickly address and contain them to minimize their escalating consequences. In HROs, a commitment to resilience is evident in a number of practices and procedures, such as the formation of temporary problem-solving teams (Weick et al., 1999), training that exposes employees to new problems (Roberts, 1990), and acceptance of improvisational actions that fall in line with organizational goals (Weick et al., 1999; Bigley & Roberts, 2001).

Deference to Expertise

Deference to expertise is a belief that decisions should be made by those with the greatest relevant expertise, regardless of their hierarchical position (Weick et al., 1999). It is a belief that relevant expertise lies somewhere in the organization and can be applied to specific problems, if needed (Roberts & Libuser, 1993). In HROs, deference to expertise is evident particularly in times of trouble, when the pace of operations change and employees are faced with novel situations (Bigley & Roberts, 2001). At these times, ultimate decision-making power is given to employees with the most expertise (Weick et

al., 1999). During normal periods of operation, however, traditional lines of authority are followed (Roberts, Stout, & Halpern, 1994).

Weick and colleagues (Weick et al., 1999; Weick & Sutcliffe, 2001) hypothesized that these five organizational processes are antecedents of collective mindfulness. Weick et al.'s (1999) model, depicted as Figure 1, proposed that the five processes lead to collective mindfulness, which then leads to an enhanced organizational ability to detect and manage unexpected events. It is this ability that leads to organizational reliability.

The connection between the five processes and collective mindfulness has only been implicitly tested. In an empirical study of innovation activity in new software firms, Vogus and Welbourne (2003) provided an indirect, partial test of the connection between the processes and collective mindfulness, suggesting that human resources practices are the mechanisms by which three of these processes develop and lead to mindfulness. First, Vogus and Welbourne (2003) posited that organizations that use skilled temporary employees exhibit a reluctance to simplify interpretations because temporary employees bring heterogeneity and fresh perspectives. Second, they posited that organizations that have positive employee relations exhibit sensitivity to operations. Positive employee relations ensure open communication which encourages employees individually and collectively to develop accurate perceptions of the big picture (Vogus & Welbourne, 2003). Finally, they posited that organizations that emphasize training exhibit a commitment to resilience. Training prepares organizations for inevitable errors and mistakes (Vogus & Welbourne, 2003). While Vogus and Welbourne (2003) did not directly measure collective mindfulness or these processes, they found that these human resource practices are associated positively with innovative activity among young

software firms. Vogus and Welbourne (2003) reasoned that their findings provide implicit support for the link between collective mindfulness and reluctance to simplify interpretations, sensitivity to operations, and commitment to resilience. In the current study, I conduct the first explicit or direct test of Weick et al.'s (1999) hypothesis.

> *Hypothesis 1*: Together, preoccupation with failure, sensitivity to operations, reluctance to simplify interpretations, underspecification of structures, and commitment to resilience significantly predict collective mindfulness.

Collective Mindfulness and Swimming Pool Staffs

Community swimming pools provide an ideal setting in which to assess collective mindfulness, examine safety and customer service quality as indices of reliability concurrently, and begin to build a bridge between traditional HROs and ordinary organizations. First, the staffs of community swimming pools are charged with ensuring the safety of swimmers. Primarily, this task involves constantly monitoring the water to make certain that no swimmers are in danger of drowning. Monitoring the water is a complex task because, in most instances, the pool staff has no knowledge of customers' swimming abilities. Additionally, the number of swimmers in the water constantly fluctuates, as do weather conditions. Ensuring swimmers' safety is also a task characterized by tight coupling – accidents can happen swiftly and the actions of a pool staff can be directly related to outcomes. For example, a swimmer can easily slip and fall, or be injured when diving into the water. Thus, there is little slack in the system. Pool employees also must ensure that the pool water is chemically safe for swimmers. This is accomplished through monitoring of chemical levels in the water, which can frequently change based on the number of swimmers, the weather, and pool equipment.

If the water is dangerous, pool staff can alter its chemical make-up or restrict swimmers until the water is safe. The actions of pool staff directly have an impact on the safety of swimmers. Thus,while not at the extremes of the complexity and coupling continua, pool staffs must overcome challenges of complexity and tight coupling to ensure safety.

Second, the staffs of community swimming pools must work to satisfy the needs and desires of customers. To do so, employees must maintain a clean pool environment, including the pool itself, bathrooms and furniture. Additionally, employees must interact with customers respectfully, particularly when preventing them from swimming and/or playing in an unsafe manner. In many instances, employees also must provide swimming lessons and recreational classes, causing them to interact directly with customers who have different needs on a regular basis. As described before, providing quality customer service is a complex and tightly coupled task. Again, while not at the extremes of the complexity and coupling continua, pool staffs must overcome challenges of complexity and tight coupling to provide quality customer service.

Furthermore, failure to perform reliably in a pool setting can have serious consequences. On the one hand, safety failures can result in lawsuits, serious injury, and even death. On the other hand, service failures can result in decreased customer satisfaction, loss of customers, and financial failure of the pool management company. Such consequences preclude these organizations from passively reacting to environmental situations. Rather, employees must attend to and form their environment in a proactive way. Because the staff of a pool must contend with complexity and tight coupling, and there are serious consequences associated with errors, I assert that the staffs

of community swimming pools provide a potential link between traditional HROs and more ordinary organizations.

Weick et al. (1999) claimed that the enriched awareness of collective mindfulness improves an organization's capability to discover and manage unexpected events, which then leads to enhanced organizational reliability. As described before, in the context of community swimming pools, reliability is defined primarily by two organizational goals: safety and customer service quality. Failures of safety in swimming pools are essentially failures to detect and/or manage accidents (Reason, 1997). Accidents are characteristically unexpected events. Failures of customer service quality in swimming pools can be failures to detect and/or manage unexpected events; for example, failing to perceive and respond adequately to customer preferences (Skaggs & Huffman, 2003). Collective mindfulness should, therefore, enhance organizational reliability, with respect to safety and customer service quality.

Hypothesis 2: Collective mindfulness is positively related to safety.

Hypothesis 3: Collective mindfulness is positively related to customer service quality.

Correlates and Controls

Prior to the current study, collective mindfulness had not been explicitly measured in organizations and, thus, its nomological network is empirically unmapped. Understanding how collective mindfulness and other organizational constructs relate to one another is a necessary step in building construct validity (Hinkin, 1998). Furthermore, understanding how collective mindfulness and other organizational constructs relate to one another is essential to incorporating the construct into broader

organizational theory (Weick et al., 1999). In the current study, I explore the relationship between collective mindfulness and a number of seemingly related constructs, with the goal of better understanding its nomological network.

Climate for Safety

The HRO literature initially focused on understanding how to enhance organizational reliability with respect to safety. One of the most widely used predictors of organizational safety is climate for safety (Zohar, 1980, 2000; Hofmann, Morgeson, & Gerras, 2003). Climate for safety represents employees' shared perceptions about the importance of safety in their organization (Zohar, 1980). As discussed before, ensuring safety is a complex and tightly coupled task. Safety should thus be the result of an organization's ability to overcome challenges of complexity and tight coupling. Because climate for safety and collective mindfulness both concern overcoming complexity and tight coupling, I assert that they will be positively related. Because climate for safety is focused narrowly on safety, while collective mindfulness is more broadly focused on vigilant attention, I assert that the two constructs will be different. In predicting safety in community swimming pools, I control for climate for safety to provide evidence that collective mindfulness is a useful new construct.

Climate for Service

Climate for service represents "employee perceptions of the practices, procedures, and behaviors that get rewarded, supported, and expected with regard to customer service and customer service quality" (Schneider et al., 1998, p.151). Researchers (e.g., Schneider et al., 1998; Schneider, Montrose, & Salvaggio, 2003) have used climate for service to predict customer service quality, operationalized as customer satisfaction,

across a wide range of organizations, from banks (Schneider et al., 1998) to grocery stores (Schneider, Ehrhart, Mayer, & Saltz, 2004). As discussed before, providing customer service is a complex and tightly coupled task. Quality customer service should thus be the result of an organization's ability to overcome challenges of complexity and tight coupling. Because climate for service and collective mindfulness both concern overcoming complexity and tight coupling, I assert that they will be positively related. Because climate for service is focused more narrowly on customer service, while collective mindfulness is more broadly focused on vigilant attention, I assert that the two constructs will be different. In using collective mindfulness to predict customer service quality in community swimming pools, I control for climate for service to provide evidence that collective mindfulness is a useful new construct.

Climate for Psychological Safety

Edmondson (1999) conceptualized psychological safety at the team level as "a shared belief that the team is safe for interpersonal risk taking" (p.354). Psychological safety, Edmondson (1999) suggested, is essential in teams that seek, through collaboration, to generate creative solutions to novel problems. Baer and Frese (2003) proposed an extension of team psychological safety to the organizational level, calling it climate for psychological safety. Climate for psychological safety results from policies, practices, and procedures that establish the organization as safe for interpersonal risk taking (Baer & Frese, 2003). Organizations supporting a climate for psychological safety exhibit enhanced organizational learning and creative problem-solving (Baer & Frese, 2003). Because Weick et al. (1999) hypothesized that collective mindfulness would also be instrumental in generating solutions to novel problems, I assert that climate for

psychological safety and collective mindfulness will be positively related. However, the primary focus of collective mindfulness is vigilant attention, which is not a focal part of climate for psychological safety. Instead, climate for psychological safety focuses on interpersonal relations. Thus, I assert that climate for psychological safety and collective mindfulness will be conceptually distinct constructs.

Climate for Initiative

Climate for initiative represents "formal and informal organizational practices and procedures guiding and supporting a proactive, self-starting, and persistent approach toward work" (Baer & Frese, 2003, p.48). Baer and Frese (2003) claimed that climate for initiative is an essential component in organizational innovation and the implementation of novel processes and products. Climate for initiative seems to be conceptually similar to collective mindfulness; both involve vigilant participation in work tasks. Thus, I assert that climate for initiative and collective mindfulness will be positively related. However, a primary focus of collective mindfulness is vigilant attention towards the detection and management of error. This is not a focal aspect of the climate for initiative construct. Thus, I assert that collective mindfulness and climate for initiative will be conceptually distinct constructs.

Loafing

Weick et al. (1999) asserted that collective mindfulness requires that employees be vigilant, attend carefully, and be engaged in their work tasks. A mindful organization is characterized by active awareness of fluctuations and system complexities (Weick & Sutcliffe, 2001). By definition, employees cannot loaf and be collectively mindful at the

same time. Thus, I assert that collective mindfulness will be negatively related to loafing. Further, I assert that the two will be conceptually distinct constructs.

Efficiency

The literature on collective mindfulness and HROs suggests organizations achieve reliable performance under trying conditions by committing to reliability, even at the cost of short-term efficiency (Creed et al., 1993; Weick et al., 1999). Organizations that promote collective mindfulness should not be able to simultaneously promote short-term efficiency. I assert that collective mindfulness will be negatively related to an orientation toward efficiency. Because an efficiency orientation focuses primarily on speed and conservation of resources, which is not a focus of collective mindfulness, I assert the two will be conceptually distinct constructs.

Method

Sample and Procedures

Overview. To test the hypotheses and explore the nomological network of collective mindfulness, I studied community swimming pools staffed by a mid-Atlantic pool management company. The primary task undertaken by the staffs of swimming pools is lifeguarding. Other tasks include checking the passes of members, collecting money from non-members, cleaning restrooms and the pool area, ensuring that the pool water meets health requirements, providing recreational programs, and giving swim lessons. I collected anonymous survey data from employees and customers of 51 pools. Additionally, I obtained supervisor assessments of safety and customer service quality, which supervisors completed as part of normal organizational operations at these 51 pools.

Lifeguards completed survey measures of collective mindfulness and the five processes predicted to foster collective mindfulness, as well as climate for safety, climate for service, climate for psychological safety, climate for initiative, efficiency orientation, and loafing. With the exception of the climate for service scale, employees responded to all items on a 5-point Likert scale assessing the degree to which they agreed with each statement (1 = *strongly disagree*, 2 = *disagree*; 3 = *neither agree nor disagree*; 4 = *agree*; 5 = *strongly agree*). Employees responded to the items from the climate for service scale on a 5-point Likert scale assessing how they would rate various aspects of their organization (1 = *poor*; 2 = *fair*; 3 = *good*; 4 = *very good*; 5 = *excellent*).

Customers completed two, six-item survey measures: (1) their perceptions of the level of safety provided by the pool staff and (2) how satisfied they were with the customer service provided by the pool staff during the previous three months. Customers also reported the approximate number of times they had attended the pool throughout the previous three months. Customers responded to survey items on a 5-point Likert scale assessing the degree to which they agreed with each statement (1 = *strongly disagree*, 2 = *disagree*; 3 = *neither agree nor disagree*; 4 = *agree*; 5 = *strongly agree*).

I also obtained data from supervisor assessments of the safety and customer service quality provided by pool staffs. Supervisors made assessments as part of their normal duties approximately three times per week throughout the summer. Safety items focused on the chemical balance of the water and the presence of safety equipment/signs. Service items focused primarily on cleanliness of the pool area. Supervisors indicated whether staff performance in these areas was *excellent*, *good*, or *poor*. I coded these

three ratings as 1 = *poor*, 3 = *good*, 5 = *excellent* to create a response scale comparable to that used for the other measures.

Procedures. During the final month of normal, seasonal pool operation, I traveled to each pool and asked regular, on-site lifeguards to complete the employee survey. I assured employees of anonymity and confidentiality. I returned to pools, as necessary, to ensure that all regular lifeguards completed the survey. Each time I visited a pool, I approached all customers present and asked them to complete the customer survey, ensuring them of anonymity and confidentiality. One month following the closing of all pools at which I collected data, I obtained supervisor assessments from the pool management company. The assessments I used for data analyses were completed by supervisors during the time that I was collecting employee and customer data.

Sample Characteristics. The employee sample included 182 regular, onsite lifeguards from 51 pools. The number of lifeguards per pool ranged from three to seven, with a mean of 3.57 (*SD* = .92). Of the 184 employees I approached for participation, only two denied my request. Thus, the response rate for the sample of employees was 99%. The average employee age was 19.34. Fifty-seven percent of employees were female. Seventy-three percent of employees were White; 14% were Black; 5% were Hispanic; 2% were Asian, and 7% reported Other for ethnicity.

The customer sample included 570 customers from 51 pools, yielding a mean of 11.16 (*SD* = 3.04) customers per pool. The number of customers from each pool ranged from 10 to 31. Customers reported attending their pools an average of 24 (*SD* = 25.76) times throughout the previous three months. Of the customers I approached, 70% agreed to complete the customer survey.

The sample of supervisor assessments that I obtained from the pool management company consisted of 330 assessments from a total of 50 pools, yielding a mean of 6.6 (*SD* = 4.40) assessments per pool. I divided the items of these assessments into two categories, safety and customer service quality, based upon factor analyses to be explained later.

Measures

I used established measures of climate for safety (Zohar, 2000), climate for service (Schneider et al., 1998), climate for psychological safety (Baer & Frese, 2003), climate for initiative (Baer & Frese, 2003), and customer service quality (Schneider et al., 1998). As there are, to my knowledge, no established survey measures of the five processes of collective mindfulness I developed scales based on prior theory (Weick et al., 1999; Weick & Sutcliffe, 2001) and focus groups. I generated nine items to measure preoccupation with failure, eight items to measure reluctance to simplify interpretations, nine items to measure sensitivity to operations, nine items to measure commitment to resilience, and six items to measure deference to expertise. To refine these items, eight graduate students Q-sorted the items based on descriptions of the processes. Q-sorters used an "other" category if any items did not fit with any of the provided descriptions. After they had individually sorted the items, I met with all Q-sorters in a group to discuss discrepancies and improve the items. I eliminated items on which there was significant disagreement. This Q-sorting process reduced the total number of items for the scales of the processes of collective mindfulness to 37 from an original 41 items. Ultimately, as explained below and in Appendix A, I used 25 items to measure the five processes of collective mindfulness.

I also developed fourteen items to measure collective mindfulness, seven items to measure loafing, six items to measure efficiency orientation, and six items to measure customer perceptions of safety. I developed these items based on theory (Weick et al., 1999; Weick & Sutcliffe, 2001) and focus groups.

Below, I discuss the scales that I used for hypothesis testing, after eliminating items for low loadings on the factor of interest and/or unreliability. Appendix A presents the specific procedures that I used to refine the scales and eliminate ineffective items. Appendix A also provides the final items used and their loadings on one factor. I conducted all factor analyses and computed all values reported below at the pool-level of analysis.

Preoccupation with failure. I measured staff preoccupation with failure using six items. Sample items are "Employees here take even the smallest of errors seriously" and "Employees here report work-related mistakes that could have serious consequences, even if nobody else notices the mistake." An exploratory factor analysis (EFA) using principal axis factoring (PAF) revealed a one-factor solution, which accounted for 45.6% of the variance in the items. The internal consistency reliability of the preoccupation with failure score was .82.

Sensitivity to operations. I measured staff sensitivity to operations using four items. Sample items are "Employees here are encouraged to share pool-related information with each other" and "Employees here listen carefully to one another when talking about pool operations." An EFA using PAF revealed a one-factor solution, which accounted for 56.4% of the variance in the items. The internal consistency reliability of the sensitivity to operations score was .84.

Reluctance to simplify interpretations. I measured staff reluctance to simplify interpretations using two items. These items are "Employees here are encouraged the question the way things are usually done here" and "Employees here are encouraged to question decisions made by others." An EFA using PAF revealed a one-factor solution, which accounted for 66.9% of the variance in the items. The internal consistency reliability of the reluctance to simplify interpretations score was .80.

Deference to expertise. I measured staff deference to expertise using five items. Sample items are "Employees here are comfortable asking others with more experience for help" and "Important decisions at this pool are made by those with the most experience." An EFA using PAF revealed a one-factor solution, which accounted for 38.0% of the variance in the items. The internal consistency reliability of the deference to expertise score was .73.

Commitment to resilience. I measured staff commitment to resilience using eight items. Sample items are "Employees here are committed to solving any problem that arises" and "When a mistake is made, employees here are encouraged to limit any negative consequences." An EFA using PAF revealed a one-factor solution, which accounted for 47.6% of the variance in the items. The internal consistency reliability of the commitment to resilience score was .87.

Collective mindfulness. I measured staff collective mindfulness using seven items. Sample items are "Employees here feel the need to be alert at all times" and "Employees here are always on the look-out for problems that could be avoided." An EFA using PAF revealed a one-factor solution, which accounted for 61.0% of the

variance in the items. Internal consistency reliability of the collective mindfulness score was .91.

Climate for safety. I used five items from Zohar's (2000) climate for safety scale. Sample items are "As long as there is no accident, my superior doesn't care how the work is done (R)" and "My superior watches more often when a worker has violated some safety rule." An EFA using PAF revealed a one-factor solution, which accounted for 54.8% of the variance in the items. Internal consistency reliability of the climate for safety score was .84.

Climate for service. I used seven items from Schneider et al.'s (1998) measure of climate for service. Sample items are "How would you rate the overall quality of service provided by your business" and "How would you rate efforts to measure and track the quality of the work and service in your business?" An EFA using PAF revealed a one-factor solution, which accounted for 46.1% of the variance in the items. Internal consistency reliability of the climate for service score was .85.

Climate for psychological safety. To measure climate for psychological safety, I used two modified items from Baer and Frese's (2003) measure of climate for psychological safety. These items are "The employees here value others' unique skills and talents" and "As an employee here, one is able to bring up problems and tough issues." An EFA using PAF revealed a one-factor solution, which accounted for 77.4% of the variance in the items. Internal consistency reliability of the climate for psychological safety score was .87.

Climate for initiative To measure climate for initiative, I used seven items modified from Baer and Frese's (2003) climate for initiative scale. Sample items are

"Employees here actively attack problems" and "Whenever something goes wrong, employees here search for a solution immediately." An EFA using PAF revealed a one-factor solution, which accounted for 65.8% of the variance in the items. Internal consistency reliability of the score for climate for initiative was .93.

Loafing. To measure the extent to which employees loaf, I used six items that I developed. Sample items are "People here don't work very hard" and "Employees here spend a lot of time just hanging out." An EFA using PAF revealed a one-factor solution, which accounted for 51.9% of the variance in the items. The internal consistency reliability of the loafing score was .86.

Efficiency orientation. To measure the extent to which employees focused on efficiency, I used five items. Sample items are "Superiors here encourage us to do our tasks as quickly as possible" and "It is important to get work done quickly here." An EFA using PAF revealed a one-factor solution, which accounted for 31.6% of the variance in the items. Internal consistency reliability of the efficiency score was .69.

Customer perceptions of safety. To measure customer perceptions of safety, I used six items that I created. Sample items are "The staff of this pool makes it a safe place" and "The staff of this pool seems competent in dealing with safety issues." An EFA using PAF revealed a one-factor solution, which accounted for 74.0% of the variance in the items. Internal consistency reliability of the customer perceptions of safety score was .92.

Customer perceptions of service quality. To measure customer perceptions of service quality, I used six items from Schneider et al.'s (1998) customer satisfaction scale. Sample items include "The staff of this pool has a friendly, helpful attitude" and

"The staff of this pool treats patrons with the respect that they deserve." An EFA using PAF revealed a one-factor solution, which accounted for 76.8% of the variance in the items. Internal consistency reliability of the customer satisfaction score was .94.

Supervisor Assessments - Safety. Five of the items from the supervisor assessment scale indicated safety performance. Sample items are "Water Clarity" and "Daily Operating Records." An EFA using PAF revealed a one-factor solution, which accounted for 71.8% of the variance in the items. Internal consistency reliability of the supervisor assessment of safety score was .91.

Supervisor Assessments – Service Quality. Four of the items from the supervisor assessment scale indicated performance in the area of customer service. Sample items are "Bathroom Cleanliness" and "Trash Removed." An EFA using PAF revealed a one-factor solution, which accounted for 47.4% of the variance in the items. Internal consistency reliability of the supervisor assessment of service quality score was .76.

Aggregation of Individual Responses to the Pool Level

Each of the constructs measured in this study theoretically operates at a shared level (Klein & Kozlowski, 2000). That is, each represents behaviors, cognitions, or attitudes that pool staff members share. To justify aggregating each of these variables, as individually measured, to a shared "pool" level, I calculated the average $r_{wg(j)}$ and two forms of the intraclass correlation coefficient: ICC(1) and ICC(2). As a measure of within-group agreement, $r_{wg(j)}$ (James, Demaree, & Wolf, 1993) is an index of the level of agreement in responses among staff members of each pool (Bliese, 2000). In organizational research, $r_{wg(j)}$ values exceeding .70 have been viewed as providing acceptable justification for aggregation (Klein et al., 2000). Both forms of the ICC can

be interpreted as measures of consistency among the responses provided by pool staff members. The ICC(1) is similar to an index of interrater reliability (James, 1982) while the ICC(2) estimates the reliability of the group means (Bliese, 2000). The significance of ICC(1) values provides evidence for justifiable aggregation (Bliese, 2000). ICC(2) values equal to or above.70 justify aggregation, between .50 and .70 are considered marginal, and lower than .50 are considered poor (Klein et al., 2000). Aggregation indices for all variables are displayed in Table 1.

As can be seen in Table 1, average $r_{wg(j)}$ values for all of the variables exceeded .70, providing evidence of substantial within-group agreement. ICC(1) values for all variables exceeded .16 and were significant at the .01 level, further justifying aggregation. ICC(2) values were also supportive of aggregation, with seven variables having ICC(2) values greater than .70 and only one variable whose ICC(2) value is less than .50. Low ICC(2) values in this study could be due to the fact that ICC(2) is affected by the number and size of groups (Klein et al., 2000), which in this study were relatively small in the employee sample. Taken as a whole, the aggregation indices for these variables support aggregating all individual data to the pool level.

Results

Table 2 presents the means, standard deviations, and intercorrelations among all variables. All analyses were conducted at the pool level. With the exception of analyses using supervisor assessments, which only had a sample size of 50, the sample size for all analyses was 51. Below, I discuss the relationships observed among the pool staff variables to begin building the nomological network of collective mindfulness. Then, I discuss how the pool staff variables relate to the customer and supervisor assessments of

safety and customer service. Finally, I provide the results of regression analyses used to test the hypotheses.

Relationships Among the Five Processes of Collective Mindfulness

On average, there were moderate, positive intercorrelations among the five processes of collective mindfulness. The smallest observed relationship was between sensitivity to operations and reluctance to simplify interpretations ($r = .17$, ns). The largest observed relationship was between commitment to resilience and deference to expertise ($r = .61$, $p<.01$). The mean of the intercorrelations among the five processes was .38 (*SD* = .15), suggesting that these processes tend to coexist.

The correlations between each process and collective mindfulness were also positive and moderate to strong, on average. Collective mindfulness correlated most strongly with commitment to resilience ($r = .74$, $p<.01$) and least strongly with deference to expertise and reluctance to simplify interpretations ($r = .44$, $p<.01$). The mean of the correlations between the five processes and collective mindfulness was .55 (*SD* = .13).

To further investigate the interrelationships among the five processes of collective mindfulness, I conducted a Velicer's Minimum Average Partial Correlation Procedure (MAP) on the correlation matrix of the items used to measure these processes. This procedure is an effective means of discovering the number of meaningful factors that underlie a number of variables. Unexpectedly, the results of this analysis indicated that three factors, not five, best explained the relationships among the items. So, I conducted an EFA using PAF with oblimin rotation to examine the how the items loaded on three factors. A three-factor solution accounted for 48.0% of the variance in the items. As can be seen in Appendix B, the pattern of loadings of the items on three factors was not

interpretable. The first factor ($\lambda_1 = 5.71$) seemed to represent a combination of deference to expertise (two items), commitment to resilience (four items), and reluctance to simplify interpretations (one item). The second factor ($\lambda_2 = 4.43$) seemed to represent preoccupation with failure (five items), however one of the deference to expertise items also loaded on this factor. The third factor ($\lambda_3 = 5.57$) seemed to represent sensitivity to operations (four items) and commitment to resilience (three items). The first factor was moderately associated with the second ($r = .341$) and third ($r = .362$) factors. The second and third factors were also moderately associated ($r = .219$).

Because the three factor solution was not conceptually interpretable, I conducted a second EFA using PAF with oblimin rotation, this time extracting four factors. The loadings of the items on four factors are presented in Appendix B. The four factors extracted were conceptually interpretable. The first factor ($\lambda_1 = 4.92$) represented problem-solving, merging items from the deference to expertise subscale and the commitment to resilience subscale. The second factor ($\lambda_2 = 4.14$) represented clearly represented preoccupation with failure. The third factor ($\lambda_3 = 5.35$) represented pool communication, with high loadings from all of the items from the sensitivity to operations subscale. The fourth factor ($\lambda_4 = 3.80$) clearly represented reluctance to simplify interpretations, with both items loading highly on this factor. The first factor was moderately associated with the second ($r = .27$), third ($r = .30$), and fourth ($r = -.29$) factors. The second factor was moderately associated with the third ($r = .17$) and fourth ($r = -.25$) factors. The third factor and the fourth factor were also moderately correlated ($r = -.29$).

One possible interpretation of this analysis is that Weick et al.'s (1999) conceptualization of five distinct processes is not meaningful. A second interpretation is that the items I developed did not accurately and/or completely tap Weick et al.'s (1999) constructs. Because this is the only study to date that has used survey methods to measure these constructs, future research is needed before conclusions can be drawn.

Collective Mindfulness and Correlates – Building the Nomological Network

Overall, collective mindfulness and the other pool characteristics correlated in expected ways. And, overall, EFA justified distinguishing between collective mindfulness and the other variables. Due to sample size restrictions, I was unable to conduct confirmatory factor analysis (CFA) to provide strong evidence for distinction between collective mindfulness and other constructs. However, the results that I report below from EFA provide descriptive support for distinction.

Collective Mindfulness and Climate for Safety. As expected, collective mindfulness and climate for safety were positively correlated ($r = .59$, $p < .01$). To further examine the relationship between collective mindfulness and climate for safety, I conducted an EFA using PAF with oblimin rotation on the items from the collective mindfulness scale and the climate for safety scale. An examination of the eigenvalues suggested that a two-factor solution, which accounted for 59.4% of the variance in the items was appropriate. The pattern of loadings provided evidence for the distinction between collective mindfulness and climate for safety. All items from the collective mindfulness scale had loadings greater than .40 on the first factor ($\lambda_1 = 5.314$) and all items from the climate for safety scale had loadings greater than .40 on the second factor

(λ_2 = 4.483). The two factors were strongly and positively related (r = .59), as expected. Appendix C presents the items and their loadings.

Collective Mindfulness and Climate for Service. Collective mindfulness and climate for service were positively correlated (r = .57, p< .01), as expected. I conducted an EFA using PAF with oblimin rotation on the items from the collective mindfulness and climate for safety scales to further examine the relationship between the two constructs. An examination of the eigenvalues supported the appropriateness of a two-factor solution, which accounted for 54.2% of the variance in the items. The patterns of loadings provided strong support for a distinction between these constructs. All collective mindfulness items loaded strongly on the first factor (λ_1 = 5.50), while all climate for service items loaded strongly on the second factor (λ_2 = 4.70). The two factors were strongly and positively correlated (r = .54). Appendix D presents the items and their loadings.

Collective Mindfulness and Climate for Initiative. As expected, pool staffs that reported high levels of collective mindfulness also reported high levels of climate for initiative (r = .76, p< .01). To further examine the relationship between collective mindfulness and climate for initiative, I conducted an EFA using PAF with oblimin rotation on the items from the two scales. A two-factor solution, accounting for 64.8% of the variance in the items, was most appropriate. The pattern of loadings supported distinguishing between collective mindfulness and climate for initiative. All climate for initiative items had high loadings on the first factor (λ_1 = 7.31) and all collective mindfulness items had high loadings on the second factor (λ_2 = 6.55). The two factors

were strongly and positively related (r = .69). Appendix E presents the items and their loadings.

Collective Mindfulness and Climate for Psychological Safety. Pool staffs that reported high levels of collective mindfulness also reported high levels of climate for psychological safety (r = .66, p< .01), as expected. I conducted an EFA using PAF with oblimin rotation on the items from the two scales to further examine the relationship between the two constructs. The pattern of eigenvalues indicated that a two-factor solution, accounting for 66.6% of the variance in the items, was most appropriate. The pattern of loadings provided support for the idea that collective mindfulness and climate for psychological safety are distinct constructs. All of the collective mindfulness items loaded highly on the first factor ($\lambda_1 = 4.92$), while the items from the climate for psychological safety scale loaded highly on the second factor ($\lambda_2 = 3.83$). The two factors were strongly and positively related (r = .64). Appendix F presents the items and their loadings.

Collective Mindfulness and Loafing. I anticipated that collective mindfulness would be negatively related to loafing. As Table 2 shows, pool staffs that reported high levels of collective mindfulness reported low levels of loafing (r = -.42, p< .01). To further examine the relationship between collective mindfulness and loafing, I conducted an EFA using PAF with oblimin rotation on the items from the two scales. A two-factor solution, which accounted for 58.3% of the variance in the items, was most appropriate. The pattern of loadings suggested that these are indeed distinct constructs, with all collective mindfulness items loading highly on the first factor ($\lambda_1 = 5.03$) and all loafing items loading highly on the second factor ($\lambda_2 = 3.75$). The relationship between the two

factors was, as expected, negative (r = -.35). Appendix G presents the items and their loadings.

Collective Mindfulness and Efficiency Orientation. I predicted that collective mindfulness would be negatively related to an efficiency orientation. Pool staffs that reported high levels of collective mindfulness reported low levels of efficiency orientation (r = -.34, p< .01). I conducted an EFA using PAF with oblimin rotation on the items from the two scales to further examine the relationship between collective mindfulness and efficiency orientation. The two-factor solution, which accounted for 53.4% of the variance in the items, was the most appropriate explanation for the relationships among the items. The pattern of loadings provided evidence for the distinction between efficiency and collective mindfulness, with the collective mindfulness items loading highly on the first factor ($\lambda_1 = 4.74$) and the efficiency items loading on the second factor ($\lambda_2 = 2.16$). The factors were moderately and negatively related (r = -.28). Appendix H presents the items and their loadings.

Correlations Among Dependent Variables

In aggregate, customer assessments of safety and customer assessments of service quality were highly, positively correlated (r = .85, p< .01). The high value of this relationship is likely due to the intertwined nature of safety and customer service in the pool setting. Customers likely see safety as one facet of the services rendered by the pool staff. The positive correlation between supervisor assessments of safety and supervisor assessments of service quality was less strong, though still significant (r = .37, p< .01).

Interestingly, customers' perceptions of safety and supervisors' perceptions of safety were not significantly correlated (r = .08). Similarly, customers' perceptions of

service quality and supervisors' perceptions of service quality were weakly correlated (r = -.01). It is likely that these measures are not related because supervisors focus on different aspects of safety and service than do customers. For example, the customer measure of service quality focuses on employee behaviors that can be observed by customers, while the supervisor measure of service focuses only on the cleanliness of the pool area. Although cleanliness depends upon employee behavior, it is not likely that customers would observe employees cleaning, as employees typically clean prior to the opening of the pool each day. In the same way, the customer measure of safety focuses on observable employee behavior, while the supervisor measure of safety focuses on legally mandated safety requirements, such as the posting of signs and the quality of pool water. Customers may not be aware of the importance of employee attention to these aspects of pool safety. Despite the weak correlation between employee and supervisor ratings, I will still examine how both ratings correlate with collective mindfulness, assuming that supervisors and customers have unique, but important perspectives on safety and service in the pool setting.

Pool Characteristics and Dependent Variables

There were a number of interesting relationships between employee characteristics and the dependent variables, safety and customer service quality. As expected, collective mindfulness was positively correlated with customer perceptions of safety ($r = .25$, $p < .10$) and customer perceptions of service quality ($r = .29$, $p < .05$). Surprisingly, collective mindfulness was not significantly correlated with supervisor assessments of safety ($r = .08$, ns) or supervisor assessments of service quality (-.01). Climate for initiative, as reported by employees, also was significantly and positively

related to customer perceptions of service quality ($r = .29$, $p < .05$). Unexpectedly, climate for service showed a weak relationship with customer perceptions of service quality ($r = .02$) and supervisor assessments of service quality ($r = -.09$). Similarly, climate for safety showed a weak relationship with customer perceptions of safety ($r = .08$) and supervisor assessments of safety ($r = .06$).

Regression Results

In Hypothesis 1, I predicted that preoccupation with failure, sensitivity to operations, reluctance to simplify interpretations, deference to expertise, and commitment to resilience would significantly predict collective mindfulness. As discussed before, the results of an EFA indicated that these processes may not constitute five distinct constructs, but rather three. Thus, in evaluating Hypothesis 1, I conducted two regressions. In the first analysis, I regressed collective mindfulness on the processes as conceptualized by Weick et al. (1999): as five distinct variables. Table 3 presents the results of this regression. The overall model was significant ($F = 17.17$, $p < .01$) and the five processes accounted for 65.6% of the variance in collective mindfulness. Two of the processes, commitment to resilience ($\beta = .50$, $p < .001$) and preoccupation with failure ($\beta = .34$, $p < .001$), accounted for the majority of prediction. The other three processes were not significant predictors in this model. As mentioned before, the correlation between commitment to resilience and collective mindfulness was high ($r = .74$, $p < .01$). Similarly, the correlation between preoccupation with failure and collective mindfulness was high ($r = .62$, $p < .01$). The other three processes were correlated with collective mindfulness below .50. These results provide mixed support for Hypothesis 1.

To further investigate Hypothesis 1, in light of the results of the EFA showing they are better conceptualized as four processes, I conducted a second regression. In this analysis I regressed collective mindfulness on the processes as indicated by the EFA: as four distinct variables. Table 4 presents the results of this regression. The overall model was significant ($F = 17.28$, $p<.01$) and the four processes accounted for 60% of the variance in collective mindfulness. The problem-solving process ($\beta = .25$, $p<.05$), preoccupation with failure ($\beta = .35$, $p<.01$), and communication ($\beta = .29$, $p<.05$) were all significant predictors of collective mindfulness, while reluctance to simplify approached significance as a predictor ($\beta = .19$, $p<.10$). These results provide support for Hypothesis 1, however they suggest that these processes, as measured, are best thought of as four distinct variables, rather than five. Overall, these two regressions provide support for the notion that these processes do indeed predict collective mindfulness. However, how these processes should be conceptualized is still unclear.

In Hypothesis 2, I predicted that collective mindfulness would be positively related to safety. I tested this hypothesis using two different measures of safety: customer perceptions of safety and supervisor assessments of safety. Table 5 reports the results of two models, one regressing customer perceptions of safety on collective mindfulness and the other regressing supervisor assessments of safety on collective mindfulness. In both cases, I controlled for climate for safety. When I used customer perceptions of safety as the dependent variable, I found that collective mindfulness ($\beta = .31$, $\Delta F = 3.14$, $p< .10$) approached significance as a predictor of safety. Climate for safety accounted for 1.0% of the variance in customer perceptions of safety. Collective mindfulness accounted for and additional 6.1% of the variance in customer perceptions of

safety, beyond climate for safety. When I used supervisor assessments of safety as the dependent variable, I found that collective mindfulness ($\beta = .15$, $\Delta F = .72$, ns) was not a significant predictor of safety. Climate for service did not account for any of the variance in supervisor assessments of safety. Collective mindfulness only accounted for 1.5% of the variance in supervisor assessments of safety, beyond climate for safety. Together, these results provide modest support for Hypothesis 2.

In Hypothesis 3, I predicted that collective mindfulness would be positively related to customer service quality. I tested this hypothesis using two different measures of service quality: customer perceptions of service quality and supervisor assessments of service quality. Table 6 reports the results of two models, one regressing customer satisfaction on collective mindfulness and the other regressing supervisor assessments of service quality on collective mindfulness. In both cases, I controlled for climate for service. When I used customer satisfaction as the dependent variable, I found that collective mindfulness ($\beta = .42$, $\Delta F = 6.36$, $p < .05$) was a significant predictor of customer service quality. Climate for service did not account for any of the variance in customer perceptions of service quality. Collective mindfulness accounted for 11.7% of the variance in customer perceptions of service quality, beyond climate for service. When I used supervisor assessments of service as the dependent variable, I found that collective mindfulness ($\beta = .38$, $\Delta F = .146$, ns) was not a significant predictor of customer service quality. Climate for service accounted for 1.0% of the variance in supervisor assessments of service quality. Collective mindfulness did not account for any additional variance, beyond climate for service, in supervisor assessments of service quality. Together, these results provide mixed support for Hypothesis 3.

Discussion

In this study, I quantitatively investigated the construct of collective mindfulness, along with some antecedents, correlates, and consequences. More specifically, I used survey methodology to measure collective mindfulness and the five processes that Weick and his colleagues (Weick et al., 1999; Weick & Sutcliffe, 2001) hypothesized lead to collective mindfulness. I proposed that collective mindfulness would be a significant predictor of organizational reliability, with respect to safety and customer service quality. Finally, I explored the nomological network of collective mindfulness by investigating its relationships with a number of other constructs – climate for safety, climate for service, climate for psychological safety, climate for initiative, loafing, and efficiency. I proposed that collective mindfulness would be positively related to the first four and negatively related to the final two. I also suggested that collective mindfulness is a distinct construct, distinguishable from the six constructs mentioned above. To test these propositions, I collected survey data from employees, customers, and supervisors of community swimming pools. Below, I summarize the results of the study and discuss some of its theoretical and practical implications. Then, I discuss some of the strengths and limitations of this research. Finally, I make suggestions for future research on collective mindfulness.

The Five Processes and Collective Mindfulness

Prior to testing the relationship between the five processes (preoccupation with failure, sensitivity to operations, reluctance to simplify, deference to expertise, and commitment to resilience) and collective mindfulness, I examined the interrelations among the five processes. Analyses suggested that, at least in the current study, these

processes do not constitute five distinct constructs, but rather four. Thus, in testing the relationship between the processes and collective mindfulness, I treated the processes both as four variables and as five variables. In the five variable analysis, I found that the overall model was significant; however two of the processes were most instrumental in predicting collective mindfulness. Specifically, commitment to resilience and preoccupation with failure were the most powerful predictors of collective mindfulness. Deference to expertise, reluctance to simplify interpretations, and sensitivity to operations were not significant predictors in the overall model. In the four variable analysis, I found that the overall model was also significant. Further, I found that all four composite processes were significant predictors of collective mindfulness.

The present study is the first to use survey methodology to measure employees' perceptions of these processes. One possible explanation of my finding that these processes do not constitute five distinct variables is that the items I developed did not adequately assess Weick et al.'s (1999) constructs. Despite my use of Weick and his colleagues' (Weick et al., 1999; Weick & Sutcliffe, 2001) conceptual work in developing the items, it is possible that my measures were construct deficient. A second possible explanation for my findings is that Weick et al.'s (1999) conceptualization of five distinct processes contributing to collective mindfulness is not entirely accurate. Perhaps these variables are better thought of as four variables. As this is the only study to date that uses survey methodology to measure the five processes or collective mindfulness, additional research is needed to evaluate these explanations.

The Predictive Utility of Mindfulness

Safety. I found mixed support for Hypothesis 2, which predicted that collective mindfulness would be positively related to safety. When I used customer perceptions of safety as the criterion, the predictive utilityof collective mindfulness approache d significance. But, when I used supervisor assessments of safety as the criterion, collective mindfulness showed no predictive power. These mixed results are understandable in light of the meager correlation (r = .08, ns) between supervisor assessments of safety and customer perceptions of safety. This low correlation could be because the focus of customer assessments of safety differs from that of supervisor assessments of safety. As stated before, customers likely make their judgments of safety based on the observable behavior of lifeguards, while supervisors make their judgments based on legally mandated requirements, such as the posting of signs and the quality of pool water. Customers may not be aware of the importance of employee attention to these aspects of pool safety.

Despite the differing foci of customer and supervisor assessments of safety, it was still surprising that collective mindfulness did not significantly predict supervisor assessments of safety. Perhaps the items from the supervisor assessment of safety scale do not tap facets of safety that require collective attention. For example, checking passes is generally a one-person job, as is completing daily operating records. Chlorine is either on-site or not on-site, and it may not be the responsibility of lifeguards to ensure the delivery of chlorine. Finally, the posting of signs is something that is generally done once and remains static. Thus, it is possible that collective mindfulness is not necessary for reliability with respect to one-person, stable tasks. That collective mindfulness

approached significance in predicting customer perceptions of safety, above and beyond climate for safety, suggests that collective mindfulness is important for reliability with respect to tasks characterized by complexity and tight coupling.

Customer service quality. Similar to my findings regarding safety, I found mixed support for Hypothesis 3, in which I predicted that collective mindfulness would be a significant predictor of customer service quality. Again, like my findings regarding safety, I found that collective mindfulness was a significant predictor of customer perceptions of service quality, but not of supervisor assessments of service quality. The correlation between the two criteria measures was meager ($r = -.01$). As stated before, the lack of relationship between the two criteria is likely due to differential foci. The customer measure of service focuses on employee behavior, while the supervisor measure of service focuses on the cleanliness of the pool area. Lifeguard attention to the cleanliness of the pool tile and the deck furniture occurs prior to the opening of the pool; customers may not see these actions. However, these issues still likely influence customers' experiences while at the pool.

Despite the differing foci of customer and supervisor assessments of service quality, it was surprising that collective mindfulness was not a significant predictor of supervisor assessments of service quality. Perhaps this finding is due to the rather static nature of the items on the supervisor assessment of service quality scale. The cleaning of the pool furniture, tile, and bathrooms typically only happens once a day – prior to opening or after the closing of the pool. Ensuring that trashcans are empty may require more attention, but emptying trashcans does not generally occur multiple times in a day. A second potential reason that collective mindfulness did not significantly predict

supervisor assessments of service quality could be that none of the supervisor assessment items have to do with employee-customer interactions. As defined before, customer service is tightly coupled and complex due to employee-customer interactions. Thus, perhaps collective mindfulness is not necessary in aspects of customer service that do not involve employee-customer interactions. That collective mindfulness was predictive of customer perceptions of service quality, which are grounded in employee-customer interactions, suggests that collective mindfulness is particularly important in organizations in which there is a high degree of employee-customer interaction.

Overall, I found that collective mindfulness is a useful predictor of customer perceptions of safety and service quality, but not supervisor assessments of safety and service quality. The discrepancy between customer and supervisor ratings likely is a result of differing foci of items, and could suggest that collective mindfulness is not necessary for static, one-person jobs. These results suggest that collective mindfulness is important for achieving organizational reliability despite complexity and tight coupling.

The Nomological Network of Collective Mindfulness

In addition to investigating the predictive utility of collective mindfulness, I explored the relationships between collective mindfulness and a number of organizational constructs. I found support that collective mindfulness is positively related to and distinct from climate for safety, climate for service, climate for initiative, and climate for psychological safety. I also found support that collective mindfulness is negatively related to and distinct from loafing and efficiency orientation. Together these results provide an initial description of how collective mindfulness fits in with broader organizational theory. Further, by showing that collective mindfulness relates in

expected ways to other constructs, these findings generate some initial support for its construct validity.

Implications

The results of this study suggest that collective mindfulness is a useful construct in predicting organizational reliability in the face of complexity and tight coupling. Further, these results support Weick and colleagues' (Weick et al., 1999) contention that collective mindfulness could serve as a much needed bridge between the traditional literature on HROs and broader organizational theory. More specifically, this study implies that collective mindfulness, which Weick et al. (1999) based on the findings of HRO researchers (e.g., Roberts, 1990; Weick, 1987), can significantly predict reliability with respect to safety and customer service quality in ordinary organizations – the staffs of community swimming pools. These findings cast some doubt on Scott's (1994) assertion that the HRO literature is too extreme or too exotic for application to normal organizational problems. In this study, I found collective mindfulness to be a better predictor of safety and customer service quality than climate for safety and climate for service, respectively. These findings may indicate that in complex and tightly coupled organizations employees must generate a certain level of collective attention, which can then be focused on particular goals such as safety or customer service quality. In all, these findings suggest that research on HROs can be applied to ordinary organizations with positive results.

The results of this study also suggest that some combination of preoccupation with failure, sensitivity to operations, reluctance to simplify, deference to expertise, and commitment to resilience contributes significantly to generating a high level of collective,

vigilant attention. In organizations pursuing reliability with respect to safety and customer service, it may be useful to encourage employees to focus on the potential for error, encourage a "big picture" orientation, embrace diversity and skepticism, emphasize expertise, and persist in solving problems.

So what is the "big picture" implication of this study? The findings of this study suggest that collective mindfulness is a useful construct. This study provides empirical support for the construct validity and predictive utility of collective mindfulness. Collective mindfulness may indeed be the mechanism by which organizations can achieve high organizational reliability despite challenges of complexity and tight coupling. This study suggests that in the context of community swimming pools, collective mindfulness is useful for predicting how customers perceive safety and customer service quality.

Strengths and Limitations

Strengths. This study makes a number of contributions to the literature on collective mindfulness. First, this study is one of few (e.g., Koch, 1993; Klein, Bigley, & Roberts, 1995) that use quantitative methodology to study organizational reliability. The literature on organizational reliability, in general, has been criticized for its reliance on qualitative methodologies (Scott, 1994; Creed, Stout, & Roberts, 1993). Those studies (e.g., Koch, 1993; Klein et al., 1995) that have used quantitative techniques to study organizational reliability have generally done so within one organization, using a case-study approach. In this study, though, I used quantitative techniques to examine organizational reliability across a sample of 51 pools. Thus, my methodology fills a gap in the HRO literature and begins triangulating upon prior findings.

A second strength of this research is the development of survey measures of collective mindfulness. As collective mindfulness is a relatively new construct, there are no existing survey measures and, thus, little empirical research has been conducted on the construct. The scales that I have developed provide an initial understanding of how collective mindfulness operates in organizational contexts. Further, by measuring collective mindfulness, I was able to relate it to a number of other organizational constructs. So, this research contributes to the literature on collective mindfulness by beginning to explore its construct validity. The scales that I have developed in this study can be used in future research on collective mindfulness. Having measures of collective mindfulness is essential for generating empirical research to assess its construct validity and explore how it might be utilized in organizational studies.

A third strength of this study is the context in which it was conducted. The HRO literature has been criticized for being too extreme and too exotic. This study provides support for Weick et al.'s (1999) contention that the findings of the HRO literature are applicable to more ordinary organizations facing challenges of complexity and tight coupling. In this study, I used safety and service quality as indices of reliability to link traditional HROs with broader organizational theory. Prior measures of reliability have rested upon an estimation of how many times something did not occur, but could have (Roberts, 1990). In gauging reliability by the perceptions of customers and supervisors, this study overcomes the significant hurdle of measuring organizational reliability, something that can be "a dynamic non-event" (Weick, 1987, p. 112). This study is one of the first to offer empirical support for the generalizability of the HRO literature through the application of the construct of collective mindfulness. This suggests that even

seemingly ordinary organizations faced by challenges of complexity and tight coupling can look to the HRO literature and collective mindfulness for suggestions on how to operate reliably.

Limitations. The findings of this study must be interpreted in recognition of its limitations. First, the sample consisted primarily of young, part-time lifeguards. The nature of lifeguarding generally restricts employment only to the summertime. Thus, this sample is not a direct analogue of many organizational forms. This limitation is somewhat tempered by the existence of many organizations that utilize young part-time workers and work to provide safety and/or customer service quality. For example, many restaurants, which rely on college-age, part-time workers must ensure the safety of food and provide quality service to customers. It is possible that collective mindfulness, in these settings, would predict organizational reliability. Future research is needed to determine the extent to which the results of this study are generalizable to other contexts.

A second limitation of this study is the size of the sample. At the unit-level, this study included only 51 pools. This small sample size reduced the power of statistical analyses and prevented me from using confirmatory factor analysis in exploring discriminatory validity. Confirmatory factor analysis would have provided a more stringent and definitive test of the relationships between collective mindfulness and other constructs. This would have allowed for more certainty in understanding the nomological network of collective mindfulness.

A third limitation of this study is the single-source bias associated with tests of the relationship between the five processes and mindfulness, as well as between mindfulness and climate for safety, climate for service, climate for psychological safety, climate for

initiative, loafing, and efficiency. As the average number of employees per unit was small, samples could not be split to avoid single-source bias. However, items measuring distinct constructs were grouped together on the employee survey, which could have generated some psychological separation between the constructs for individuals. Further, respondents were guaranteed response anonymity, which can reduce the effects of common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). While common method bias could have inflated correlations among the employee characteristic variables, common method bias did not likely have an effect on the relationship between collective mindfulness and outcome variables.

A final limitation of this research is that data were collected at a single point in time. Weick et al. (1999) emphasize that collective mindfulness is not a static phenomenon, but rather it is dynamic and involves the interpretation of fluctuations over time. While the present study asked employees and customer to consider characteristics over the course of the entire summer, this is a rather crude measure. This research does not permit interpretations of causality due to its correlational nature. Thus, while Weick et al.'s (1999) theory proposes that the five processes lead to collective mindfulness, it is plausible that collective mindfulness leads to these five processes. The current study, while showing relationships between the constructs, does not permit attributions of causality. Future research is needed to determine the causal relationship between collective mindfulness and the five processes and evaluate Weick et al.'s (1999) conceptualization.

Future Directions

This study advances understanding of collective mindfulness and organizational reliability with respect to safety and customer service. There are many areas in which future research is needed to further investigate the role of collective mindfulness in organizational studies. First, future research is needed to continue refining survey measures of collective mindfulness. The findings of the present study suggest that survey methodology can be used to measure collective mindfulness. However, additional research with new samples is needed to refine the measures used in this study. Particularly important is research utilizing a large enough sample to permit confirmatory factor analysis.

Future research should also address the antecedents to collective mindfulness. In the current study, I did not find Weick et al.'s (1999) conceptualization of five antecedents to be accurate. Rather, the items I used to measure these processes seemed to constitute three variables. Additional research is needed to determine what the antecedents to collective mindfulness are, and how they should be best conceptualized.

More research is needed to examine the relationship between collective mindfulness and organizational outcomes such as creativity, adaptability, and innovation. If collective mindfulness facilitates the detection and management of unexpected events, it may play a role in team and organizational adaptability, which often depends upon detecting that a change has occurred (Audia, Locke, & Smith, 2000). Further, in areas such as innovation and creativity, collective mindfulness may contribute to the generation of novel ideas. Research is also needed to investigate the relationship between collective mindfulness and overall productivity. Collective mindfulness requires a commitment to

reliability, which can be costly (Roberts & Libuser, 1993; Weick et al., 1999). In certain organizations, vigilant attention may not be necessary and may be a waste of resources. Research is needed to identify when, and under what conditions, collective mindfulness is most appropriate and valuable. Researchers could also investigate how collective mindfulness might relate to individual-level outcomes, such as stress and burnout. Ensuring a mindful organization requires heightened vigilance and proactivity (Weick et al., 1999). It is possible that consistently operating at such a high level would lead to high levels of employee stress and even burnout.

Future research on mindfulness is needed to explore cross-level relationships and understand how individual-level constructs relate to group and organizational level mindfulness. What types of people best contribute to generating collective mindfulness? How does individual mindfulness relate to collective mindfulness? How does the composition of an organization affect the development of collective mindfulness? Is it true that homogeneity of employees is necessary to developing a reluctance to simplify interpretations?

This study is one of the first to empirically study collective mindfulness. And, the results of this study are quite encouraging. Collective mindfulness has the potential to significantly contribute to the understanding of organizational operations under trying conditions. This study provides empirical data to support the utility of collective mindfulness in predicting safety and customer service quality. This study also begins to map the nomological network of collective mindfulness. Yet, collective mindfulness is still a relatively unexplored construct. In light of the serious consequences of errors in organizations, organizational researchers must address issues of organizational reliability.

The results of this study suggest one way of addressing organizational reliability is to be mindful of mindfulness.

Table 1
Aggregation Indices for All Variables

Variable	Average Rwg(j)	ICC(1)	ICC(2)
1. Sensitivity to operations.	.91	.18**	.44
2. Deference to expertise	.90	.31**	.62
3. Commitment to resilience	.93	.31**	.62
4. Preoccupation with failure	.91	.43**	.73
5. Reluctance to simplify interpretations	.72	.25**	.54
6. Collective mindfulness	.91	.36**	.67
7. Climate for safety	.86	.51**	.79
8. Climate for service	.89	.38**	.69
9. Climate for initiative	.93	.42**	.72
10. Climate for psychological safety	.86	.32**	.63
11. Loafing	.90	.31**	.61
12. Efficiency orientation	.92	.31**	.62
13. Supervisor assessments of service	.86	.47**	.85
14. Customer assessments of service	.90	.23**	.76
15. Supervisor assessments of safety	.97	.48**	.86
16. Customer assessments of safety	.90	.17**	.70

** denotes $p < .01$; * denotes $p < .05$; + denotes $p < .10$

Table 2
Means, Standard Deviations, and Interrcorrelations Among All Variables

	Mean	SD	1	2	3	4	5	6	7	8	9
1. Sensitivity to operations	4.12	.43									
2. Deference to expertise	3.86	.46	.36**								
3. Commitment to resilience	3.79	.45	.59**	.61**							
4. Preoccupation with failure	3.40	.53	.27+	.39**	.47**						
5. Reluctance to simplify interpretations	3.11	.67	.17	.23+	.43**	.30*					
6. Collective mindfulness	3.84	.54	.49**	.44**	.74**	.62**	.44**				
7. Climate for safety	3.35	.65	.44**	.18	.51**	.51**	.23+	.59**			
8. Climate for service	2.82	.55	.38**	.37**	.54**	.43**	.16	.57**	.41**		
9. Climate for initiative	3.63	.61	.36**	.45**	.68**	.69**	.44**	.76**	.57**	.40**	
10. Climate for psychological safety	3.76	.63	.36**	.30*	.56**	.45**	.35**	.66**	.31*	.37**	.63**
11. Loafing	2.57	.65	-.13	-.25+	-.37**	-.48**	-.30*	-.42**	-.26+	-.32*	-.41**
12. Efficiency orientation	2.81	.46	-.07	-.09	-.27+	-.24+	-.06	-.34**	-.53**	-.03	-.30*
13. Supervisor assessments of service	4.23	.55	.00	-.04	.06	.06	-.08	-.01	.13	-.09	.01
14. Customer assessments of service	4.08	.38	-.01	.08	.13	.13	.15	.29*	.16	.02	.29*
15. Supervisor assessments of safety	4.84	.38	.18	.13	.00	.00	.05	.13	.06	.02	-.05
16. Customer assessments of safety	4.02	3.7	.00	.10	.12	.12	.00	.25+	.08	.11	.21

** denotes $p < .01$; * denotes $p < .05$; + denotes $p < .10$

Table 2 (cont.)

	Mean	SD	10	11	12	13	14	15	16
1. Sensitivity to operations									
2. Deference to expertise									
3. Commitment to resilience									
4. Preoccupation with failure									
5. Reluctance to simplify interpretations									
6. Collective mindfulness									
7. Climate for safety									
8. Climate for service									
9. Climate for initiative									
10. Climate for psychological safety									
11. Loafing	2.57	.65	-.29*						
12. Efficiency orientation	2.81	.46	-.27+	.25+					
13. Supervisor assessments of service	4.23	.55	-.08	.21	-.10				
14. Customer assessments of service	4.08	.38	.22	-.21	-.21	-.01			
15. Supervisor assessments of safety	4.84	.38	.05	.05	.01	.37**	-.05		
16. Customer assessments of safety	4.02	3.7	.15	-.11	-.10	.06	.85**	.08	

** denotes $p < .01$; * denotes $p < .05$; + denotes $p < .10$

Table 3
Five Processes Predicting Collective Mindfulness

Variable	β	*F*	*R2*
Sensitivity to Operations	.12		
Deference to Expertise	-.07		
Commitment to Resilience	.50**		
Preoccupation with Failure	.34**		
Reluctance to Simplify	.12		
Full Model		17.17**	0.66

** denotes $p < .01$; * denotes $p < .05$; + denotes $p < .10$

Table 4
Processes as Four Factors Predicting Collective Mindfulness

Variable	β	*F*	*R2*
Problem-Solving	.25*		
Preoccupation with Failure	.35**		
Communication	.29**		
Reluctance to Simplify	.19+		
Full Model		17.28**	.60**

** denotes $p < .01$; * denotes $p < .05$; + denotes $p < .10$

Table 5
Collective Mindfulness Predicting Safety

	Customer Perceptions of Safety as Criterion		Supervisor Assessments of Safety as Criterion	
Variable	Step 1 β	Step 2 β	Step 1 β	Step 2 β
Climate for Safety	.08	-.10	.06	-.03
Collective Mindfulness		.31+		.15
ΔR^2	.01	.06+	.00	.02
R^2	.01	.07	.00	.02

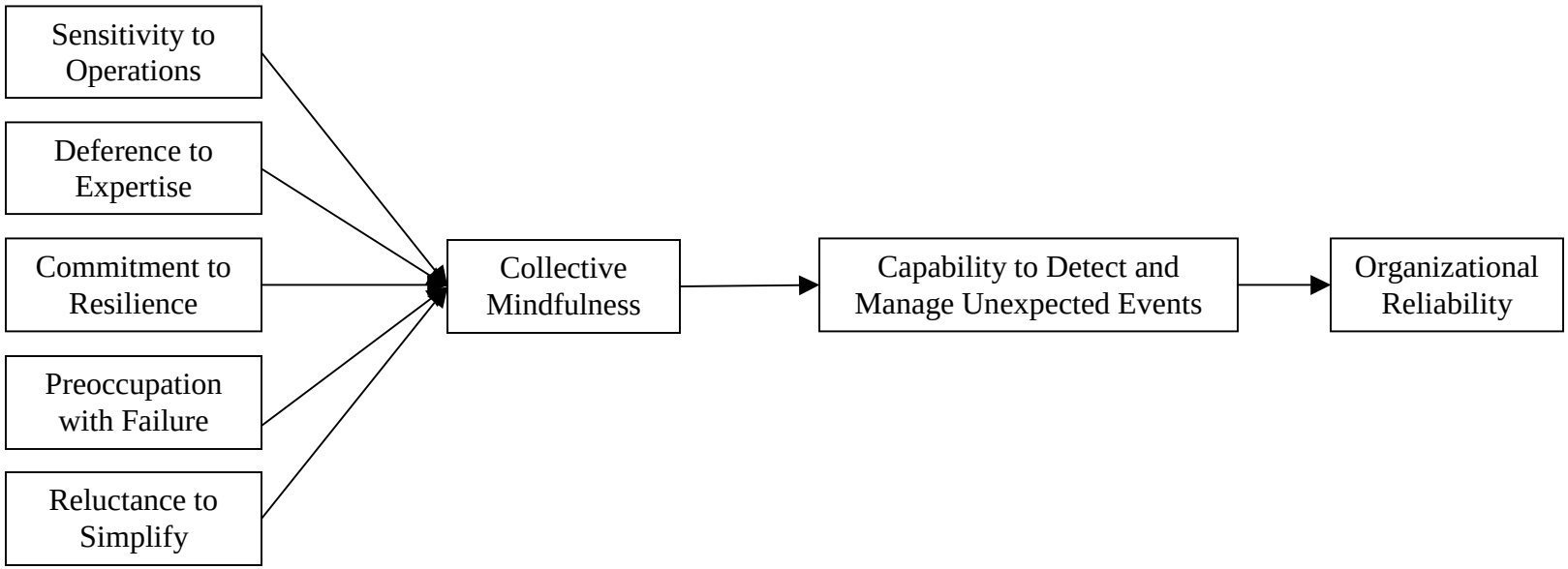
** denotes $p < .01$; * denotes $p < .05$; + denotes $p < .10$

Table 6
Collective Mindfulness Predicting Customer Service Quality

	Customer Perceptions of Service as Criterion		Supervisor Assessments of Service as Criterion	
Variable	Step 1 β	Step 2 β	Step 1 β	Step 2 β
Climate for Service	.02	-.21	-.10	-.13
Collective Mindfulness		.42*		.07
ΔR^2	.00	.12*	.01	.00
R^2	.00	.12*	.01	.00

** denotes $p < .01$; * denotes $p < .05$; + denotes $p < .10$

Figure 1. Weick et al.'s (1999) Conceptual Model



APPENDIX A

Strategy for eliminating ineffective items

Because I created many of the scales that I used in this research, I used the following strategy to refine the scales and eliminate any items that proved ineffective due to issues of validity or reliability. I conducted all of these analyses at the pool level (n = 51). For each scale, I did the following:

1. I used Velicer's Minimum Average Partial Correlation (MAP) procedure to determine the number of meaningful factors that should be extracted from the scale. I conducted this procedure on the correlation matrix of scale items.
2. I ran an Exploratory Factor Analysis (EFA) using Principal Axis Factoring (PAF) with oblimin rotation. I extracted the number of factors indicated by the MAP procedure. I then interpreted the results of the EFA (i.e., determining the meaning of the factors). I eliminated items that did not have absolute loadings greater than .40 on the factor of interest. I also eliminated any items that had absolute loadings greater than .40 on multiple factors.
3. If any items were eliminated in the Step 2, I ran a second EFA using PAF, extracting only one factor. I eliminated any items that did not have absolute loadings greater than .40 on the factor. The loadings reported below were from the pattern matrix.
4. I computed Cronbach's Alpha to analyze the interrater reliability of the scale. I eliminated any items that prevented Alpha from reaching .70.
5. If items were eliminated in Step 3 or Step 4, I conducted a third EFA on the final items.

In the pages that follow, I provide the results of each step for each scale.

Preoccupation with failure

1. Velicer's MAP: Correlations among items are best explained by one factor.
2. One factor explained 39.34% of the variance in the items ($\lambda_1 = 2.75$). Below are the items and their loadings on one factor (F1). I eliminated the first item due to its low loading.

Item	F1
Employees here talk more about work-related mistakes than work-related successes.	.12
Employees here take even the smallest of mistakes seriously.	.66
Employees here see close calls (e.g., a child nearly getting hurt) as mistakes.	.83
Employees here are praised if they report pool-related problems, errors, or inconsistencies (e.g., no toilet paper in the bathroom).	.51
Employees here report work-related mistakes that could have serious consequences, even if nobody else notices the mistake.	.73
Employees here feel comfortable reporting pool-related mistakes they have made to their superiors.	.64
Employees here talk about pool-related mistakes that have been made.	.63

3. One factor (F1) explained 45.6% of the variance in the items ($\lambda_1 = 2.74$). I did not eliminate additional items in this step.

Item	F1
Employees here take even the smallest of mistakes seriously.	.65
Employees here see close calls (e.g., a child nearly getting hurt) as mistakes.	.82
Employees here are praised if they report pool-related problems, errors, or inconsistencies (e.g., no toilet paper in the bathroom).	.52
Employees here report work-related mistakes that could have serious consequences, even if nobody else notices the mistake.	.74
Employees here feel comfortable reporting pool-related mistakes they have made to their superiors.	.66

Employees here talk about pool-related mistakes that have been made.	.63

4. Cronbach's alpha for these items was .82. Thus, I did not eliminate additional items.

5. Not necessary.

Sensitivity to operations

1. Velicer's MAP: Correlations among items are best explained by two factors.

2. Two factors explained 57.35% of the variance in the items ($\lambda_1 = 2.96$, $\lambda_2 = 2.34$). Below are the items and their loadings on Factor 1 (F1) and Factor 2 (F2). The two factors correlated .31. I eliminated the third item because it loads highly on both factors. I eliminated the fourth, fifth, and eighth items because they load highly on the second factor, which likely represents employee perceptions of high workload times. The remaining four items focus on sensitivity to operations.

Item	F1	F2
Employees here are encouraged to share pool-related information with each other.	.78	-.13
Employees here listen carefully to one another when talking about pool operations.	.76	.21
Employees here concentrate on what is happening "moment to moment."	.43	.51
Employees here are concerned with their own tasks, not with the pool as a whole. **R**	-.12	.45
Employees here recognize the danger of having a lot of people in the pool at any one moment.	.10	.72
Employees here are familiar with tasks beyond their immediate jobs.	.71	.06
Employees here frequently talk with one another about what is going on at the pool.	.73	-.03
When there are a lot of people at this pool, employees here try to help each other out.	.21	.87

3. One factor (F1) explained 56.4% of the variance in the items ($\lambda_1 = 2.25$). I did not eliminate additional items in this step.

Item	F1
Employees here are encouraged to share pool-related information with each other.	.71
Employees here listen carefully to one another when talking about pool operations.	.80
Employees here are familiar with tasks beyond their immediate jobs.	.76
Employees here frequently talk with one another about what is going on at the pool.	.73

4. Cronbach's alpha for these items was .84. Thus, I did not eliminate additional items in this step.

5. Not necessary.

Reluctance to Simplify Interpretations

1. Velicer's MAP: Correlations among items are best explained by one factor.
2. One factor (F1) explained 28.6% of the variance in the items ($\lambda_1 = 1.73$). Below are the items and their loadings. I eliminated the first, fourth, fifth, and sixth items due to their low loadings.

Item	F1
Employees here believe that simple solutions are good for complex problems. **R**	-.08
It is rare at this pool that anyone's view is dismissed.	.45
Employees here are encouraged to question the way things are usually done here.	.78
Employees here show a great deal of mutual respect for each other.	.34
Employees here feel comfortable expressing their own opinions about pool operations.	.36

This pool values employees who are able to get along well with different types of people.	.29
Employees here are encouraged to question decisions made by others.	.77

3. One factor (F1) explained 48.9% of the variance in the items ($\gamma 1 = 1.47$). I eliminated the first item due to its low loading.

Item	F1
It is rare at this pool that anyone's view is dismissed.	.36
Employees here are encouraged to question the way things are usually done here.	.83
Employees here are encouraged to question decisions made by others.	.81

4. Cronbach's alpha for the two items used was .80. Thus, I did not eliminate any items in this step.

5. One factor (F1) explained 66.9% of the variance in the items ($\gamma 1 = 1.34$).

Item	F1
Employees here are encouraged to question the way things are usually done here.	.82
Employees here are encouraged to question decisions made by others.	.82

Deference to expertise

1. Velicer's MAP: One factor best explained the correlations among the items.

2. One factor (F1) explained 32.0% of the variance in the items ($\lambda_1 = 1.92$). Below are the items and their loadings. I eliminated the fourth item due to its low loading.

Item	F1
Employees here are comfortable asking others with more experience for help.	.53
Important decisions at this pool are made by those with the mose experience.	.48
When employees here cannot solve a problem, they seek someone with more experience to solve it.	.79
Whoever discovers a mistake at this pool is initially responsible for correcting it.	.13
At this pool, it is generally easy to obtain expert help when something comes up that employees don't know how to handle.	.58
At this pool, experience is more important than hierarchical position.	.66

3. One factor (F1) explained 38.0% of the variance in the items ($\lambda_1 = 1.90$). I did not eliminate any items in this step.

Item	F1
Employees here are comfortable asking others with more experience for help.	.52
Important decisions at this pool are made by those with the mose experience.	.47
When employees here cannot solve a problem, they seek someone with more experience to solve it.	.77
At this pool, it is generally easy to obtain expert help when something comes up that employees don't know how to handle.	.60
At this pool, experience is more important than hierarchical position.	.68

4. Cronbach's alpha for these items was .73. Thus, I did not eliminate additional items.

5. Not necessary.

Commitment to Resilience

1. Velicer's MAP: One factor best explained the correlations among these items.

2. One factor (F1) explained 42.6% of the variance in the items ($\lambda_1 = 3.83$). Below are items and their loadings. I eliminated the fourth item due to its low loading.

Item	F1
Employees here are committed to solving any problem that arises.	.71
When a mistake is made, employees here are encouraged to limit any negative consequences.	.59
Employees here are encouraged to solve problems in new ways.	.64
Employees here are occasionally retrained.	.14
Employees here are given tasks from which they can learn more about pool operations.	.55
Employees here are well-trained for the kind of work they do.	.60
When a mistake is made at this pool, employees can "bounce back" from it.	.86
Employees here do not give up on solving a problem.	.84
Employees here use their abilities and knowledge in new ways to improve how this pool is run.	.66

3. One factor (F1) explained 47.6% of the variance in the items ($\lambda_1 = 3.81$). I did not eliminate any items in this step.

Item	F1
Employees here are committed to solving any problem that arises.	.72
When a mistake is made, employees here are encouraged to limit any negative consequences.	.60
Employees here are encouraged to solve problems in new ways.	.63
Employees here are given tasks from which they can learn more about pool operations.	.55
Employees here are well-trained for the kind of work they do.	.60
When a mistake is made at this pool, employees can "bounce back" from it.	.86
Employees here do not give up on solving a problem.	.84
Employees here use their abilities and knowledge in new ways to improve how this pool is run.	.66

4. Cronbach's alpha for this scale was .87. Thus, I did not eliminate any items.

5. Not necessary.

Collective mindfulness

1. Velicer's MAP: Three factors best explained the correlations among these items.

2. Three factors (F1, F2, and F3) explained 63.2% of the variance in the items (λ_1 = 5.77, λ_2 = 3.98, λ_3 = 2.13). F1 and F2 correlated -.50; F1 and F3 correlated .35; F2 and F3 correlated -.09. Below are the items and their loadings. The first factor most strongly represented collective mindfulness. The second factor represented a measurement effect due to negatively worded items. The third factor captured employees' beliefs regarding the likelihood of mistakes. I eliminated the second, third, fourth, eighth, ninth, and tenth items because of their low loadings on the first factor. I eliminated that fifth item because it loaded highly on multiple factors.

Item	F1	F2	F3
Employees here feel the need to be alert at all times.	.59	.00	0.27
The work we do here doesn't require a lot of attention. **R**	.12	-.74	0.05
You don't have to pay much attention in order to do your job well. **R**	-.10	-.94	-0.14
It's fine to daydream and let your mind wander while you're on the job here. **R**	.10	-.73	-0.02
Employees here are always on the look-out for problems that could be avoided.	.59	.03	0.41
Employees here are always on the look-out for ways to meet customers' needs.	.69	-.15	-0.13
Employees here are attentive to the different needs of different customers.	.76	-.04	0.01
Employees here believe that it's okay to "zone-out" occasionally while on the job. **R**	.07	-.68	0.36
Employees here believe that mistakes will be made unless everyone devotes full attention to doing their jobs well.	.01	-.01	0.75
Employees believe that the nature of this work makes mistakes likely.	-.01	.00	0.59

Employees here show great care in performing their work tasks.	.89	.12	0.02
Employees here recognize the operating a pool is a dangerous task.	.65	-.11	0.08
Employees here are committed to showing great care and dedication in performing all of their tasks.	1.00	.06	-0.13
It is important that employees here speak up if they think that there has been a problem.	.67	-.23	-0.08

3. One factor (F1) explained 61.0% of the variance in the items ($\lambda_1 = 4.27$). I did not eliminate additional items in this step.

Item	F1
Employees here feel the need to be alert at all times.	.68
Employees here are always on the look-out for ways to meet customers' needs.	.73
Employees here are attentive to the different needs of different customers.	.80
Employees here show great care in performing their work tasks.	.81
Employees here recognize the operating a pool is a dangerous task.	.75
Employees here are committed to showing great care and dedication in performing all of their tasks.	.92
It is important that employees here speak up if they think that there has been a problem.	.75

4. Cronbach's alpha for this scale was .91. Thus, I did not eliminate additional items.

5. Not necessary.

Loafing

1. Velicer's MAP: One factor best explained the correlations among these items.

2. One factor (F1) explained 45.0% of the variance in the items ($\lambda_1 = 3.15$). Below are the items and their loadings. I eliminated the fourth item due to its low loading.

Item	F1
People here don't work very hard.	.74
Employees here spend a lot of time just "shooting the breeze."	.86
Employees here spend a lot of time just hanging out.	.88
This is a relaxing place to work.	.17
Employees here pass the day by socializing with one another.	.63
Superiors here do not seem to mind if employees spend a lot of time talking with their friends, while at work.	.52
Our superiors spend a lot of time just "shooting the breeze" with us.	.62

3. One factor (F1) explained 51.9% of the variance in the items ($\lambda_1 = 3.12$). I did not eliminate additional items in this step.

Item	F1
People here don't work very hard.	.74
Employees here spend a lot of time just "shooting the breeze."	.85
Employees here spend a lot of time just hanging out.	.87
Employees here pass the day by socializing with one another.	.63
Superiors here do not seem to mind if employees spend a lot of time talking with their friends, while at work.	.52
Our superiors spend a lot of time just "shooting the breeze" with us.	.64

4. Cronbach's alpha for this scale was .86. Thus, I did not eliminate additional items.

5. Not necessary.

Efficiency orientation

1. Velicer's MAP: One factor best explained the correlations among these items.

2. One factor (F1) explained 26.4% of the variance in the items ($\lambda_1 = 1.48$). Below are the items and their loadings. I eliminated the fourth item due to its low loading.

Item	F1
Superiors here encourage us to do our tasks as quickly as possible.	.62
It is important to get work done quickly here.	.68
Superiors here tell people who are slow and careful in their work to speed up.	.55
Superiors here reward people for being efficient.	-.02
At this pool, it is more important to perform tasks quickly than to perform them thoroughly.	.50
People here are rewarded for doing their tasks as quickly as possible.	.41

3. One factor (F1) explained 31.6% of the variance in the items ($\lambda_1 = 1.58$). I did not eliminate additional items in this step.

Item	F1
Superiors here encourage us to do our tasks as quickly as possible.	.61
It is important to get work done quickly here.	.68
Superiors here tell people who are slow and careful in their work to speed up.	.56
At this pool, it is more important to perform tasks quickly than to perform them thoroughly.	.50
People here are rewarded for doing their tasks as quickly as possible.	.42

4. Cronbach's alpha for this scale was .69. This value could not be improved by eliminating additional items. Thus, I did not eliminate additional items in this step.

5. Not necessary.

Climate for safety

1. Velicer's MAP: Two factors best explained the correlations among these items.

2. Two factors (F1, F2) explained 44.1% of the variance in the items ($\lambda_1 = 2.88$, $\lambda_2 = 1.79$). F1 and F2 correlated .23. Below are the items and their loadings. With the

exception of the fourth item, all items loading highly on the first factor are negatively worded. Items loading highly on the second factor are positively worded. Because safety and accidents are a negative construct, I retained the items loading highly on the first factor. Thus, I eliminated the fifth, sixth, seventh, eighth, and ninth items due to their low loadings on the first factor.

Item	F1	F2
As long as there is no accident, my superior doesn't care how the work is done. **R**	.67	-.03
Whenever pressure builds up, my superior wants us to just get the job done, rather than do it by the rules. **R**	.84	.12
My superior only keeps track of major safety problems and overlooks routine problems. **R**	.56	.27
My superior watches more often when a worker has violated some safety rule.	.47	-.06
My superior approaches workers during work to discuss safety issues.	.07	.65
My superior gets annoyed with any worker ignoring safety rules, even minor ones.	.10	.30
My superior seriously considers any worker's suggestions for improving safety.	.10	.57
My superior pays less attention to safety problems than do superiors at other pools. **R**	.00	.10
My superior says a good word whenever he/she sees a job done according to the safety rules.	.27	.83
As long as work remains on schedule, my superior doesn't care how this has been achieved. **R**	.99	-.06

3. One factor (F1) explained 54.8% of the variance in the items ($\lambda_1 = 2.74$). I did not eliminate additional items in this step.

Item	F1
As long as there is no accident, my superior doesn't care how the work is done. **R**	.65

Whenever pressure builds up, my superior wants us to just get the job done, rather than do it by the rules. **R**	.90
My superior only keeps track of major safety problems and overlooks routine problems. **R**	.63
My superior watches more often when a worker has violated some safety rule.	.45
As long as work remains on schedule, my superior doesn't care how this has been achieved. **R**	.95

4. Cronbach's alpha for this scale was .84. Thus, I did not eliminate additional items.

5. Not necessary.

Climate for Service

1. Velicer's MAP: One factor best explained the correlations among these items.

2. One factor (F1) explained 46.1% of the variance in the items ($\lambda_1 = 3.23$). Below are items and their loadings. No items were eliminated in this step.

Item	F1
How would you rate efforts to measure and track the quality of the work and service in your business?	.79
How would you rate the leadership shown by management in your business in supporting the service quality effort?	.75
How would you rate the overall quality of service provided by your business?	.77
How would you rate the job knowledge and skills of employees in your business to deliver superior quality work and service?	.68
How would you rate the tools, technology, and other resources provided to employees to support the delivery of superior quality work and service?	.60
How would you rate the effectiveness of our communication efforts to both employees and customers?	.55
How would you rate the recognition and rewards employees receive for the delivery of superior work and service?	.57

3. Not necessary.

4. Cronbach's alpha for this scale was .85. Thus, I did not eliminate additional items.

5. Not necessary.

Climate for psychological safety

1. Velicer's MAP: One factor best explained the correlations among these items.

2. One factor (F1) explained 28.9% of the variance in the items ($\lambda_1 = 1.74$). Below are the items and their loadings. I eliminated the first, second, third, and fourth items due their low loadings.

Item	F1
At this pool, some employees are rejected for being different. **R**	.36
When someone at this pool makes a mistake, it is often held against him/her. **R**	.10
No one at this pool would deliberately act in a way that undermines others' efforts.	.26
At this pool, one is free to take risks.	.02
The employees here value others' unique skills and talents.	.77
As an employee here, one is able to bring up problems and tough issues.	.97

3. One factor (F1) explained 77.4% of the variance in these two items ($\gamma 1 = 1.55$). I did not eliminate additional items in this step.

Item	F1
The employees here value others' unique skills and talents.	.88
As an employee here, one is able to bring up problems and tough issues.	.88

4. Cronbach's alpha for this scale was .87. Thus, I did not eliminate additional items.

5. Not necessary.

Climate for initiative

1. Velicer's MAP: One factor best explained the correlations among these items.
2. One factor (F1) explained 65.8% of the variance in the items ($\lambda_1 = 4.61$). Below are the items and their loadings. I did not eliminate any items in this step.

Item	F1
Employees here actively attack problems.	.81
Whenever something goes wrong, employees here search for a solution immediately.	.84
Whenever there is a chance to get actively involved, employees here take it.	.88
Employees here take initiative immediatley - more often than at other pools.	.87
Employees here use opportunities quickly in order to attain goals.	.89
Employees here usually do more than they are asked to do.	.75
Employees here are particularly good at implementing ideas.	.61

3. Not necessary.
4. Cronbach's alpha for this scale was .93. Thus, I did not eliminate additional items.
5. Not necessary.

Customer perceptions of safety

1. Velicer's MAP: One factor best explained the correlations among these items.
2. One factor (F1) explained 74.0% of the variance in the items ($\lambda_1 = 4.44$). Below are the items and their loadings. I did not eliminate any items in this step.

Item	F1
The staff of this pool makes it a safe place.	.95
The staff of this pool seems to be on the lookout for the safety of patrons.	.95
The staff of this pool seems competent in dealing with safety issues.	.93
The safety of patrons is important to the staff of this pool.	.92
The staff of this pool seems to spend a lot of time loafing about. **R**	.44

The staff of this pool is alert at all times.	.86

3. Not necessary.

4. Cronbach's alpha for this scale was .92. Thus, I did not eliminate additional items.

5. Not necessary.

Customer perceptions of service

1. Velicer's MAP: One factor best explained the correlations among these items.

2. One factor (F1) explained 76.8% of the variance in the items ($\lambda_1 = 4.60$). Below are the items and their loadings. I did not eliminate any items in this step.

Item	F1
The staff of this pool has a friendly, helpful attitude.	.87
The staff of this pool treats patrons with the respect that they deserve.	.93
The staff of this pool is intent on meeting the needs of patrons.	.96
The staff of this pool makes things easier for patrons.	.90
The staff of this pool is not concerned with providing customer service. **R**	.70
The staff of this pool is always on the lookout for ways to meet patrons' needs.	.86

3. Not necessary.

4. Cronbach's alpha for this scale was .94. Thus, I did not eliminate additional items.

5. Not necessary.

Supervisor assessments

1. Velicer's MAP: Two factors best explained the correlations among these items.

2. Two factors (F1, F2) explained 49.3% of the variance in the items ($\lambda_1 = 4.86$, $\lambda_2 = 4.24$). The two factors are correlated .46. Below are the items and their loadings. The first factor represented supervisor assessments of safety performance, including

items assessing whether the water is clean, if employees check passes, if employees are completing daily operating records, if there is chlorine on hand, and if safety signs are posted. The second factor represented supervisor assessments of service performance, including items assessing the cleanliness of the pool tile, the furniture, the bathrooms, and whether employees take out trash. Because both factors are meaningful to the study at hand, I decided to keep items that load highly on a single factor. Thus, I eliminated the first, second, fourth, sixth, eighth, and eleventh items.

Item	F1	F2
Pool Deck	.15	.36
Pool	.13	.26
Tile	-.11	.75
Skimmer Baskets	.30	.31
Furniture	-.02	.68
Guard Room	.21	.39
Bathrooms	-.34	1.03
Filter Room	.23	.36
Water Clarity	.61	.18
Trash Cans	.10	.40
Safety Equipment	.34	.55
Passes being checked	1.04	-.12
Daily Operating Records	.76	.04
Chlorine on Hand	.82	.13
Signs Posted	.91	-.07

3. In this step, I again extracted two factors, using only the items retained from the previous step. The two factors (F1 and F2) accounted for 63.0% of the variance in the items ($\lambda_1 = 4.25$, $\lambda_2 = 2.99$). The two factors are correlated .38. I eliminated the sixth item, “safety equipment,” because it loads highly on both factors.

Item	F1	F2

Tile	-.01	.67
Furniture	.07	.66
Bathrooms	-.23	1.00
Water Clarity	.64	.17
Trash Cans	.14	.41
Safety Equipment	.42	.51
Passes being checked	1.03	-.10
Daily Operating Records	.77	.02
Chlorine on Hand	.84	.10
Signs Posted	.92	-.10

4. I computed two Cronbach's alphas, one for each of the factors. The first factor, which I shall call Supervisor Assessment of Safety, includes the following items: water clarity, passes being checked, daily operating records, chlorine on hand, and signs posted. Alpha for this scale was .91. The second factor, which I shall call Supervisor Assessment of Service Quality, includes the following items: tile, furniture, bathrooms, and trash cans. Alpha for this scale was .76. Thus, no additional items were eliminated from either scale.
5. I conducted an EFA on each of the factors separately. For the Supervisor Assessment of Safety scale, one factor (F1) explained 71.8% of the variance in the items (λ_1 = 3.59). Below are the items and their loadings.

Item	F1
Water Clarity	.71
Passes being checked	.96
Daily Operating Records	.81
Chlorine on Hand	.88
Signs Posted	.86

For the Supervisor Assessment of Service Quality scale, one factor (F1) explained 47.4% of the variance in the items ($\lambda_1 = 1.90$). Below are the items and their loadings.

Item	F1
Tile	.65
Furniture	.69
Bathrooms	.87
Trash Cans	.49

APPENDIX B

The Five Processes of Collective Mindfulness

Three Factor Solution:

Item	F1	F2	F3
Sensitivity to Operations			
Employees here are encouraged to share pool-related information with each other.	-.24	.23	.67
Employees here listen carefully to one another when talking about pool operations.	.15	.07	.72
Employees here are familiar with tasks beyond their immediate jobs.	-.04	.00	.82
Employees here frequently talk with one another about what is going on at the pool.	-.07	-.10	.74
Deference to Expertise			
Employees here are comfortable asking others with more experience for help.	.34	-.15	.51
Important decisions at this pool are made by those with the mose experience.	.27	.40	-.12
When employees here cannot solve a problem, they seek someone with more experience to solve it.	.39	.16	.22
At this pool, it is generally easy to obtain expert help when something comes up that employees don't know how to handle.	.73	-.07	-.07
At this pool, experience is more important than hierarchical position.	.60	.00	-.02
Commitment to Resilience			
Employees here are committed to solving any problem that arises.	.18	.13	.67
When a mistake is made, employees here are encouraged to limit any negative consequences.	.15	-.05	.61
Employees here are encouraged to solve problems in new ways.	.39	.37	.19
Employees here are given tasks from which they can learn more about pool operations.	.41	-.16	.39
Employees here are well-trained for the kind of work they do.	.66	.11	-.03
When a mistake is made at this pool, employees can "bounce back" from it.	.63	.07	.31
Employees here do not give up on solving a problem.	.67	.06	.26
Employees here use their abilities and knowledge in new ways to improve how this pool is run.	.30	.17	.42
Preoccupation with Failure			
Employees here take even the smallest of mistakes seriously.	-.18	.67	.13

Employees here see close calls (e.g., a child nearly getting hurt) as mistakes.	-.01	.91	-.20
Employees here are praised if they report pool-related problems, errors, or inconsistencies (e.g., no toilet paper in the bathroom).	.10	.43	.07
Employees here report work-related mistakes that could have serious consequences, even if nobody else notices the mistake.	.31	.67	-.20
Employees here feel comfortable reporting pool-related mistakes they have made to their superiors.	.45	.45	.13
Employees here talk about pool-related mistakes that have been made.	-.04	.64	.21
Reluctance to Simplify Interpretations			
Employees here are encouraged to question the way things are usually done here.	.15	.22	.18
Employees here are encouraged to question decisions made by others.	.40	.14	.02

F1 and F2 correlate .341; F1 and F3 correlate .362; F2 and F3 correlate .219

Four Factor Solution:

Item	F1	F2	F3	F4
Sensitivity to Operations				
Employees here are encouraged to share pool-related information with each other.	-.15	.26	.72	.18
Employees here listen carefully to one another when talking about pool operations.	.22	.11	.77	.11
Employees here are familiar with tasks beyond their immediate jobs.	-.11	-.05	.76	-.24
Employees here frequently talk with one another about what is going on at the pool.	.01	-.07	.76	.13
Deference to Expertise				
Employees here are comfortable asking others with more experience for help.	.32	-.14	.50	-.07
Important decisions at this pool are made by those with the mose experience.	.32	.44	-.06	.09
When employees here cannot solve a problem, they seek someone with more experience to solve it.	.40	.18	.24	-.02
At this pool, it is generally easy to obtain expert help when something comes up that employees don't know how to handle.	.80	-.01	-.03	.09

At this pool, experience is more important than hierarchical position.	.61	.04	.00	.01
Commitment to Resilience				
Employees here are committed to solving any problem that arises.	.13	.11	.63	-.19
When a mistake is made, employees here are encouraged to limit any negative consequences.	.05	-.09	.55	-.29
Employees here are encouraged to solve problems in new ways.	.27	.33	.15	-.31
Employees here are given tasks from which they can learn more about pool operations.	.41	-.14	.39	-.03
Employees here are well-trained for the kind of work they do.	.60	.12	-.02	-.14
When a mistake is made at this pool, employees can "bounce back" from it.	.52	.06	.28	-.26
Employees here do not give up on solving a problem.	.52	.03	.21	-.36
Employees here use their abilities and knowledge in new ways to improve how this pool is run.	.15	.11	.35	-.39
Preoccupation with Failure				
Employees here take even the smallest of mistakes seriously.	-.18	.64	.13	-.06
Employees here see close calls (e.g., a child nearly getting hurt) as mistakes.	.02	.92	-.16	.04
Employees here are praised if they report pool-related problems, errors, or inconsistencies (e.g., no toilet paper in the bathroom).	.03	.39	.04	-.21
Employees here report work-related mistakes that could have serious consequences, even if nobody else notices the mistake.	.31	.68	-.16	-.01
Employees here feel comfortable reporting pool-related mistakes they have made to their superiors.	.33	.41	.10	-.31
Employees here talk about pool-related mistakes that have been made.	-.04	.62	.21	-.07
Reluctance to Simplify Interpretations				
Employees here are encouraged to question the way things are usually done here.	-.16	.09	.02	-.76
Employees here are encouraged to question decisions made by others.	.13	.00	-.16	-.75

APPENDIX C

Collective Mindfulness and Climate for Safety

Item	F1	F2
Employees here feel the need to be alert at all times.	.67	.00
Employees here are always on the look-out for ways to meet customers' needs.	.53	.32
Employees here are attentive to the different needs of different customers.	.71	.10
Employees here show great care in performing their work tasks.	.85	-.03
Employees here recognize the operating a pool is a dangerous task.	.85	-.13
Employees here are committed to showing great care and dedication in performing all of their tasks.	.91	.00
It is important that employees here speak up if they think that there has been a problem.	.69	.10
As long as there is no accident, my superior doesn't care how the work is done. **R**	.07	.59
Whenever pressure builds up, my superior wants us to just get the job done, rather than do it by the rules. **R**	.02	.89
My superior only keeps track of major safety problems and overlooks routine problems. **R**	.01	.65
My superior watches more often when a worker has violated some safety rule.	.24	.29
As long as work remains on schedule, my superior doesn't care how this has been achieved. **R**	-.10	1.00

Factors correlate .59.

APPENDIX D

Collective Mindfulness and Climate for Service

Item	F1	F2
Employees here feel the need to be alert at all times.	.52	.24
Employees here are always on the look-out for ways to meet customers' needs.	.79	-.07
Employees here are attentive to the different needs of different customers.	.76	.07
Employees here show great care in performing their work tasks.	.78	.06
Employees here recognize the operating a pool is a dangerous task.	.73	-.01
Employees here are committed to showing great care and dedication in performing all of their tasks.	.81	.17
It is important that employees here speak up if they think that there has been a problem.	.84	-.10
How would you rate efforts to measure and track the quality of the work and service in your business?	.21	.63
How would you rate the leadership shown by management in your business in supporting the service quality effort?	.20	.60
How would you rate the overall quality of service provided by your business?	.17	.63
How would you rate the job knowledge and skills of employees in your business to deliver superior quality work and service?	-.03	.73
How would you rate the tools, technology, and other resources provided to employees to support the delivery of superior quality work and service?	-.07	.69
How would you rate the effectiveness of our communication efforts to both employees and customers?	.08	.50
How would you rate the recognition and rewards employees receive for the delivery of superior work and service?	-.11	.67

Factors correlate .54.

APPENDIX E

Collective Mindfulness and Climate for Initiative

Item	F1	F2
Employees here feel the need to be alert at all times.	.10	.59
Employees here are always on the look-out for ways to meet customers' needs.	-.16	.88
Employees here are attentive to the different needs of different customers.	-.03	.85
Employees here show great care in performing their work tasks.	.38	.52
Employees here recognize the operating a pool is a dangerous task.	.39	.46
Employees here are committed to showing great care and dedication in performing all of their tasks.	.22	.72
It is important that employees here speak up if they think that there has been a problem.	.19	.63
Employees here actively attack problems.	.78	.05
Whenever something goes wrong, employees here search for a solution immediately.	.88	-.06
Whenever there is a chance to get actively involved, employees here take it.	.87	.03
Employees here take initiative immediatley - more often than at other pools.	.89	-.05
Employees here use opportunities quickly in order to attain goals.	.91	-.04
Employees here usually do more than they are asked to do.	.61	.19
Employees here are particularly good at implementing ideas.	.47	.22

Factors correlate .69.

APPENDIX F

Collective Mindfulness and Climate for Psychological Safety

Item	F1	F2
Employees here feel the need to be alert at all times.	.63	.09
Employees here are always on the look-out for ways to meet customers' needs.	.57	.20
Employees here are attentive to the different needs of different customers.	.61	.24
Employees here show great care in performing their work tasks.	.89	-.07
Employees here recognize the operating a pool is a dangerous task.	.56	.27
Employees here are committed to showing great care and dedication in performing all of their tasks.	1.11	-.21
It is important that employees here speak up if they think that there has been a problem.	.46	.42
The employees here value others' unique skills and talents.	.10	.80
As an employee here, one is able to bring up problems and tough issues.	-.01	.88

Factors correlate .54.

APPENDIX G

Collective Mindfulness and Loafing

Item	F1	F2
Employees here feel the need to be alert at all times.	.72	.09
Employees here are always on the look-out for ways to meet customers' needs.	.67	-.15
Employees here are attentive to the different needs of different customers.	.81	.06
Employees here show great care in performing their work tasks.	.76	-.17
Employees here recognize the operating a pool is a dangerous task.	.75	.00
Employees here are committed to showing great care and dedication in performing all of their tasks.	.89	-.07
It is important that employees here speak up if they think that there has been a problem.	.77	.04
People here don't work very hard.	-.30	.62
Employees here spend a lot of time just "shooting the breeze."	-.13	.76
Employees here spend a lot of time just hanging out.	-.20	.77
Employees here pass the day by socializing with one another.	-.12	.58
Superiors here do not seem to mind if employees spend a lot of time talking with their friends, while at work.	.12	.61
Our superiors spend a lot of time just "shooting the breeze" with us.	.16	.76

Factors correlate -.35.

APPENDIX H

Collective Mindfulness and Efficiency Orientation

Item	F1	F2
Employees here feel the need to be alert at all times.	.69	.12
Employees here are always on the look-out for ways to meet customers' needs.	.66	-.30
Employees here are attentive to the different needs of different customers.	.76	-.06
Employees here show great care in performing their work tasks.	.85	.13
Employees here recognize the operating a pool is a dangerous task.	.74	-.01
Employees here are committed to showing great care and dedication in performing all of their tasks.	.95	.12
It is important that employees here speak up if they think that there has been a problem.	.76	-.06
Superiors here encourage us to do our tasks as quickly as possible.	-.03	.63
It is important to get work done quickly here.	.31	.95
Superiors here tell people who are slow and careful in their work to speed up.	-.33	.37
At this pool, it is more important to perform tasks quickly than to perform them thoroughly.	-.24	.41
People here are rewarded for doing their tasks as quickly as possible.	-.27	.24

Factors correlate -.28.

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