

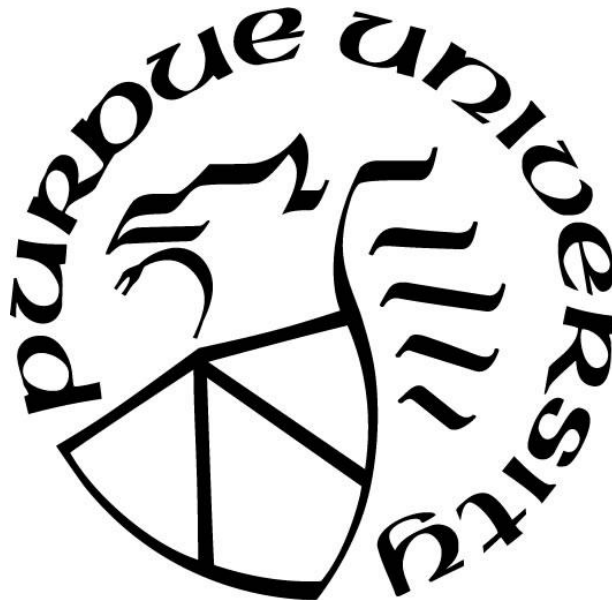
**NURSE RESILIENCE AND ITS APPLICATION IN UNDERSTANDING
NURSES' JOB STRESS: A STRUCTURAL EQUATION MODELING
APPROACH**

by
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To my husband He and parents Xiang Yu and Tao Hua.

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ABSTRACT

The present study examines the influences of nurse perceived work-related resources and detachment from work outside of work on their positive job stress experience using structural equation modeling. The study is guided by a contemporary understanding of resilience as a process focusing on the recovery processes and positive experiences in the face of job stress among registered nurses that are understudied in previous healthcare research. This study provides a heuristic model of resilience that advances the concept clarification in nursing research. Findings include the significant influences of perceived resourcefulness at work and detachment from work outside of work on nurses' positive job stress experience. Supportive work environments positively impact nurses' positive perceptions of job stress, emphasizing the importance of adequate staffing level that closely links to nursing workload. Collectively, supportive work environments and nurses' dedication to the profession all contributes to detachment outside of work, confirming the significance of efficient task completion and problem solving at work that promotes recovery processes after work. This finding also suggests that professional training and leadership can play a role in transmitting positive views of work-life balance. Remarkably, the impact of detachment outside of work on positive job stress experience is comparable to that of nurse perceived staffing adequacy at work, highlighting the significance of recovery experiences to nurse stress management. Interestingly, the influences of resourcefulness at work and detachment outside of work on positive stress experience do not differ between less experienced and more experienced registered nurses, suggesting their universal importance.

CHAPTER 1 INTRODUCTION

Nurse Job Stress and its Consequences

Nursing is a stressful occupation (Clegg, 2001; Woodhead, Northrop & Edelstein, 2016). Nurses' job stress, or work/workplace/occupational stress, has gained much attention for decades due to its potential adverse consequences on various domains such as nurses' well-being, job outcomes, and quality of care (Mark & Smith, 2012; McVicar, 2003). Job stress is an abstract and complex concept. Defining job stress is not straightforward despite its wide use in scientific articles in various disciplines (Clegg, 2001; Hart & Cooper, 2001). The American Psychological Association (n.d) defines job stress as "a physiological and psychological response to events or conditions in the workplace that is detrimental to health and well-being".

Research on nurses' job stress is commonly based on traditional stress theories. First is the stressor-strain approach, i.e., identifying stressors in the workplace and the consequent strain and poor well-being (Beehr, 1995). *Job stressors* refer to work-related conditions, events and situations that cause stress (Hurrell, Nelson, & Simmons, 1998). In nursing, job stressors can be originated in many aspects of the work environment such as workload and interpersonal relationships (McVicar, 2003, 2016). Strain, as the response to stress physically and psychologically, can be short-term (e.g., negative affects) or become chronic when stressors persist, leading to poor well-being such as burnout (Hurrell, Nelson, & Simmons, 1998; McVicar, 2003, 2016; Sonnentag & Fritz, 2015). The stressor-strain approach offers a simplistic view of job stress that is highly applicable in research. However, it suffers from a major drawback: the lack of underpinning theories (Hart & Cooper, 2001). Consequently, job stressors that are hypothesized to cause stress are commonly a laundry list identified empirically. In addition, the stressor-strain approach focuses on the negative aspect of stress experience only. Importantly, the positive and negative aspects of stress experience may have their own unique sets of causes, processes, and consequences. Therefore, positive responses should not be intuitively simplified as the absence of negative responses. Furthermore, the stressor-strain approach discounts the potential reciprocal relationships between stressors and strain. For example, job stressors cause nurses to feel depressed, and being depressed, in return, will influence nurses' perceptions of job stressors.

Second, burnout is conceptualized as a prolonged response to chronic job stressors and can be considered as a work-specific stress theory. The concept *burnout* has been popular in nursing as both a lay term and a scientific term (Adriaenssens, De Gucht, & Maes, 2015; Cooper et al., 2016; Dall'Ora, Ball, Reinius & Griffiths, 2020). Notably, when nurses describe themselves as experiencing burnout, they often mean the experience of exhaustion, one of the three dimensions of burnout, conceptually. *Exhaustion* refers to “the feelings of being overextended and depleted of one’s emotional and physical resources” (Maslach, Schaufeli, & Leiter, 2001). The other two dimensions are depersonalization and inefficacy. *Depersonalization* refers to the excessive detachment from various aspects of jobs, such as nurses detaching themselves from coworkers and patients. *Inefficacy* refers to “the feelings of incompetence and a lack of achievement and productivity at work” (Maslach, Schaufeli, & Leiter, 2001). The process theories of burnout suggest that burnout is expected to occur later in the career (Maslach, Schaufeli, & Leiter, 2001). Exhaustion occurs first, leading to the immediate response of depersonalization, which then leads to inefficacy. However, the transitioning mechanisms between depersonalization and inefficacy are not yet clear. Further, burnout is commonly positioned as a mediator between job stress and adverse job performance and well-being.

Third, the transactional theory of stress and coping is one of the predominant stress theories. Since first proposed in the 1980s, the stress and coping theory has evolved into a process theory that takes into account both individual and environmental differences (Folkman & Moskowitz, 2000; Wethington, Glanz, & Schwartz, 2015). Its key premise is that stress experience is mediated by an individual’s interpretation of the situation and the personal, social and material resources they have to deal with it (Folkman & Moskowitz, 2000; Wethington, Glanz, & Schwartz, 2015). When the demands of a situation are interpreted as exceeding one’s resources, coping is expected: solving the problems (problem-focused coping) and/or regulating negative emotions (emotion-focused coping) (Lazarus & Folkman, 1984). Also, coping focuses on what an individual actually and actively does, whether it makes the matter better or worse. In addition, it discounts the role of some personality characteristics that affect one’s interpretation of the situation and their personal, social, and material resources (Hart & Cooper, 2001). For instance, an individual with high positive affectivity tends to interpret and respond to stress experiences more positively. Regardless of its vagueness, the transactional theory of stress and coping serves as a classic theory that

underpins several well-known stress theories, such as the person-environment fit theory (Edwards, Caplan, & Harrison, 1998) and the job demand-resource theory (Bakker & Demerouti, 2007).

Both the person-environment fit (P-E fit) theory and the job demand-resource (JD-R) theory focus on work domains of an employee's lives only, as compared to the generality of the stress and coping theory. The P-E fit theory emphasizes a misfit between the characteristics of the person and the job environments, while the JD-R theory emphasizes an imbalance that job demands exceed job resources. And both misfit and imbalance result in psychological, physical or behavior strain (Bakker & Demerouti, 2007; Edwards, Caplan, & Harrison, 1998). Research employing these two theories assumes that work and nonwork lives are independent lives that can be studied separately. However, stress research had suggested a systemic view of job stress that work and nonwork lives are integrated (Greenhaus & Powell, 2006; Hart & Cooper, 2001). Some research even suggests that employees' psychological well-being may attribute to nonwork lives more than work lives (Hart, 1999).

Based on the stress theories discussed above, research in nursing has investigated (1) the measurement of nurse job stress, (2) the predictors, alleviators or buffers of negative well-being (including burnout) and job outcomes (e.g., intention to leave, absenteeism, and turnover), and (3) nurses' coping strategies in response to stressors. One of the widely used measures of nurse job stress is the Nursing Stress Scale (NSS), identifying stressors in the workplace (Gray-Toft & Anderson, 1981; French, Lenton, Walters, & Eyles, 2000). The original version of NSS has seven subscales and 34 items, covering the physical, psychological, and social environments in the workplace (Gray-Toft & Anderson, 1981). The specific domains are workload, death and dying, inadequate preparation, lack of staff support, uncertainty, conflict with physicians, and conflict with other nurses and supervisors. Later studies have looked at additional sources of stress in nursing, such as the lack of reward, shifting work, conflict with patients and their families, and discrimination (based on, e.g., race, sex, or ethnicity) (Demerouti et al. 2000; French, Lenton, Walters, & Eyles, 2000; McGowan, 2001).

A considerable amount of literature has been published on the predictors, alleviators or buffers of nurses' negative well-being and job outcomes in various care settings. For example, a national survey found that work constraints (e.g., equipment issues), work/family conflict, and inefficient teamwork lead to psychological distress and increased turnover intention amongst registered nurses, while supervisor support weakened the relationship between job dissatisfaction

and turnover intentions (Modaresnezhad et al., 2020). Increasingly, studies on nurse burnout emerge as more evidence supporting the link between nurse burnout and turnover, especially in acute care settings (e.g., Adriaenssens et al., 2015; Cooper et al., 2016; Modaresnezhad et al., 2020). The growth in burnout research also attributes to the widely validated measure of burnout, the Maslach Burnout Inventory, among nurses worldwide (Beckstead, 2002; Poghosyan, Aiken, & Sloane, 2009).

The past decade has seen a rapid increase in research on the protective role of psychological resilience, or resiliency, in nurses' work lives. *Psychological resilience or resiliency*, to be distinguished from the concept *resilience*, commonly refers to the personal qualities that allow an individual to adapt to stress or adversity (Luthans, Vogelgesang, & Lester, 2006; Masten, 2001; Richardson, 2002; Rutter, 1987). *Resilience*, instead, has evolved into the process of adapting to stress or adversity (Richardson, 2002; Windle, 2011); *psychological resilience or resiliency* is part of an individual's resources that facilitate the resilience process (Connor & Davidson, 2003; Richardson, 2002). Previous studies have reported the association between nurses' resiliency and alleviated adverse well-being and job outcomes such as burnout, anxiety, perceived stress, and absenteeism (e.g., Ang et al., 2018; Magtibay et al., 2017; Manomenidis et al., 2019; Rushton et al., 2015; Williams et al., 2016). Despite the growth of resiliency research in nursing, explicit conceptualizations of resilience and resiliency were often missing or lacking the support of coherent theories (e.g., Mealer et al., 2012; Prosser et al., 2017; Zander et al., 2012). This terminology ambiguousness also exists in standardized resiliency or resilience measures including the most widely employed resiliency scale in nursing research, the Connor-Davidson Resilience Scale (CD-RISC). It measures a collection of personal qualities such as self-efficacy, optimism, and mastery (Connor & Davidson, 2003). Despite the debates on its theoretical underpinnings in the selection of the included personal qualities (Windle, Bennett & Noyes, 2011), the CD-RISC (in various versions) has shown good psychometric properties and relatively easy application, which lays the foundation for its wide use in nursing research. Resiliency research in nursing, either measuring resiliency by standardized scales or exploring it in qualitative inquiries, complements traditional stress research, emphasizing the role of personal protective qualities in the stress process.

Nurses' coping strategies are reactive and situational in nature as the stress and coping theory claims (Folkman & Moskowitz, 2000; Wethington, Glanz, & Schwartz, 2015). There thus

are various coping strategies reported in the literature tied to different circumstances and areas of practice, for example, nurses coping with stressors related to dementia patients' behavioral and psychological symptoms. Also, the measurement and the classification (positive vs. negative; efficient vs. inefficient) of coping strategies are not straightforward. Neither is the synthesis as previous research on coping strategies were mainly qualitative inquiries that focus on in-depth understanding but not generalizability (e.g., Backhouse, Penhale, Gray & Killett, 2018; Clifford & Doody, 2018; Thys et al., 2019). For instance, nurses describe their coping with a dementia patient having troublesome behavioral symptoms as repositioning or segregating the patient from those who might be harmed (Backhouse, Penhale, et al., 2018). In other words, coping is an important component in stress responses and is more meaningful within a specific context; decontextualized synthesis is both challenging and less informative.

In short, the extant literature on nurse job stress is fruitful in understanding stressors in the workplace and the consequent negative outcomes in various domains. Also, much attention has been paid to negative outcomes later in the career (e.g., burnout and turnover) that may allow limited room for change. In addition, there has been little discussion about positive responses to job stress and positive outcomes that may play a unique role in the job stress phenomenon. Further, although the stress theories commonly employed in nursing stress research complement each other to some extent, gaps still exist. For example, little is known about the interplay between personal qualities and environmental factors, as well as the domains of work and nonwork lives in nurse job stress.

Statement of Purpose

The overall objective of this study is to understand how nurses achieve positive outcomes in the face of job stress through the lens of resilience. As discussed previously, *resilience* refers to the process of positive adaptation despite stress or adversity (Richardson, 2002; Windle, 2011). *Adaptation* often refers to “adjusting to the environment effectively and function optimally in various domains” (American Psychological Association, n.d.). *Resiliency* represents a collection of personal qualities that facilitates the resilience process (Luthans, Vogelgesang, & Lester, 2006; Masten, 2001; Richardson, 2002; Rutter, 1987). In the field of job stress research, resilience theories can complement the existing stress theories and help unfold more layers of the stress phenomenon.

Resilience theories have different emphases from the traditional stress theories. Resilience presupposes conditions of risk from stress or adversity regardless of their severity (if classifiable). In other words, resilience is considered as an “ordinary magic” that people all have in the face of stress or adversity (Masten, 2001). Resilience research in adulthood started to gain attention in the situations of severe or traumatic stress such as what soldiers experience in wars (Bonanno, 2004). But later research extended the field to a wider range of stress or adversity (chronic and/or acute) in various domains of lives including work lives. Importantly, resilient people may, but are not necessary to, experience no or lower stress but have the capability to positively adapt to stress. In addition, although reactive coping with stress is part of the resilience process, resilience emphasizes the capability to recover or “bounce back” from the disruptions from stress or adversity in various domains (e.g., biologically, psychologically, and socially). In other words, on one hand, resilience acknowledges the efforts of actively solving the problems and managing negative emotions to cope with stress. On the other hand, resilience recognizes the situations when problems are not solvable to individuals’ efforts, when coping is not as efficient and versatile as expected in complex circumstances, and when negative emotions should not be overly blamed but accepted along with positive emotions as a natural part of being human.

Contemporary resilience theories have advantages in understanding job stress in nursing. The complex nursing contexts weaken the validity of simplistic ways of job stress quantification. For example, besides the empirically appealing sources of stress (e.g., conflicts with coworkers, supervisors, and patients and families), the uncertainty persistent in various domains of nursing practice is a crucial source of stress that can be easily underestimated in traditional measures of nurse job stress. In addition, resilience theories may suit the climate of nursing practice better in terms of the increasing expectations for high-quality care despite the long-standing work constraints facing the majority of nurses (e.g., staff shortage, low wages and poor benefits, equipment and infrastructure constraints, and high workload). Resilience becomes vivid among nursing staff members who stay in their positions and continue to be caring despite limited resources in various domains of work. Understanding what and how personal and/or external resources are activated in the face of job stress to protect nurses from disruptions, to allow efficient recovery from disruptions, and to achieve and maintain positivity in various domains will help to fill the knowledge gaps in the current job stress research.

Despite its theoretical advantages, the application of resilience theories in nursing stress research has challenges. Similar to the stress and coping theory, generality is both an advantage and a disadvantage of the resilience theories. That is, resilience theories can be applied to various domains of lives but the operation of the key constructs in specific areas can be challenging. In the nursing context, challenges lie in the identification of nurses' personal and external resources and the interplay of various resources associated with both work lives and nonwork lives (e.g., the interplay of nurses' self-efficacy, supervisor support and family coherence). Challenges also lie in the understanding and the measurement of potential recovery mechanisms in the resilience process that is open to interpretation. In addition, an appealing significance of resilience research among nurses is the identification of positive adaptive outcomes that may prevent, reverse, or alleviate the routes to cumulative adverse outcomes later in the career such as nurse burnout and turnover. However, it is unclear what adaptive outcomes may take on this role, which are also reliably measurable and trackable.

In spite of the challenges in the application of resilience theories in nursing stress research, this study attempts to explore an early-stage interpretation of the resilience process in nursing and its operation using a secondary dataset. This study has two specific aims. The first is to provide clarification on the conceptualization of resilience as a process and adapt a definition of resilience among nurses. Second, this study uses the conception of resilience among nurses as a framework to guide the understanding of how nurses achieve positive outcomes in the face of job stress. Specifically, this study follows a resource-recovery-adaptation approach, where nurses' personal and external resources, a potential recovery mechanism, and a positive outcome are operationalized from an existing dataset obtained from a multi-state sample of registered nurses in the United States. Data was collected in two Press Ganey surveys, the Employee Survey and the Resilience Survey, in 2018. The surveys were administered in over one thousand healthcare organizations, including acute care hospitals, medical practice groups, outpatient surgery centers, children's hospitals, home health organizations as well as other ancillary services (Press Ganey Associates, 2018). The surveys contained items measuring nurses' perceptions of their organizations (i.e., community commitment, diversity and inclusion, employee care, compensation, and service and quality), their direct work environments (i.e., leadership, teamwork, staffing level, and job resources), and their work (i.e., job stress, job satisfaction, commitment to the nursing profession, and work-life balance), as well as nurses' demographic characteristics (i.e., age, sex,

race, tenure, shift, and full-time/part-time status). This study uses structural equation modeling (SEM) to clarify the relationships between nurse perceived resources, the recovery mechanism and the positive outcome.

Research Questions

The research questions to be addressed are as follows:

Research Question 1. What is the influence of perceived work-related resources (personal and organizational) on nurses' positive stress experience (i.e., nurses perceiving job stress as reasonable)?

Research Question 2. What's the role of detachment outside of work [recovery mechanism] influencing the effect of perceived work-related resources on nurse's positive stress experience?

Research Question 3. Whether and to what extent do the relationships between work-related resources, detachment outside of work and positive stress experience differ by nurses' length of service?

CHAPTER 2 LITERATURE REVIEW AND THEORETICAL FRAMEWORK

This chapter includes three components. The first provides a historical overview of resilience and resiliency research. The second summarizes evidence surrounding the attributes of nurse resilience. A heuristic model and a definition of nurse resilience are provided subsequently. The third specifies the conceptual framework guiding the current study and the hypotheses to be tested.

Resilience and Resiliency: A Historical Overview

The nouns resilience and resiliency derive from the Latin verb *resilire*, meaning “to rebound” or “to recoil” (Merriam-Webster, n.d.). In physics, resilience is “the ability of an elastic material to absorb energy and release that energy as it springs back to its original shape”. People view the recovery in this phenomenon as analogous to “a person’s ability to bounce back after a jarring setback”. In social sciences, the uses of the two terms *resilience* and *resiliency* are inconsistent. To avoid confusion, throughout this chapter, *resiliency* refers to personal qualities that facilitate adaptation, while *resilience* refers to the process of adaptation in the face of stress or adversity.

Resilience and Resiliency in Psychology

Resilience research originated in developmental psychology and extended to psychology of adulthood (Rutter, 1979; Anthony & Koupernik, 1974). In early inquiries, resilience in childhood reflected the phenomenon that children who were at high risk for psychopathology had atypical good outcomes in the face of, e.g., poverty, daily instability and parent with severe mental illness (Werner, 1982; Garmezy, 1974; Garmezy, Masten, & Tellegen, 1984). In adulthood, resilience research gained attention in cases when people facing severe or traumatic stress or adversity (e.g., war trauma and the loss of loved ones) (Bonanno, Papa & O’Neill, 2001; Bonanno, 2004, Connor & Davidson, 2003). As the field evolved, however, scholars argued that resilience is an “ordinary magic” commonly observed across the lifespan, other than an extraordinary phenomenon (Masten, 2001, Bonanno, 2004).

Historically, there were two major paradigms in resilience and resiliency research. The first wave of resilience research focused on identifying resiliency or resilient qualities among those who had positively adapted to stress or adversity. The resiliency or resilient qualities had also been referred to as strengths, competence, assets, or protective factors. In addition, the conception of resiliency was not limited to personal, psychological qualities only, such as self-esteem, self-efficacy and positive outlook, but might also include protective factors in external support systems such as a supportive family environment (Garmezy, Masten, & Tellegen, 1984; Richardson, 2002). The second wave of resilience research looked further into the processes of acquiring resiliency and achieving positive outcomes in the face of stress or adversity (Richardson, 2002). This wave of inquiries was mainly qualitative, trying to understand how individuals achieve and maintain a “biopsychospiritual homeostasis”, or the “adapted state of mind, body and spirit” (Richardson, 2002). Specifically, components of importance include the sources of stress and adversity and the consequent disruptions, the routinization of stressors to cope and grow through disruptions, and the effect of protective factors on specific disruptors.

Resiliency Measurement

The measurement of resilience is not straightforward due to its complex processes, but many resiliency measures had developed in psychology since the 1990s (Windle, Bennett, & Noyes, 2011). This subsection introduces two resiliency measures of the greatest familiarity in the nursing research community, the Connor-Davidson Resilience Scale (CD-RISC) and the Resilience Scale for Adults (RSA). The two measures are great exemplars of resiliency measurement that have similar but different underpinning conceptions.

The CD-RISC (25-item or 10-item) is the most widely used resiliency measure worldwide. It was originally designed to measure individuals’ intrapersonal resources for coping with mental illnesses for use in clinical practice (Connor & Davidson, 2003) and has also been widely used in general populations. The CD-RISC measures key personal qualities of resilient people based on the theories of hardiness, strengths, patience and endurance (Kobasa, 1979; Lyons, 1991; Rutter, 1985). Specifically, these qualities are self-efficacy, optimism, mastery, hardiness, social competence, adaptability and spirituality (Connor & Davidson, 2003; Davidson, 2018). The measure has been translated into 77 languages other than English and validated among diverse samples including the general population, veterans, students, patients, and health care workers

(Connor & Davidson, 2003; Davidson, 2018; Gabriel, Diefendorff & Erickson, 2001; Mealer, Schmiede & Meeks, 2016). Overall, the CD-RISC demonstrates good psychometric properties consistently.

In contrast, the RSA (37-item or 33-item), designed by scholars in Norway, measures both intrapersonal and interpersonal protective factors that facilitate resilience in face of stress or adversity (Friborg et al., 2003; Friborg, Barlaug, Martinussen, Rosenvinge, & Hjemdal, 2005). The intrapersonal qualities included in the RSA are similar to those in the CD-RISC but have specific credit granted for an individual's ability to plan and organize in the face of stress and adversity. Besides, the RSA also measures an individual's interpersonal resources including a coherent and supportive family and other external support systems (e.g., supportive friends and relatives). The RSA has been translated and validated in many countries, for example, among the general population, outpatient samples, college students and athletes (Morote, Hjemdal, Krysinska, Uribe, & Corveleyn, 2017; Friborg et al., 2005; Cowden, Meyer- Weitz, & Asante, 2016; Anyan, Hjemdal, Bizumic, & Friborg, 2019; Capanna, Stratta, Hjemdal, Collazzoni, & Rossi, 2015; Hjemdal et al., 2011). Overall, the scale as a whole demonstrated good psychometric properties but the subscale "planning and organizing" had internal consistency scores below the acceptable level (Hjemdal et al., 2011; Anyan et al., 2019).

Resilience in Nursing

Resilience in nursing has drawn increasing attention worldwide in the past two decades. Different from resilience in psychology, resilience in nursing is contextualized in the profession embedding various stressors and protective factors relevant to nursing practice. This section synthesizes empirical evidence surrounding nurse resilience and organizes them into seven clusters of attributes. When the discussion on certain domains in nurse resilience literature is limited, relevant evidence from, such as, general nursing or industrial and organizational psychology research will be integrated. Subsequently, a heuristic model and a definition of nurse resilience as a process are adapted to clarify the concept based on the empirical evidence and theories underpinning the current study.

Attributes

Seven clusters of attributes had roughly emerged in nurse resilience research: nurses' personal qualities, nursing excellence, interpersonal support systems, workplace resources, coping, recovery, and adaptive/positive outcomes.

Notably, the influences of nurses' demographic characteristics on nurse resilience are not yet clear (Hart, Brannan & De Chesnay, 2014; Gillespie, Chaboyer, & Wallis, 2009b; Yu et al., 2019). Inconsistent conceptions and measures of resilience among nurses pose difficulties for evidence synthesizing. There were mixed findings regarding the associations between personal resilient qualities and nurses' sex, age, marital status, education level, years of experience, and shift work in various nursing contexts. For example, in regression analyses, resiliency scores were relatively flat over the years of experience among nurses working in high-intensity hospital units (Rushton et al., 2015). Using the same resiliency scale, researchers found increased years of experience were significantly related to lower resiliency scores among ICU nurses (Mealer et al., 2012). Among operating room nurses, however, years of experience were found to have either non-significant influence or modest but significant influence on resiliency scores (Gillespie et al., 2009b; Gillespie, Chaboyer, Wallis, & Grimbeek, 2007).

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Nurses' personal qualities associated with nurse resilience have been explored in both quantitative and qualitative studies worldwide. The main approach to nurse resilience in quantitative studies was measuring nurses' resiliency by standardized scales, commonly using the CD-RISC or the RSA. In contrast, qualitative studies provided a broader understanding of what personal resources are essential to nurse resilience from nurses' own perspectives.

As discussed previously, resiliency measures identify key personal, psychological qualities such as self-efficacy, mastery, and social competence that are part of the protective factors facilitating nurses' adaptation to stressful work environments. *Self-efficacy* refers to "an individual's subjective perception of his or her capability to perform in a given setting or to attain desired results" (American Psychological Association, n.d.). As a stand-alone attribute, self-efficacy was also frequently cited in nurse resilience research (Ang et al., 2019; Cope, Jones & Hendricks, 2016a; Gillespie, Chaboyer, Wallis & Grimbeek, 2007; Hart et al., 2014; Hegney et al.,

2015; Kornhaber & Wilson, 2011; Rees, Breen, Cusack & Hegney, 2015; Rushton et al., 2015; Shirey, 2012). Research consistently found the importance of nurses' belief in their ability to handle stressful situations at work. Emotional intelligence and positive emotions were also considered as resilient qualities that may positively influence how nurses perceive job stress (Gillespie, Chaboyer, Wallis & Grimbeek, 2007; Mealer et al., 2012). Higher emotional intelligence among nurses may reflect their abilities to recognize, comprehend and regulate one's own and others' emotions (American Psychological Association, n.d.; Mealer et al., 2012; Glass, 2009; McDonald et al., 2012; McDonald et al., 2013; Cline, 2015; Cope, Jones & Hendricks, 2016b; Delgado et al., 2017). Positive emotions valued by nurses included hope, confidence, enthusiasm and optimism (Gillespie, Chaboyer, Wallis & Grimbeek, 2007; Heritage et al., 2019; Rosa-Besa et al., 2021). In addition, other reported psychological qualities in the resilience process included humor, mindfulness, determination, persistence, realistic thinking, acceptance, and spirituality (Ang et al., 2018; Heritage et al., 2019; Rees, Breen, Cusack & Hegney, 2015; Rosa-Besa et al., 2021). *Mindfulness* refers to the "awareness of one's internal states and surroundings" (American Psychological Association, n.d.). Along with spirituality, mindfulness has been commonly applied to nurse resilience interventions (Harwood et al., 2021; Mackenzie, Poulin, & Seidman-Carlson, 2006; Slatyer et al., 2018). Acceptance is a favorable attitude toward the uncertainty or unpredictability of nursing practice and toward situations that are not controllable to nurses' efforts (American Psychological Association, n.d.; Ang et al., 2018). Acceptance may facilitate the re-planning and re-organizing of priorities in practice and help nurses to cope better with acute situations.

Nursing excellence

Nursing excellence involves qualities or capabilities related to the nursing profession. Nursing-related qualities discussed in nurse resilience research included commitment to the profession, passion for the profession, pride in the profession, work/clinical engagement, and professional autonomy (Cao & Chen, 2021a, 2021b; Cameron & Brownie, 2010; Cope, Jones & Hendricks, 2016a, 2016b; Hetzel-Riggin et al., 2020; McDonald et al., 2012; Rosa-Besa et al., 2021). *Commitment* refers to the obligation or devotion to the nursing profession (American Psychological Association, n.d.). *Professional autonomy* means that nurses have the authority and the competence to be independent in decision-making that influences their work (Pursio,

Kankkunen, Sanner-Stiehr & Kvist, 2021). Although it was not discussed frequently as a stand-alone attribute to nurse resilience, autonomy was commonly tied to leadership or leader/supervisor support, involvement in decision-making, and a healthy work environment as a whole (American Organization of Nurse Executives, 2015).

Although the role of work engagement in nurse resilience has only been investigated in most recent studies (Cao & Chen, 2021a, 2021b; Hetzel-Riggin et al., 2020), research on work/clinical engagement has emerged in general nursing literature. In psychology, *work engagement* refers to "a positive, fulfilling, work-related state of mind" (Schaufeli, Salanova, González-Roma, & Bakker, 2002). Work engagement has been defined as the antithesis of burnout (Maslach, Schaufeli, & Leiter, 2001; Schaufeli, Salanova, Gonzalez-Roma, & Bakker, 2002). In nursing, work engagement emphasizes the meaning of the nursing profession that gives value to lives (Vinje & Mittlemark; 2008). Research on nurses' work engagement has shown its associations with various nurse outcomes such as job satisfaction, work performance, occupational stress, perceived quality of care, burnout, and turnover (Manning, 2016). Nurses' work engagement is influenced by both organizational and personal factors (Fiabane, Giorgi, Sguazzin, & Argentero, 2013; VandenBos, 2007). These organizational factors include workload, control, reward, trust and teamwork, and leadership. Personal factors influencing work engagement include physical and mental health and personality (i.e., Type A personality, characterized by such as chronic competitiveness and high levels of achievement motivation [VandenBos, 2007]).

In industrial and organizational psychology, work engagement is often measured by the Utrecht Work Engagement Scale (UWES). The UWES consists of three dimensions: vigor, dedication, and absorption, characterized by high levels of energy, a sense of enthusiasm and pride, and full concentration on one's work, respectively (Bakker & Demerouti, 2008; Schaufeli et al., 2002). Schaufeli, Bakker, and Salanova (2006) developed a shortened UWES with 9 items (Table 1). The current secondary analysis captures the meaning and value of the nursing profession that agrees with Vinje and Mittlemark (2008)'s conception of work engagement in nursing. However, compared to the widely used UWES, the current study mainly captures the dedication dimension of work engagement (see details in Chapter 3).

Table 1. Utrecht Work Engagement Scale -9 (Short Version)

	Subscale	Item
1	Vigor	At my work, I feel bursting with energy.
2	Vigor	At my job, I feel strong and vigorous
3	Vigor	When I get up in the morning, I feel like going to work
4	Dedication	I am enthusiastic about my job
5	Dedication	My job inspires me.
6	Dedication	I am proud of the work that I do.
7	Absorption	I feel happy when I am working intensely
8	Absorption	I am immersed in my work
9	Absorption	I get carried away when I am working

Source: Schaufeli, W. B., Bakker, A. B., and Salanova, M. (2006).

Interpersonal support systems

Strong social support from family and friends was consistently valued for nurse resilience (Glass, 2009; Cameron & Brownie, 2010; Mealer et al., 2012; Mealer et al., 2014; Kim & Windsor, 2015; McDonald et al, 2016). Interpersonal support systems may provide assistance or comfort to help nurses cope with job stress (American Psychological Association, n.d.). As discussed previously, interpersonal support systems had been integrated into resiliency scales as an important dimension of resiliency (Friborg et al., 2003; Friborg et al., 2005).

Workplace resources

Research has also agreed upon the role of workplace resources in facilitating nurse resilience. Specifically, studies have discussed the importance of teamwork and collegial support, good leadership and mentorship, good interpersonal relationships (with coworkers, supervisors, other professionals or patients and families), and adequate training and education (Cope, Jones & Hendricks, 2016a, 2016b; Gillespie, Chaboyer, Wallis & Grimbeek, 2007; Mealer, Jones, & Meek, 2017; Kalliath & Lee, 2009; Kalliath, Lee & Rochman, 2010; Tabakakis, McAllister, Bradshaw, & To, 2019). These findings are consistent with the emphasis on a supportive or healthy work environment in general nursing research and practice (American Organization of Nurse Executives, 2015).

Specifically, evidence on leadership styles and leadership support has been fruitful concerning nurse job outcomes and work environments (Avolio & Gardner, 2005; Bass & Avolio, 1994; Cummings et al., 2018; Manning, 2016). Leadership includes three main styles: transformational leadership, transactional leadership, and authentic leadership (Avolio & Gardner,

2005; Bass & Avolio, 1994; Cummings et al., 2018; Manning, 2016). In short, leaders or supervisors who are transparent, supportive, and inspiring are favored. Collectively, research supports the positive influences of good leadership on staff collaboration and staff relationships with work such as organizational commitment, empowerment, and intent to stay.

Adequate tools, training and staffing levels in the workplace are essential to nursing practice in all settings. Tool/material inadequacy has been shown to increase nursing workload, such as malfunctioning equipment, equipment/material shortage, and technology troubles (hardware and software) (Kalisch, Tschannen, Lee, & Frieze, 2011). Appropriate training is important for nurses' skill improvement in various aspects of nursing practice. According to Hennessy and Hicks (2011)'s training needs analysis (TNA) tool, a validated and widely used questionnaire, training may target clinical, communication, supervisory, administrative and research activities.

Adequate staffing level has drawn long attention in nursing practice and research due to its high impact on nurse workload, patient outcomes (e.g., mortality and adverse events), and nurse job outcomes (e.g., burnout and turnover) (Griffiths et al., 2020; Lake, Riman & Sloane, 2020; Cristina Gasparino et al., 2021; Moloney, Boxall, Parsons, & Cheung, 2018). The definition of staffing in nursing is twofold: the number and the skill mix of nursing staff members. The measurement of nurse staffing levels has taken a variety of approaches, such as using nurses' judgment, patient-to-nurse ratios, timed-task approaches, and patient dependency classification approaches (Griffiths et al., 2020).

Informed by the evidence regarding the importance of a supportive work environment in fostering nurse resilience, the current secondary analysis involves five elements of workplace resources: leadership, teamwork/collaboration, staffing level, training, and tools/materials. Leadership is perceived as positive or negative instead of specific styles. A positive sense of leadership is described as that the leader is a good communicator, highly accessible to staff and open to innovative ideas about patient care; the leader makes flexible work scheduling, involves nurses in decision-making, recognizes nurses for a job well done, and maintains a good leader-nurse relationship (Aiken & Patrician, 2000; Squires, Tourangeau, Laschinger, & Doran, 2010). The teamwork/collaboration, staffing level, training, and tools/materials are assessed by their general adequacy or efficiency in the care units. For example, the general adequacy of staffing

level was measured by a single survey item asking nurses' agreement/disagreement on the statement, "My work unit is adequately staffed".

Coping

Coping was a commonly cited attribute in nurse resilience research (Ang et al., 2018; Gillespie, Chaboyer, Wallis & Grimbeek, 2007; Heritage et al., 2019; Rees, Breen, Cusack & Hegney, 2015; Rosa-Besa et al., 2021; Tusaie & Dyer, 2004; Udod et al., 2021). Reactive coping is a process of adjustment following an adverse event (Lazarus & Folkman, 1984). Coping can also be proactive in that nurses accumulate resources, e.g., competence, material and knowledge, before an adverse event (Aspinwall & Taylor, 1997). Coping is diverse and complex, supported by the wide range of coping strategies reported in nurse resilience research. Effective coping, especially problem-focused coping, enhances nurses' positive adaptation in the face of job stress (Gillespie, Chaboyer, Wallis & Grimbeek, 2007).

Recovery

Nurse resilience literature provided limited insights into the role of recovery in the resilience process. Recovery in resilience has also been phrased as the reintegration process from disruptions (to body, mind and spirit) caused by stressors (Richardson, 2002). Both coping and recovery result in the cultivation of resilient qualities so that stressors become routine and less disruptive. As a result, coping and recovery promote nurses' positive adaptation in the face of job stress.

Self-care and work-life balance, or employee care from the standpoint of healthcare organizations, are potential recovery processes to enhance nurse resilience (Cooper et al., 2020; Mintz-Binder, Sweatt, Andersen & Song, 2021; Slatyer et al., 2018). Work-life balance refers to the perception that work and non-work activities are compatible (Kalliath & Brough, 2008). Self-care involves a wide range of activities including exercising, meditation, and socializing (Richards, Campenni, & Muse-Burke, 2010). Both concepts are broad and lacking a direct well-developed measure. One example of single-item measures of satisfaction with work-life balance is from the U.S. General Social Survey: "How successful do you feel in balancing your paid work and family life?" (Milkie & Peltola, 1999). In the nursing context, flexible scheduling strategies that nurses

have some to full control over working hours are considered important to enhance nurse work-life balance (Campbell & Patrician, 2020; Harvey et al., 2020; Wynendaele et. al., 2020).

Psychological detachment outside of work is a potential recovery mechanism that is strongly associated with employee outcomes outside of the nursing context (Sonnentag & Fritz, 2015). Psychological detachment outside of work shares some attributes with work-life balance in the sense of being mindful of after-work life and allowing recovery from work-related disruptions. But psychological detachment outside of work is more clearly defined, i.e., "refraining from job-related activities and mentally disengaging from work during time off the job" (Sonnentag & Fritz, 2015). The most widely used measure of psychological detachment has four items: "During time after work, I forget about work."; "During time after work, I don't think about work at all"; "During time after work, I distance myself from my work."; and "During time after work, I get a break from the demands of work" (Sonnentag & Fritz, 2007). However, to the author's knowledge, this measure has not been used and validated among nursing staff.

Although the previously discussed recovery processes mainly focus on nonwork lives, the most recent nurse resilience research has looked at integrating nurse self-care or employee care into work lives (Mintz-Binder, Sweatt, Andersen & Song, 2021). Self-care during work hours involved a variety of activities and practices such as lavender aromatherapy, meditation, and coloring.

Adaptive/Positive Outcomes

As discussed previously, there are conceptual difficulties around what outcomes can be considered good or positive, and also reflect adaptation among nurses. Unsurprisingly, the discussion on nurses' adaptive outcomes is largely lacking in nurse resilience research. However, there were attempts to address positive outcomes related to nurses' resiliency, though a considerable proportion assessed the absence of negative outcomes. Specifically, there were three clusters of "positive" outcomes reported in nurse resilience research. The first cluster was the growth in personal abilities to cope, adapt, and thrive (e.g., becoming competent, confident, and enduring) (Tusaie & Dyer, 2004; Gillespie, Chaboyer, & Wallis, 2009a; Cope, Jones, & Hendricks, 2016a, 2016b; Tubbert, 2016; Glass, 2009; Kornhaber & Wilson, 2011). The second cluster was the maintenance of job satisfaction, compassion, well-being, and normal work functioning (e.g., effective workplace practices and delivery of quality health care) (Glass, 2009;

Cope, Jones, & Hendricks, 2016a; Hudgins, 2016; Guo et al., 2017). The last cluster was the diminished chronic consequences of job stress (e.g., psychological distress, post-traumatic stress disorder, burnout, and turnover) (Cusack et al., 2016; Dolan, Strodl, & Hamernik, 2012; Guo et al., 2018; Guo et al., 2019; Leverence, 2015; Slatyer et al., 2018).

Outside of the nursing context, employee adaptation in the workplace had various interpretations in the literature. An essential takeaway is that adaptation in the workplace should be investigated at multiple time points to demonstrate the adjustment process. For example, overtime adjustment on job-related self-efficacy, job satisfaction and psychological distress have been considered as adaptative responses to job stress (Jex, Bliese, Buzzell, and Primeau, 2001; Sargent & Terry, 1998).

Heuristic Model and Definition

A heuristic model of nurse resilience is developed to illustrate the hypothesized dynamic process (Figure 1). The model and the subsequent definition of nurse resilience are inspired mainly by Richardson's (2002) and Windle's (2011) conceptions of the resilience process. The model involves all the attributes discussed above and specifies their relationships, including reciprocal relationships, that are reasonable to be assumed. Nurses' resources in the resilience process come from the interplay between personal and external resources. Activated resources promote effective coping and/or efficient recovery and lead to positive, adaptive outcomes in the face of stress or adversity. Coping is a cognitive process where actions are taken to solve the problems and/or regulate negative emotions. Recovery processes to a "biopsychospiritual homeostasis", or the "adapted state" are activated consciously and/or unconsciously when disruptions to body, mind and spirit occur. Ideally, nurses cope effectively and recover fully from the disruptions in the face of stress or adversity, leading to positive, adaptive outcomes. Both coping and recovery processes are universal and nonhierarchical in the resilience process. It is reasonable to assume that coping and recovery processes complement each other. That is, effective coping promotes efficient recovery and vice versa. Also, it is reasonable to assume that nurses learn and grow from the processes and, in turn, their coping and recovery capabilities are strengthened, as well as their resources.

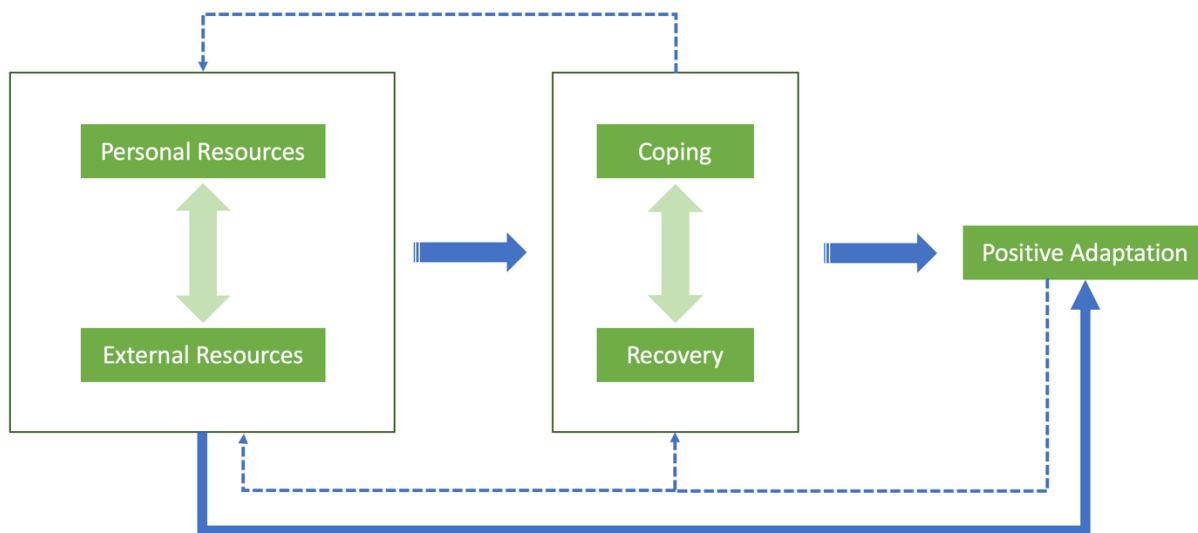


Figure 1. A heuristic model of nurse resilience as a process

The heuristic model of nurse resilience provides a comprehensive view of the hypothesized resilience process among nurses in the face of stress or adversity. This model is open to future testing and modification. The current secondary analysis, however, cannot test the resilience as a dynamic process due to methodological limitations: cross-sectional design, linear statistical model and missing resource variables (details in chapter 3). Instead, the current study aims at an early-stage interpretation of the resilience process focusing on the unidirectional pathways between the key constructs. Figure 2 illustrates the simplified model of resilience process. The current analysis takes into account the correlations between personal and external resources but not their interactions. Also, this analysis focuses on a potential recovery mechanism but not the coping processes. Further, a positive outcome, i.e., nurses' positive stress experience, is tested in this cross-sectional design, instead of adaptive outcomes that require longitudinal analysis.

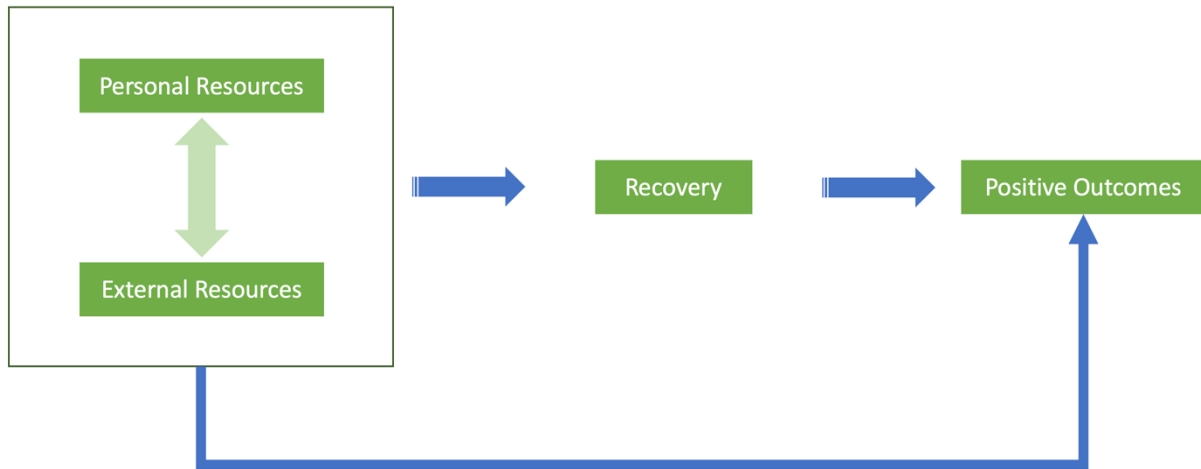


Figure 2. Simplified model of nurse resilience as a process

Based on the review of literature, this study defines nurse resilience as:

The process of effectively coping with and adapting to significant sources of stress or adversity at work. Nurses' personal resources and workplace resources facilitate this capacity for "bouncing back" and adaptation.

Conceptual Framework and Hypotheses

Based on the simplified model of the resilience process (Figure 2) and the availability of its attributes in the Press Ganey dataset, a conceptual framework (Figure 3) is developed to guide the formation of hypotheses.

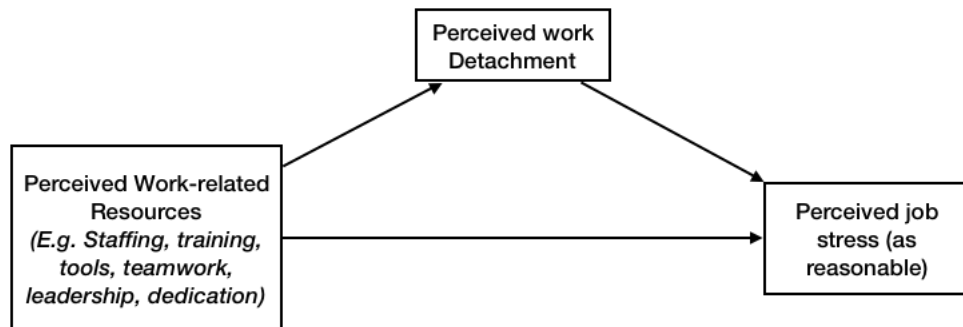


Figure 3. Conceptual framework of the study

Based on the definition of nurse resilience, perceived work-related resources both within the nurse and within the work environment facilitate nurses' capacity to recover from disruptions and adapt to stressful work environments and achieve good outcomes (Richardson, 2002; Windle, 2011). From the existing Press Ganey dataset, perceived work-related resources include efficient teamwork, good leadership, dedication to the nursing profession, and adequate staffing level, training and tools at work. As a recovery experience outside of work, detachment from work cognitively and psychologically is part of the resilience process, although its mediating role between resources and positive outcomes is understudied.

This study has four hypotheses to test:

Hypothesis 1: Resourceful nurses will be more likely to have positive stress experience.

The good outcome of the resilience process is operationalized as nurses' positive stress experience, i.e., nurses perceiving the level of job stress as reasonable.

Hypothesis 2: Resourceful nurses will be more likely to detach themselves from work outside of work.

Hypothesis 3: Nurses who are able to detach themselves from work outside of work are more likely to have positive stress experience.

Given the uncertainty of the role of detachment outside of work (mediator or moderator) in the extant literature, this study hypothesizes that it serves as a mediating recovery mechanism. Resourceful nurses are more likely to be supported/encouraged to, be mindful to, or be able to detach themselves from work outside of work. Nurses who had adequate recovery from detachment outside of work are more likely to have positive perceptions of job stress.

Hypothesis 4: The direct effect of perceived resourcefulness on positive stress experience (i.e., perceiving job stress as reasonable) (tested in Hypothesis 1) and the indirect effect mediated by work detachment (tested in Hypothesis 2 &3) will not differ by nurses' length of service.

The length of service captured in this project ranges from less than 6 months to more than 25 years. This is a weak hypothesis due to the lack of evidence in extant nurse resilience literature.

This chapter includes three components. The first provides a historical overview of resilience and resiliency research. The second summarizes evidence surrounding the attributes of nurse resilience. A heuristic model and a definition of nurse resilience are provided subsequently. The third specifies the conceptual framework guiding the current study and the hypotheses to be tested.

Resilience and Resiliency: A Historical Overview

The nouns resilience and resiliency derive from the Latin verb *resilire*, meaning “to rebound” or “to recoil” (Merriam-Webster, n.d.). In physics, resilience is “the ability of an elastic material to absorb energy and release that energy as it springs back to its original shape”. People view the recovery in this phenomenon as analogous to “a person’s ability to bounce back after a jarring setback”. In social sciences, the uses of the two terms *resilience* and *resiliency* are inconsistent. To avoid confusion, throughout this chapter, *resiliency* refers to personal qualities that facilitate adaptation, while *resilience* refers to the process of adaptation in the face of stress or adversity.

Resilience and Resiliency in Psychology

Resilience research originated in developmental psychology and extended to psychology of adulthood (Rutter, 1979; Anthony & Koupernik, 1974). In early inquiries, resilience in childhood reflected the phenomenon that children who were at high risk for psychopathology had atypical good outcomes in the face of, e.g., poverty, daily instability and parent with severe mental illness (Werner, 1982; Garmezy, 1974; Garmezy, Masten, & Tellegen, 1984). In adulthood, resilience research gained attention in cases when people facing severe or traumatic stress or adversity (e.g., war trauma and the loss of loved ones) (Bonanno, Papa & O’Neill, 2001; Bonanno, 2004, Connor & Davidson, 2003). As the field evolved, however, scholars argued that resilience is an “ordinary magic” commonly observed across the lifespan, other than an extraordinary phenomenon (Masten, 2001, Bonanno, 2004).

Historically, there were two major paradigms in resilience and resiliency research. The first wave of resilience research focused on identifying resiliency or resilient qualities among those who had positively adapted to stress or adversity. The resiliency or resilient qualities had also been

referred to as strengths, competence, assets, or protective factors. In addition, the conception of resiliency was not limited to personal, psychological qualities only, such as self-esteem, self-efficacy and positive outlook, but might also include protective factors in external support systems such as a supportive family environment (Garmezy, Masten, & Tellegen, 1984; Richardson, 2002). The second wave of resilience research looked further into the processes of acquiring resiliency and achieving positive outcomes in the face of stress or adversity (Richardson, 2002). This wave of inquiries was mainly qualitative, trying to understand how individuals achieve and maintain a “biopsychospiritual homeostasis”, or the “adapted state of mind, body and spirit” (Richardson, 2002). Specifically, components of importance include the sources of stress and adversity and the consequent disruptions, the routinization of stressors to cope and grow through disruptions, and the effect of protective factors on specific disruptors.

Resiliency Measurement

The measurement of resilience is not straightforward due to its complex processes, but many resiliency measures had developed in psychology since the 1990s (Windle, Bennett, & Noyes, 2011). This subsection introduces two resiliency measures of the greatest familiarity in the nursing research community, the Connor-Davidson Resilience Scale (CD-RISC) and the Resilience Scale for Adults (RSA). The two measures are great exemplars of resiliency measurement that have similar but different underpinning conceptions.

The CD-RISC (25-item or 10-item) is the most widely used resiliency measure worldwide. It was originally designed to measure individuals’ intrapersonal resources for coping with mental illnesses for use in clinical practice (Connor & Davidson, 2003) and has also been widely used in general populations. The CD-RISC measures key personal qualities of resilient people based on the theories of hardiness, strengths, patience and endurance (Kobasa, 1979; Lyons, 1991; Rutter, 1985). Specifically, these qualities are self-efficacy, optimism, mastery, hardiness, social competence, adaptability and spirituality (Connor & Davidson, 2003; Davidson, 2018). The measure has been translated into 77 languages other than English and validated among diverse samples including the general population, veterans, students, patients, and health care workers (Connor & Davidson, 2003; Davidson, 2018; Gabriel, Diefendorff & Erickson, 2001; Mealer, Schmiede & Meeks, 2016). Overall, the CD-RISC demonstrates good psychometric properties consistently.

In contrast, the RSA (37-item or 33-item), designed by scholars in Norway, measures both intrapersonal and interpersonal protective factors that facilitate resilience in face of stress or adversity (Friborg et al., 2003; Friborg, Barlaug, Martinussen, Rosenvinge, & Hjemdal, 2005). The intrapersonal qualities included in the RSA are similar to those in the CD-RISC but have specific credit granted for an individual's ability to plan and organize in the face of stress and adversity. Besides, the RSA also measures an individual's interpersonal resources including a coherent and supportive family and other external support systems (e.g., supportive friends and relatives). The RSA has been translated and validated in many countries, for example, among the general population, outpatient samples, college students and athletes (Morote, Hjemdal, Krysinska, Uribe, & Corveleyn, 2017; Friborg et al., 2005; Cowden, Meyer- Weitz, & Asante, 2016; Anyan, Hjemdal, Bizumic, & Friborg, 2019; Capanna, Stratta, Hjemdal, Collazzoni, & Rossi, 2015; Hjemdal et al., 2011). Overall, the scale as a whole demonstrated good psychometric properties but the subscale "planning and organizing" had internal consistency scores below the acceptable level (Hjemdal et al., 2011; Anyan et al., 2019).

Resilience in Nursing

Resilience in nursing has drawn increasing attention worldwide in the past two decades. Different from resilience in psychology, resilience in nursing is contextualized in the profession embedding various stressors and protective factors relevant to nursing practice. This section synthesizes empirical evidence surrounding nurse resilience and organizes them into seven clusters of attributes. When the discussion on certain domains in nurse resilience literature is limited, relevant evidence from, such as, general nursing or industrial and organizational psychology research will be integrated. Subsequently, a heuristic model and a definition of nurse resilience as a process are adapted to clarify the concept based on the empirical evidence and theories underpinning the current study.

Attributes

Seven clusters of attributes had roughly emerged in nurse resilience research: nurses' personal qualities, nursing excellence, interpersonal support systems, workplace resources, coping, recovery, and adaptive/positive outcomes.

Notably, the influences of nurses' demographic characteristics on nurse resilience are not yet clear (Hart, Brannan & De Chesnay, 2014; Gillespie, Chaboyer, & Wallis, 2009b; Yu et al., 2019). Inconsistent conceptions and measures of resilience among nurses pose difficulties for evidence synthesizing. There were mixed findings regarding the associations between personal resilient qualities and nurses' sex, age, marital status, education level, years of experience, and shift work in various nursing contexts. For example, in regression analyses, resiliency scores were relatively flat over the years of experience among nurses working in high-intensity hospital units (Rushton et al., 2015). Using the same resiliency scale, researchers found increased years of experience were significantly related to lower resiliency scores among ICU nurses (Mealer et al., 2012). Among operating room nurses, however, years of experience were found to have either non-significant influence or modest but significant influence on resiliency scores (Gillespie et al., 2009b; Gillespie, Chaboyer, Wallis, & Grimbeek, 2007).

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As discussed previously, resiliency measures identify key personal, psychological qualities such as self-efficacy, mastery, and social competence that are part of the protective factors facilitating nurses' adaptation to stressful work environments. *Self-efficacy* refers to "an individual's subjective perception of his or her capability to perform in a given setting or to attain desired results" (American Psychological Association, n.d.). As a stand-alone attribute, self-efficacy was also frequently cited in nurse resilience research (Ang et al., 2019; Cope, Jones & Hendricks, 2016a; Gillespie, Chaboyer, Wallis & Grimbeek, 2007; Hart et al., 2014; Hegney et al., 2015; Kornhaber & Wilson, 2011; Rees, Breen, Cusack & Hegney, 2015; Rushton et al., 2015; Shirey, 2012). Research consistently found the importance of nurses' belief in their ability to handle stressful situations at work. Emotional intelligence and positive emotions were also considered as resilient qualities that may positively influence how nurses perceive job stress (Gillespie, Chaboyer, Wallis & Grimbeek, 2007; Mealer et al., 2012). Higher emotional

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Nursing excellence

Nursing excellence involves qualities or capabilities related to the nursing profession. Nursing-related qualities discussed in nurse resilience research included commitment to the profession, passion for the profession, pride in the profession, work/clinical engagement, and professional autonomy (Cao & Chen, 2021a, 2021b; Cameron & Brownie, 2010; Cope, Jones & Hendricks, 2016a, 2016b; Hetzel-Riggin et al., 2020; McDonald et al., 2012; Rosa-Besa et al., 2021). *Commitment* refers to the obligation or devotion to the nursing profession (American Psychological Association, n.d.). *Professional autonomy* means that nurses have the authority and the competence to be independent in decision-making that influences their work (Pursio, Kankkunen, Sanner-Stiehr & Kvist, 2021). Although it was not discussed frequently as a stand-alone attribute to nurse resilience, autonomy was commonly tied to leadership or leader/supervisor support, involvement in decision-making, and a healthy work environment as a whole (American Organization of Nurse Executives, 2015).

Although the role of work engagement in nurse resilience has only been investigated in most recent studies (Cao & Chen, 2021a, 2021b; Hetzel-Riggin et al., 2020), research on work/clinical engagement has emerged in general nursing literature. In psychology, *work engagement* refers to "a positive, fulfilling, work-related state of mind" (Schaufeli, Salanova, González-Roma, & Bakker, 2002). Work engagement has been defined as the antithesis of burnout (Maslach, Schaufeli, & Leiter, 2001; Schaufeli, Salanova, Gonzalez-Roma, & Bakker, 2002). In nursing, work engagement emphasizes the meaning of the nursing profession that gives value to lives (Vinje & Mittlemark; 2008). Research on nurses' work engagement has shown its associations with various nurse outcomes such as job satisfaction, work performance, occupational stress, perceived quality of care, burnout, and turnover (Manning, 2016). Nurses' work engagement is influenced by both organizational and personal factors (Fiabane, Giorgi, Sguazzin, & Argentero, 2013; VandenBos, 2007). These organizational factors include workload, control, reward, trust and teamwork, and leadership. Personal factors influencing work engagement include physical and mental health and personality (i.e., Type A personality, characterized by such as chronic competitiveness and high levels of achievement motivation [VandenBos, 2007]).

In industrial and organizational psychology, work engagement is often measured by the Utrecht Work Engagement Scale (UWES). The UWES consists of three dimensions: vigor, dedication, and absorption, characterized by high levels of energy, a sense of enthusiasm and pride, and full concentration on one's work, respectively (Bakker & Demerouti, 2008; Schaufeli et al., 2002). Schaufeli, Bakker, and Salanova (2006) developed a shortened UWES with 9 items (Table 1). The current secondary analysis captures the meaning and value of the nursing profession that agrees with Vinje and Mittlemark (2008)'s conception of work engagement in nursing. However, compared to the widely used UWES, the current study mainly captures the dedication dimension of work engagement (see details in Chapter 3).

Table 2. Utrecht Work Engagement Scale -9 (Short Version)

	Subscale	Item
1	Vigor	At my work, I feel bursting with energy.
2	Vigor	At my job, I feel strong and vigorous
3	Vigor	When I get up in the morning, I feel like going to work
4	Dedication	I am enthusiastic about my job
5	Dedication	My job inspires me.
6	Dedication	I am proud of the work that I do.
7	Absorption	I feel happy when I am working intensely
8	Absorption	I am immersed in my work
9	Absorption	I get carried away when I am working

Source: Schaufeli, W. B., Bakker, A. B., and Salanova, M. (2006).

Interpersonal support systems

Strong social support from family and friends was consistently valued for nurse resilience (Glass, 2009; Cameron & Brownie, 2010; Mealer et al., 2012; Mealer et al., 2014; Kim & Windsor, 2015; McDonald et al, 2016). Interpersonal support systems may provide assistance or comfort to help nurses cope with job stress (American Psychological Association, n.d.). As discussed previously, interpersonal support systems had been integrated into resiliency scales as an important dimension of resiliency (Friborg et al., 2003; Friborg et al., 2005).

Workplace resources

Research has also agreed upon the role of workplace resources in facilitating nurse resilience. Specifically, studies have discussed the importance of teamwork and collegial support, good leadership and mentorship, good interpersonal relationships (with coworkers, supervisors, other professionals or patients and families), and adequate training and education (Cope, Jones & Hendricks, 2016a, 2016b; Gillespie, Chaboyer, Wallis & Grimbeek, 2007; Mealer, Jones, & Meek, 2017; Kalliath & Lee, 2009; Kalliath, Lee & Rochman, 2010; Tabakakis, McAllister, Bradshaw, & To, 2019). These findings are consistent with the emphasis on a supportive or healthy work environment in general nursing research and practice (American Organization of Nurse Executives, 2015).

Specifically, evidence on leadership styles and leadership support has been fruitful concerning nurse job outcomes and work environments (Avolio & Gardner, 2005; Bass & Avolio,

1994; Cummings et al., 2018; Manning, 2016). Leadership includes three main styles: transformational leadership, transactional leadership, and authentic leadership (Avolio & Gardner, 2005; Bass & Avolio, 1994; Cummings et al., 2018; Manning, 2016). In short, leaders or supervisors who are transparent, supportive, and inspiring are favored. Collectively, research supports the positive influences of good leadership on staff collaboration and staff relationships with work such as organizational commitment, empowerment, and intent to stay.

Adequate tools, training and staffing levels in the workplace are essential to nursing practice in all settings. Tool/material inadequacy has been shown to increase nursing workload, such as malfunctioning equipment, equipment/material shortage, and technology troubles (hardware and software) (Kalisch, Tschannen, Lee, & Frieze, 2011). Appropriate training is important for nurses' skill improvement in various aspects of nursing practice. According to Hennessy and Hicks (2011)'s training needs analysis (TNA) tool, a validated and widely used questionnaire, training may target clinical, communication, supervisory, administrative and research activities.

Adequate staffing level has drawn long attention in nursing practice and research due to its high impact on nurse workload, patient outcomes (e.g., mortality and adverse events), and nurse job outcomes (e.g., burnout and turnover) (Griffiths et al., 2020; Lake, Riman & Sloane, 2020; Cristina Gasparino et al., 2021; Moloney, Boxall, Parsons, & Cheung, 2018). The definition of staffing in nursing is twofold: the number and the skill mix of nursing staff members. The measurement of nurse staffing levels has taken a variety of approaches, such as using nurses' judgment, patient-to-nurse ratios, timed-task approaches, and patient dependency classification approaches (Griffiths et al., 2020).

Informed by the evidence regarding the importance of a supportive work environment in fostering nurse resilience, the current secondary analysis involves five elements of workplace resources: leadership, teamwork/collaboration, staffing level, training, and tools/materials. Leadership is perceived as positive or negative instead of specific styles. A positive sense of leadership is described as that the leader is a good communicator, highly accessible to staff and open to innovative ideas about patient care; the leader makes flexible work scheduling, involves nurses in decision-making, recognizes nurses for a job well done, and maintains a good leader-nurse relationship (Aiken & Patrician, 2000; Squires, Tourangeau, Laschinger, & Doran, 2010). The teamwork/collaboration, staffing level, training, and tools/materials are assessed by their

general adequacy or efficiency in the care units. For example, the general adequacy of staffing level was measured by a single survey item asking nurses' agreement/disagreement on the statement, "My work unit is adequately staffed".

Coping

Coping was a commonly cited attribute in nurse resilience research (Ang et al., 2018; Gillespie, Chaboyer, Wallis & Grimbeek, 2007; Heritage et al., 2019; Rees, Breen, Cusack & Hegney, 2015; Rosa-Besa et al., 2021; Tusaie & Dyer, 2004; Udod et al., 2021). Reactive coping is a process of adjustment following an adverse event (Lazarus & Folkman, 1984). Coping can also be proactive in that nurses accumulate resources, e.g., competence, material and knowledge, before an adverse event (Aspinwall & Taylor, 1997). Coping is diverse and complex, supported by the wide range of coping strategies reported in nurse resilience research. Effective coping, especially problem-focused coping, enhances nurses' positive adaptation in the face of job stress (Gillespie, Chaboyer, Wallis & Grimbeek, 2007).

Recovery

Nurse resilience literature provided limited insights into the role of recovery in the resilience process. Recovery in resilience has also been phrased as the reintegration process from disruptions (to body, mind and spirit) caused by stressors (Richardson, 2002). Both coping and recovery result in the cultivation of resilient qualities so that stressors become routine and less disruptive. As a result, coping and recovery promote nurses' positive adaptation in the face of job stress.

Self-care and work-life balance, or employee care from the standpoint of healthcare organizations, are potential recovery processes to enhance nurse resilience (Cooper et al., 2020; Mintz-Binder, Sweatt, Andersen & Song, 2021; Slatyer et al., 2018). Work-life balance refers to the perception that work and non-work activities are compatible (Kalliath & Brough, 2008). Self-care involves a wide range of activities including exercising, meditation, and socializing (Richards, Campenni, & Muse-Burke, 2010). Both concepts are broad and lacking a direct well-developed measure. One example of single-item measures of satisfaction with work-life balance is from the U.S. General Social Survey: "How successful do you feel in balancing your paid work and family

life?” (Milkie & Peltola, 1999). In the nursing context, flexible scheduling strategies that nurses have some to full control over working hours are considered important to enhance nurse work-life balance (Campbell & Patrician, 2020; Harvey et al., 2020; Wynendaele et. al., 2020).

Psychological detachment outside of work is a potential recovery mechanism that is strongly associated with employee outcomes outside of the nursing context (Sonnentag & Fritz, 2015). Psychological detachment outside of work shares some attributes with work-life balance in the sense of being mindful of after-work life and allowing recovery from work-related disruptions. But psychological detachment outside of work is more clearly defined, i.e., "refraining from job-related activities and mentally disengaging from work during time off the job" (Sonnentag & Fritz, 2015). The most widely used measure of psychological detachment has four items: “During time after work, I forget about work.”; “During time after work, I don’t think about work at all”; “During time after work, I distance myself from my work.”; and “During time after work, I get a break from the demands of work” (Sonnentag & Fritz, 2007). However, to the author’s knowledge, this measure has not been used and validated among nursing staff.

Although the previously discussed recovery processes mainly focus on nonwork lives, the most recent nurse resilience research has looked at integrating nurse self-care or employee care into work lives (Mintz-Binder, Sweatt, Andersen & Song, 2021). Self-care during work hours involved a variety of activities and practices such as lavender aromatherapy, meditation, and coloring.

Adaptive/Positive Outcomes

As discussed previously, there are conceptual difficulties around what outcomes can be considered good or positive, and also reflect adaptation among nurses. Unsurprisingly, the discussion on nurses’ adaptative outcomes is largely lacking in nurse resilience research. However, there were attempts to address positive outcomes related to nurses’ resiliency, though a considerable proportion assessed the absence of negative outcomes. Specifically, there were three clusters of “positive” outcomes reported in nurse resilience research. The first cluster was the growth in personal abilities to cope, adapt, and thrive (e.g., becoming competent, confident, and endurable) (Tusaie & Dyer, 2004; Gillespie, Chaboyer, & Wallis, 2009a; Cope, Jones, & Hendricks, 2016a, 2016b; Tubbert, 2016; Glass, 2009; Kornhaber & Wilson, 2011). The second cluster was the maintenance of job satisfaction, compassion, well-being, and normal work

functioning (e.g., effective workplace practices and delivery of quality health care) (Glass, 2009; Cope, Jones, & Hendricks, 2016a; Hudgins, 2016; Guo et al., 2017). The last cluster was the diminished chronic consequences of job stress (e.g., psychological distress, post-traumatic stress disorder, burnout, and turnover) (Cusack et al., 2016; Dolan, Strodl, & Hamernik, 2012; Guo et al., 2018; Guo et al., 2019; Leverence, 2015; Slatyer et al., 2018).

Outside of the nursing context, employee adaptation in the workplace had various interpretations in the literature. An essential takeaway is that adaptation in the workplace should be investigated at multiple time points to demonstrate the adjustment process. For example, overtime adjustment on job-related self-efficacy, job satisfaction and psychological distress have been considered as adaptative responses to job stress (Jex, Bliese, Buzzell, and Primeau, 2001; Sargent & Terry, 1998).

Heuristic Model and Definition

A heuristic model of nurse resilience is developed to illustrate the hypothesized dynamic process (Figure 1). The model and the subsequent definition of nurse resilience are inspired mainly by Richardson's (2002) and Windle's (2011) conceptions of the resilience process. The model involves all the attributes discussed above and specifies their relationships, including reciprocal relationships, that are reasonable to be assumed. Nurses' resources in the resilience process come from the interplay between personal and external resources. Activated resources promote effective coping and/or efficient recovery and lead to positive, adaptive outcomes in the face of stress or adversity. Coping is a cognitive process where actions are taken to solve the problems and/or regulate negative emotions. Recovery processes to a "biopsychospiritual homeostasis", or the "adapted state" are activated consciously and/or unconsciously when disruptions to body, mind and spirit occur. Ideally, nurses cope effectively and recover fully from the disruptions in the face of stress or adversity, leading to positive, adaptive outcomes. Both coping and recovery processes are universal and nonhierarchical in the resilience process. It is reasonable to assume that coping and recovery processes complement each other. That is, effective coping promotes efficient recovery and vice versa. Also, it is reasonable to assume that nurses learn and grow from the processes and, in turn, their coping and recovery capabilities are strengthened, as well as their resources.

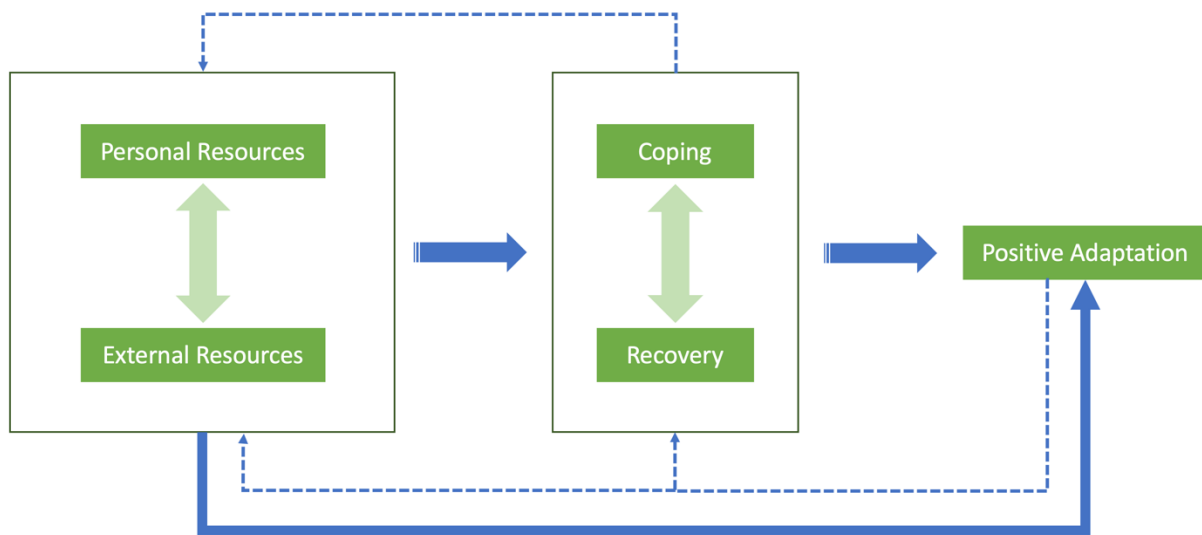


Figure 4. A heuristic model of nurse resilience as a process

The heuristic model of nurse resilience provides a comprehensive view of the hypothesized resilience process among nurses in the face of stress or adversity. This model is open to future testing and modification. The current secondary analysis, however, cannot test the resilience as a dynamic process due to methodological limitations: cross-sectional design, linear statistical model and missing resource variables (details in chapter 3). Instead, the current study aims at an early-stage interpretation of the resilience process focusing on the unidirectional pathways between the key constructs. Figure 2 illustrates the simplified model of resilience process. The current analysis takes into account the correlations between personal and external resources but not their interactions. Also, this analysis focuses on a potential recovery mechanism but not the coping processes. Further, a positive outcome, i.e., nurses' positive stress experience, is tested in this cross-sectional design, instead of adaptive outcomes that require longitudinal analysis.

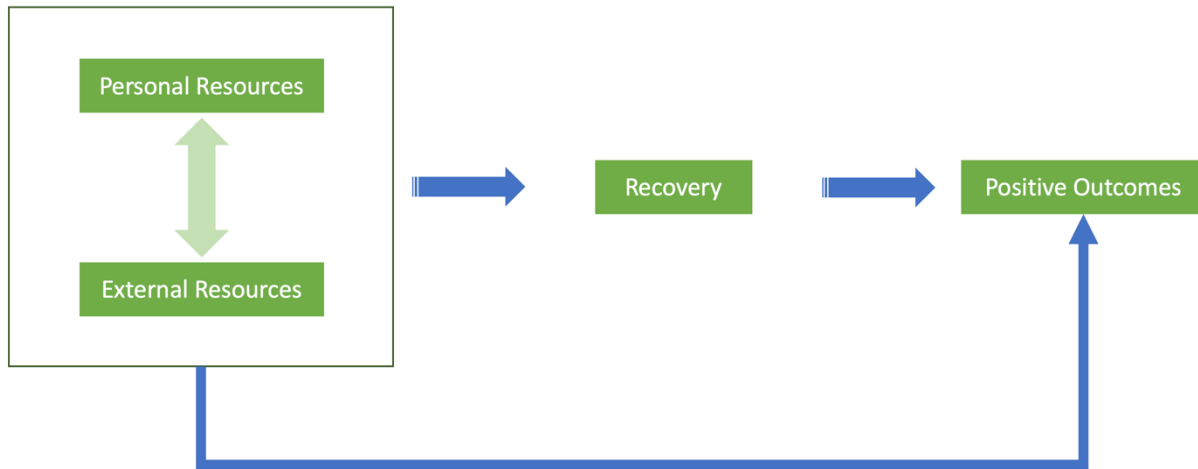


Figure 5. Simplified model of nurse resilience as a process

Based on the review of literature, this study defines nurse resilience as:

The process of effectively coping with and adapting to significant sources of stress or adversity at work. Nurses' personal resources and workplace resources facilitate this capacity for "bouncing back" and adaptation.

Conceptual Framework and Hypotheses

Based on the simplified model of the resilience process (Figure 2) and the availability of its attributes in the Press Ganey dataset, a conceptual framework (Figure 3) is developed to guide the formation of hypotheses.

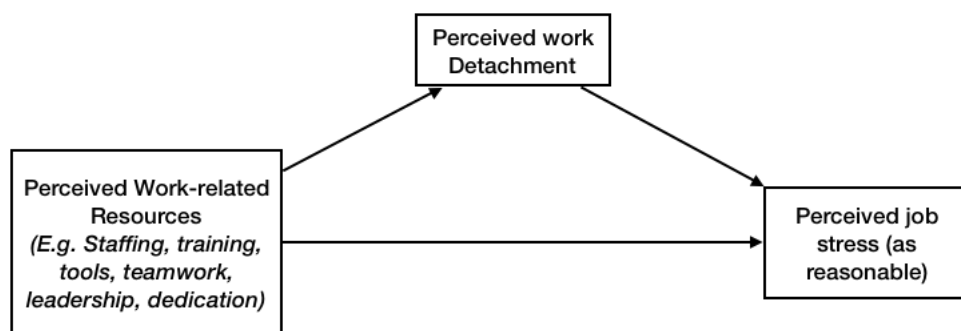


Figure 6. Conceptual framework of the study

Based on the definition of nurse resilience, perceived work-related resources both within the nurse and within the work environment facilitate nurses' capacity to recover from disruptions and adapt to stressful work environments and achieve good outcomes (Richardson, 2002; Windle, 2011). From the existing Press Ganey dataset, perceived work-related resources include efficient teamwork, good leadership, dedication to the nursing profession, and adequate staffing level, training and tools at work. As a recovery experience outside of work, detachment from work cognitively and psychologically is part of the resilience process, although its mediating role between resources and positive outcomes is understudied.

This study has four hypotheses to test:

Hypothesis 1: Resourceful nurses will be more likely to have positive stress experience.

The good outcome of the resilience process is operationalized as nurses' positive stress experience, i.e., nurses perceiving the level of job stress as reasonable.

Hypothesis 2: Resourceful nurses will be more likely to detach themselves from work outside of work.

Hypothesis 3: Nurses who are able to detach themselves from work outside of work are more likely to have positive stress experience.

Given the uncertainty of the role of detachment outside of work (mediator or moderator) in the extant literature, this study hypothesizes that it serves as a mediating recovery mechanism. Resourceful nurses are more likely to be supported/encouraged to, be mindful to, or be able to detach themselves from work outside of work. Nurses who had adequate recovery from detachment outside of work are more likely to have positive perceptions of job stress.

Hypothesis 4: The direct effect of perceived resourcefulness on positive stress experience (i.e., perceiving job stress as reasonable) (tested in Hypothesis 1) and the indirect effect mediated by work detachment (tested in Hypothesis 2 & 3) will not differ by nurses' length of service.

The length of service captured in this project ranges from less than 6 months to more than 25 years. This is a weak hypothesis due to the lack of evidence in extant nurse resilience literature.

CHAPTER 3 METHODS

Data

Research hypotheses were tested using the data from Press Ganey's 2018 Employee Short Survey and Employee Resilience Survey. These are annual surveys among participating organizations in multiple states. The Employee Short Survey includes a wide range of topics regarding employees' experiences at work. This project selected variables from the required survey questions mainly because the non-required items, in general, had very high missing rates, commonly over 50% and up to 99.9%. The only exception is the survey question asking employees' perception of job stress intensity. The themes of these questions (provided by Press Ganey), for all employees or nursing staff only, are described in Table 2. The Employee Resilience Survey includes two themes: employee decompression and employee activation. These two themes are described in Table 3.

Nurses who completed the 2018 surveys were from over one thousand organizations. These organizations included acute care hospitals, medical practice groups, outpatient surgery centers, children's hospitals, home health organizations as well as other ancillary services. The survey items were all positively framed, with six response categories of Strongly Disagree, Disagree, Neutral, Agree, Strongly Agree and Not Applicable (Strongly disagree = 1; Strongly Agree = 5, Not Applicable = missing). For example, an item measuring employee's perception of job stress intensity was "The amount of job stress I feel is reasonable". Because the objective of this study was to understand job stress among direct care registered nurses (RNs), only RNs who "spend at least 50% of the time in direct patient care" were included in the analysis.

Table 3. Themes in the Press Ganey Employee Short Survey

Theme	Description	Number of Questions
Employee Care	The organization cares about employee safety and treats them with respect.	1
Employee Involvement	The employee is involved in decisions that affect their work.	1
Employee Involvement, Nursing Only	The nursing staff has autonomy at work.	2
Energy and Focus	The employee is seldom distracted from their work and willing to go above and beyond what's expected of them.	2
Engagement Indicators	Overall, the employee feels satisfied, proud, and willing to stay with the organization and recommend it to others.	6
Fair compensation	Pay is fair compared to other healthcare employers in this area	1
Growth and Development, Nursing Only	The organization provides job training and career development opportunities.	7
Leadership	The leader/supervisor effectively supports and empowers employees.	5
My work	The employee likes his/her work. The employee believes that the job makes good use of their skills and abilities.	2
Organizational Values	The organization conducts business in an ethical manner.	1
Quality & Service	The organization provides high-quality care and service.	1
Recognition	The employee is satisfied with the recognition received for doing a good job.	1
Teamwork, Nursing Only	Good teamwork within and between work units	2
Work-Life balance	The organization supports employees in balancing work life and personal life. The employee perceives the amount of job stress as reasonable.	2

Table 4. Themes in the Press Ganey Employee Resilience Survey

Theme	Description	Number of Questions
Decompression	The employee is able to disconnect from work during nonwork time.	4
Activation	The employee is engaged with their work	4

Respondents

The sample included a total of 176,817 direct-care RNs. Respondents were primarily female (85%) and White (67%). Characteristics of the RNs are given in Table 4.

Table 5. Characteristics of registered nurses in study sample

Variable	%
Employment status	
Full-Time	66.0%
Part-Time	21.1%
Other	8.1%
Work Shift	
Day Shift	59.6%
Night Shift	24.3%
Evening Shift	4.5%
Other	9.4%
Length of Service	
Less than 1 year	13.7%
1-5 years	38.8%
6-10 years	17.0%
More than 10 years	30.3%
Gender	
Female	84.8%
Male	10.4%
Age	
18-44	60.9%
45-64	30.3%
>=65	2.6%
Race	
White	67.1%
Black	7.4%
Hispanic	4.0%
Asian	7.5%
American Indian or Alaska Native	0.3%
Other	1.0%

Variable Selection and Analysis

The selection of variables for the key constructs in the conceptual framework (Figure 3) was limited by variable availability in the Press Ganey dataset. For example, the conceptualization of nurse resilience in this project values both nurses' internal/personal qualities and external/workplace protectors. However, nurses' personal qualities such as self-efficacy were largely lacking in the dataset. Eventually, a total of 18 variables were selected from the dataset, regarding nurses' perceptions of work-related resources, detachment from work outside of work, and positive stress experience. The list of all selected variables is given in Table 5. Notably, the variable "dedication" is re-conceptualized from the theme "activation" in the Press Ganey Employee Resilience Survey. The concept "activation" resembles the "vigor" or "energy" dimension of "work engagement" (Macey & Schneider, 2008), while the survey items of "activation" are more consistent with the "dedication" subscale in the Utrecht Work Engagement Scale (UWES) (Schaufeli, Bakker & Salanova, 2006). Thus, to be consistent with the theoretical underpinnings, the concept "activation" in the Press Ganey survey is replaced by "dedication" indicating a sense of "significance, enthusiasm, inspiration, pride, and challenge" (Schaufeli, Bakker & Salanova, 2006). Additionally, the concept "detachment" is re-conceptualized from the theme "decompression" in the Press Ganey Employee Resilience Survey to stay consistent with the theoretical underpinnings of the current study.

Table 6. Selected variables from Press Ganey dataset

Variable	Survey item
Dedication	DD1: The work I do makes a real difference. DD2: My work is meaningful. DD3: I care for all patients/clients equally even when it is difficult. DD4: I see every patient/client as an individual person with specific needs.
Staffing	My work unit is adequately staffed.
Training	I get the training I need to do a good job.
Tools	I get the tools and resources I need to provide the best care/service for our clients/patients.
Teamwork	My work unit works well together.
Leadership	LD1: The person I report to is a good communicator. LD2: The person I report to cares about my job satisfaction. LD3: The person I report to encourages teamwork. LD4: I respect the abilities of the person to whom I report. LD5: The person I report to treats me with respect.
Detachment	DT1: I rarely lose sleep over work issues. DT2: I am able to free my mind from work when I am away from it. DT3: I can enjoy my personal time without focusing on work matters. DT4: I am able to disconnect from work communications during my free time (emails/phone etc.).
Positive stress experience	The amount of job stress I feel is reasonable.

Hypotheses were tested through structural equation modeling (SEM) using Stata/SE 16. SEM integrates several multivariate techniques into one model fitting framework (Kline, 2016). These techniques include measurement theory, factor analysis, path analysis, regression, and simultaneous equations. SEM has several advantages in the study of complex, multi-faceted social constructs. Latent variables in SEM capture constructs that are not directly observable, namely latent variables, such as work dedication. Also, the explicit modeling of measurement error of endogenous variables (acting as dependent variables) makes SEM more flexible for survey data with expected measurement errors. Furthermore, SEM allows the modeling of multiple outcomes and relationships simultaneously (Kline, 2016), making it especially useful in testing mediation effects (Gunzler, Chen, Wu & Zhang, 2013). SEM also simplifies mediation analysis as it allows simultaneous inference about indirect, direct and total effects (MacKinnon, 2012).

The main steps of variable selection and analysis for the final structural model are described briefly below.

First, variables were conceptually selected and empirically tested (when possible). To take advantage of SEM, variables were treated as latent variables (hypothetical constructs) with multiple indicators when possible. All conceptually selected variables (except the outcome variable of job stress experience) were tested by exploratory factor analysis (EFA), specifically the common factor analysis, including those in the measurement indexes designed by Press Ganey. The purpose of EFA is dimensionality reduction by seeking underlying latent variables that are reflected in the observed variables (Kline, 2016; Yong & Peace, 2013).

Second, the measurement of latent variables was then tested by confirmatory factor analysis (CFA), one of the techniques in SEM. For example, perceived leadership was treated as a latent variable with five indicators. The quality of these five indicators manifesting perceived leadership was tested by the parameter-level goodness of fit (GOF) (factor loadings and significance), overall model GOF (fit statistics) and the internal consistency reliability (Cronbach's α).

Third, selected variables that were not supported by EFA to manifest any underlying latent variables were treated as observed (manifest) variables. In SEM, exogenous variables are assumed to be measured without errors, the same as in multiple regression. "Exogenous" variable means variable "from the outside", acting as independent variable (Kline, 2016). When an observed/latent variable is exogenous, whatever predicts it is not represented in the model. In contrast, "endogenous" variable means variable "from within", acting as dependent variable (Kline, 2016). For instance, the outcome variable, nurses' positive stress experience, is an endogenous observed variable where its predictors are presented in the model.

Lastly, after the CFA of latent variables, the GOF of the structural model was tested. The structural model specifies paths between variables, given in the conceptual framework (Figure 3). Nurse resilience is a complex phenomenon. The model tested in this project is a recursive model, the most straightforward model where all paths are unidirectional. The appropriateness of this hypothesized model was tested by (1) the overall GOF to data (fit statistics), (2) parameter-level GOF (significance), (3) equation-level GOF (R^2), and (4) the comparison of overall GOF to alternative models. These four steps of variable selection and analysis are explained in depth in the following subsections.

Data Screening

Data were first assessed for multivariate normality in Stata/SE 16. The guideline of normality is absolute values of skewness less than 3 and kurtosis less than 10 (Kline, 2016). Accordingly, all selected variables fell within the range of normality in terms of skewness and kurtosis (Refers to Table 11, 15, 19, 24, 26, 28, 30, 32). Multicollinearity was then examined by Spearman's rho to rule out two indicators that primarily measure the same concept (Kline, 2016). A bivariate correlation matrix indicated that all selected variables were significantly correlated at the .05 level. The majority coefficients were below .7, except the indicators of the work detachment and the leadership indexes at .71-.81 (refer to Appendix A). However, the multicollinearity threshold is not conclusive. Some scholars determine multicollinearity by a coefficient higher than .7, while others relax it to .85 (Kline, 2016). Accordingly, no absolute multicollinearity was detected among the selected variables.

The amount of missing data for most variables used in this project was small (ranged from 0 - 7.9%) except for the three variables listed in Table 6. These variables regarding job stress, job tools and training had about 15%-18% missing data. Survey items regarding adequate job tools and training are nursing-specific questions that may not be implemented in some facilities (determined by the contract with Press Ganey). About 17.5% of the sample did not respond to both questions regarding job tools and training, accounting for 100% and 95.6% of the total missingness in the two questions, respectively. The relatively high missingness in the non-required question, "The amount of job stress I feel is reasonable", is expected. It is the only non-required question included in this project.

The differences in demographic characteristics between respondents and non-respondents to high-missing variables were then checked using multinomial logistic regressions. Non-respondents to questions regarding job tools and training were less likely to be White or older and were more likely to be working full-time and having a longer service length (all significant at the .05 level). Non-respondents and respondents to questions regarding job tools and training did not differ in their gender and work shift (day shift vs. other shifts). Non-respondents to question regarding job stress were more likely to be female and having a longer service length and less likely to be older, working full-time or on a day shift (all significant at the .05 level). Non-respondents and respondents to the job stress question did not differ in the race (White vs. non-White).

To summarize, the probability of a missing response is dependent on the RN's demographic characteristics in high-missing variables. Also, some facilities likely chose not to include nursing-specific questions regarding job tools and training in their employee survey, but the underlying reasons are unclear. Thus, missing data in this study was addressed by the listwise deletion in Maximum Likelihood where cases with missing scores on any variable are excluded from analyses (Kline, 2016).

Table 7. High missing variables (%)

Variable	Missing %
The amount of job stress I feel is reasonable.	14.6%
I get the tools and resources I need to provide the best care/service for our clients/patients.	17.5%
I get the training I need to do a good job.	18.3%

Exploratory Factor Analysis

All variables related to nurses' perceptions of work-related resources and detachment from work outside of work were included in exploratory factor analysis (EFA), specifically the common factor analysis. Common factor analysis assumes that total variance can be partitioned into common and unique variance (Watkin, 2018). Unlike principal component analysis, common factor analysis does not assume that variables are measured perfectly. The Kaiser-Meyer-Olkin (KMO) was tested for data appropriateness for EFA (Watkins, 2018). KMO reflects the extent to which correlations are a function of the variance shared across all variables, ranging from 0.00 to 1.00. A KMO value $\geq .700$ is desired. The result showed a KMO value of .909. Thus, appropriateness for EFA was supported. Factor loadings with orthogonal rotation are given in Table 7, where factor loadings below .3 were not shown. The total variance explained is given in Table 8. The scree plot is given in Figure 4.

Table 8. Rotated factor loadings (<.3 not shown)

Variable	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6	Factor7	Factor8
teamwork	0.4301							
staffing	0.3082	0.3186		0.4267				
tools	0.3790			0.5291				
training	0.4036			0.4310				
DD1			0.7686					
DD2			0.7165					
DD3			0.6979					
DD4			0.7048					
DT1		0.7949						
DT2		0.8671						
DT3		0.8013						
DT4		0.7503						
LD1	0.8318							
LD2	0.8199							
LD3	0.7930							
LD4	0.8265							
LD5	0.7988							

Note. DD = dedication; DT = detachment; LD = leadership

Table 9. Total variance explained

Factor	Variance	Difference	Proportion	Cumulative
Factor1	4.15346	1.04017	0.4208	0.4208
Factor2	3.11330	0.71057	0.3154	0.7362
Factor3	2.40273	1.59904	0.2434	0.9796
Factor4	0.80369	0.62272	0.0814	1.0611
Factor5	0.18098	0.06375	0.0183	1.0794
Factor6	0.11723	0.04680	0.0119	1.0913
Factor7	0.07043	0.02215	0.0071	1.0984
Factor8	0.04828	.	0.0049	1.1033

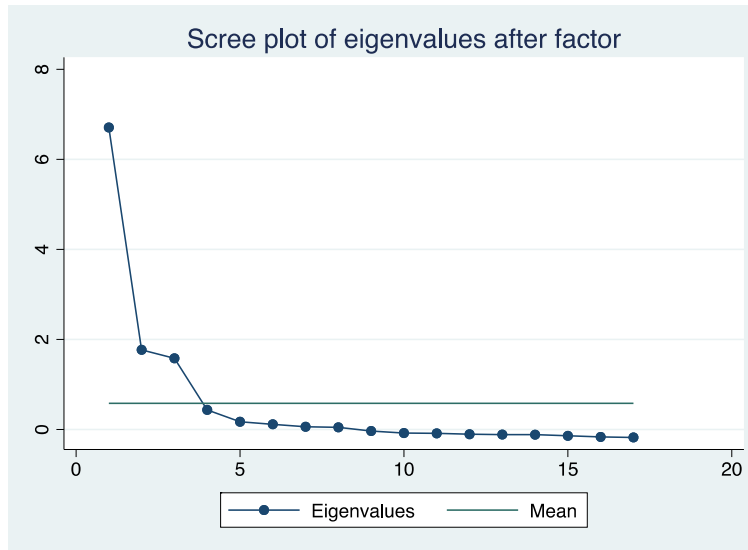


Figure 7. Scree plot

There are three criteria for factor retaining in EFA, but neither is the gold standard (Yong & Pearce, 2013). One criterion is Kaiser’s rule of thumb that retains factors with an eigenvalue above 1.00 (Yong & Pearce, 2013). Another is Jolliffe’s criterion that retains factors with an eigenvalue above .70 (Jolliffe, 1986). The third criterion is to use the scree test in conjunction with the eigenvalues, retaining factors above the “elbow” (i.e., point of inflexion) in the scree plot (Cattell, 1978). Accordingly, factor four with indicators of *staffing*, *tools* and *training* can either be extracted or dropped. In addition, the existence of crossloading, where a variable loads at .32 or higher on two or more factors, complexes factor retaining (Costello & Osborne, 2005). For example, the variable *training* had factor loadings of .404 and .431 on factors one and four, respectively. The interpretation of complex variables with crossloadings is ambiguous that they can be extracted or dropped if the interpretation is difficult (Costello & Osborne, 2005). Conceptually, factor four with indicators of *staffing*, *tools* and *training* may be constructed as “Nursing Resources” that are essential to nursing practice.

Due to the ambiguity in factor extraction, the three-factor model including latent variables “Dedication”, “Detachment” and “Leadership” and the four-factor model including an additional latent variable “Nursing Resources” will be compared at the end of this chapter. The model with better overall GOF will be the final model for hypothesis testing.

Confirmatory Factor Analysis of Latent Variables

This subsection describes the evaluation of measurement models for the three latent variables (Dedication, Detachment and Leadership) supported by EFA, as well as the potential latent variable “Nursing Resources”. Generic measurement models were developed and validated for each latent variable using confirmatory factor analysis (CFA). Specifically, the quality of indicators manifesting the underlying latent variables was tested by the internal consistency reliability (Cronbach’s α), the overall GOF (fit statistics) and the parameter-level GOF (factor loadings and significance).

Reliability coefficient (Cronbach’s α) measures internal consistency reliability. Coefficients around .900 are considered as “excellent”, values around .800 as “very good”, and values around .700 as “adequate” (Kline, 2016). The generic CFA models of variable “Dedication”, “Detachment” and “Leadership” were over-identified models where degrees of freedom (df) > 0, while the model of “Nursing Resources” was a just-identified model where df = 0. Overall GOF of each over-identified CFA model was then tested by fit statistics. Fit statistics adopted in this study are given in Table 9 (Acock, 2013; Kline, 2016). Notably, the likelihood ratio chi-square is sensitive to sample size. With an extremely large sample size in this study, chi-square is likely to be always statistically significant (Kline, 2016). When the model does not fit the data well according to the fit statistics, modification indices (MI) values were checked for highly correlated measurement errors. Specifying error covariances gives extra parameters to improve model fit. The effect of an indicator on a latent variable (factor loading/pattern coefficient) was tested at a significance level of .05. Parameter-level GOF is met as factor loadings/pattern coefficients $\geq$.600 and statistically significant (Kline, 2016). CFA for each latent variable is described as follows.

Table 10. Goodness of fit indices and thresholds for measurement and structural models

Fit Statistics	Good Fit Threshold	Acceptable Fit Threshold
Likelihood ratio chi-square	Low ($p > .05$)	
Root Mean Square Error of Approximation (RMSEA)	<.05	.05 - .08
Bentler Comparative Fit Index (CFI) and Tucker Lewis Index (TLI)	>.95	.90-.95
Standardized Root Mean Square Residual (SRMR)	<.06	.06-.08

Perceived leadership. The indicators of "Leadership" were adopted from a five-item leadership index in the Press Ganey Employee Survey and were supported by the EFA as discussed previously. This index represents good leaders who are competent and good communicators, care about staff's job satisfaction, encourage teamwork and treat staff with respect. Frequencies and distributions of indicators for the latent variable "Leadership" are given in Tables 10 and 11. The five-item measurement for "Leadership" had an excellent reliability at .930. The generic model was revised to get a better model fit according to modification indices. The revised model (with measurement error covariances) is displayed in Figure 5. The revised model demonstrated good overall GOF and parameter-level GOF. Fit statistics for the revised model comparing to the generic model are given in Table 12. Parameter estimates for the indicators are given in Table 13.

Table 11. Percentages of indicators for "Leadership"

Indicator	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Missing	Total
LD 1. The person I report to is a good communicator.	3.3%	6.6%	11.9%	35.1%	35.3%	7.9%	100%
LD 2. The person I report to cares about my job satisfaction.	2.8%	6.4%	12.0%	32.9%	38.1%	7.9%	100%
LD 3. The person I report to encourages teamwork.	1.6%	3.3%	8.3%	36.9%	44.1%	5.8%	100%
LD 4. I respect the abilities of the person to whom I report.	1.8%	3.3%	8.4%	36.2%	42.4%	7.9%	100%
LD 5. The person I report to treats me with respect.	1.5%	2.8%	6.6%	30.5%	50.8%	7.8%	100%

Table 12. Distributions of indicators for "Leadership"

Indicator	Mean	Standard Deviation	Variance	Skewness	Kurtosis
LD 1. The person I report to is a good communicator.	4.00	1.059	1.121	-1.092	3.640
LD 2. The person I report to cares about my job satisfaction.	4.05	1.044	1.090	-1.113	3.670
LD 3. The person I report to encourages teamwork.	4.26	.886	.786	-1.427	5.230
LD 4. I respect the abilities of the person to whom I report.	4.24	.906	.820	-1.417	5.137
LD 5. The person I report to treats me with respect.	4.37	.870	.757	-1.673	6.020

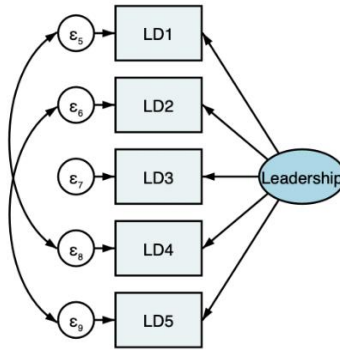


Figure 8. Revised measurement model of “Leadership”

Table 13. Fit statistics for the original and revised measurement model of “Leadership”

Model	χ^2 (p)	df	RMSE	CFI	TLI	SRMR
Generic	11793.90 (p < .001)	5	.121	.982	.963	.019
Revised	441.65 (p < .001)	3	.030	.999	.998	.003

Table 14. Results of measurement model of “Leadership”

Indicator	Standardized Regression Weight	Unstandardized Estimate	Standard Error	Significance
LD 1. The person I report to is a good communicator.	.866	1		
LD 2. The person I report to cares about my job satisfaction.	.849	.966	.002	<.001
LD 3. The person I report to encourages teamwork.	.851	.822	.002	<.001
LD 4. I respect the abilities of the person to whom I report.	.863	.853	.002	<.001
LD 5. The person I report to treats me with respect.	.808	.766	.002	<.001

Perceived Work Dedication. This project was able to capture one dimension of work engagement: work dedication. As previously discussed, the concept "Dedication" was re-conceptualized from the "Activation" in the Press Ganey Resilience Survey. Informed by the literature of work engagement, the "Activation" indicators well describe a "portrait" of dedicated nurses who are proud of their profession and believe in the value of their work, and take on challenges in patient-centered care provision (Bakker & Demerouti, 2008; Schaufeli et al., 2002; Scscaufeli, Bakker & Salanov, 2006). The four-item scale for "Work Dedication" had a very good reliability at .848. The revised model demonstrated good overall GOF and parameter-level GOF. Frequencies and distributions of the indicators are given in Tables 14 and 15. The revised model (with measurement error covariances) is displayed in Figure 6. Fit statistics for the revised model comparing to the generic model are given in Table 16. Parameter estimates for the indicators are given in Table 17.

Table 15. Percentages of indicators for "Work Dedication"

Indicator	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Missing	Total
DD 1. The work I do makes a real difference.	.2%	.6%	4.0%	36.0%	59.1%	0	100%
DD 2. My work is meaningful.	.3%	.5%	2.9%	35.8%	60.5%	0	100%
DD 3. I care for all patients/clients equally even when it is difficult.	.2%	.5%	1.6%	35.0%	62.8%	0	100%
DD 4. I see every patient/client as an individual person with specific needs.	.2%	.2%	1.2%	34.3%	64.3%	0	100%

Table 16. Distributions of indicators for "Work Dedication"

Indicator	Mean	Standard Deviation	Variance	Skewness	Kurtosis
DD 1. The work I do makes a real difference.	4.53	.627	.393	-1.376	5.787
DD 2. My work is meaningful.	4.56	.608	.370	-1.471	6.536
DD 3. I care for all patients/clients equally even when it is difficult.	4.60	.570	.325	-1.479	6.760
DD 4. I see every patient/client as an individual person with specific needs.	4.624	.588	.235	-1.297	5.879

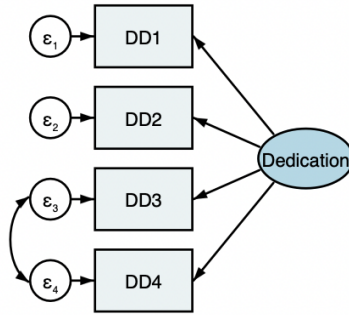


Figure 9. Revised measurement model of “Work Dedication”

Table 17. Fit statistics for the original and revised measurement model of “Work Dedication”

Model	χ^2 (p)	df	RMSE	CFI	TLI	SRMR
Generic	33780.42 (p = .0000)	2	.309	.896	.688	.066
Revised	721.14 (p = .0000)	1	.064	.998	.987	.006

Table 18. Results of measurement model of “Work Dedication”

Indicator	Standardized Regression Weight	Unstandardized Estimate	Standard Error	Significance
DD 1. The work I do makes a real difference.	.897	1.608	.006	<.001
DD 2. My work is meaningful.	.811	1.410	.006	<.001
DD 3. I care for all patients/clients equally even when it is difficult.	.614	1		
DD 4. I see every patient/client as an individual person with specific needs.	.620	.947	.003	<.001

Perceived Work Detachment. The indicators of “Detachment from Work Outside of Work” were adopted from an index of “Decompression” in the Press Ganey Resilience Survey and were supported by EFA. This index well describes nurses who can detach themselves from work activities cognitively and psychologically during the non-work time and enjoy their personal time (Sonnetag & Fritz, 2015). This four-item measurement model had an excellent reliability at .907. The revised model (with measurement error covariances) demonstrated good overall GOF and parameter-level GOF. The revised model is displayed in Figure 7. Frequencies and distributions of the indicators are given in Tables 18 and 19. Fit statistics for the revised model comparing to the generic model are given in Table 20. Parameter estimates for the indicators are given in Table 21.

Table 19. Percentages of Indicators for “Detachment from Work Outside of Work”

Indicators	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Missing	Total
DT 1. I rarely lose sleep over work issues.	2.5%	11.1%	16.0%	45.4%	25.0%	0	100%
DT 2. I am able to free my mind from work when I am away from it.	2.2%	10.7%	15.7%	44.6%	26.9%	0	100%
DT 3. I can enjoy my personal time without focusing on work matters.	2.4%	8.7%	12.8%	44.8%	31.4%	0	100%
DT 4. I am able to disconnect from work communications during my free time (emails/phone etc.).	2.8%	9.7%	12.1%	43.8%	31.6%	0	100%

Table 20. Distributions of indicators for “Detachment from Work Outside of Work”

Indicators	Mean	SD	Variance	Skewness	Kurtosis
DT 1. I rarely lose sleep over work issues.	3.79	1.018	1.036	-.776	3.034
DT 2. I am able to free my mind from work when I am away from it.	3.83	1.010	1.020	-.789	3.055
DT 3. I can enjoy my personal time without focusing on work matters.	3.94	1.002	1.004	-.977	3.513
DT 4. I am able to disconnect from work communications during my free time (emails/phone etc.).	3.92	1.034	1.068	-.964	3.362

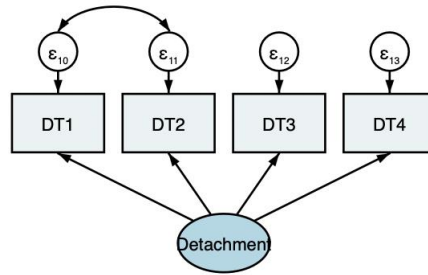


Figure 10. Revised measurement model of “Detachment form Work Outside of Work”

Table 21. Fit statistics for the original and revised measurement model of “Detachment from Work Outside of Work”

Model	χ^2 (p)	df	RMSE	CFI	TLI	SRMR
Generic	29851.64 (p = .0000)	2	.291	.940	.820	.043
Revised	60.96 (p = .0000)	1	.018	1.000	.999	.001

Table 22. Results of measurement model of “Detachment from Work Outside of Work”

Indicator	Standardized Regression Weight	Unstandardized Estimate	Standard Error	Significance
DT 1. I rarely lose sleep over work issues.	.730	1		
DT 2. I am able to free my mind from work when I am away from it.	.820	1.113	.002	<.000
DT 3. I can enjoy my personal time without focusing on work matters.	.910	1.227	.004	<.000
DT 4. I am able to disconnect from work communications during my free time (emails/phone etc.).	.828	1.152	.003	<.000

Potential Latent Variables: Perceived Nursing Resources. As suggested by EFA, the model may retain a fourth factor manifested by three indicators: staffing, tools and training. This latent variable is defined as “Nursing Resources”. For this three-indicator measurement model (Figure 8) to be identified, the three error terms (ε_1 , ε_2 , ε_3) were assumed to be uncorrelated with each other (Kline, 2016). This model had the df and chi-square value both equal to zero so that the overall GOF by fit statistics cannot be calculated. The three-item scale had an adequate reliability at .718. The model demonstrated good parameter-level GOF. The percentages and distributions for the item staffing, tools and training are given below in Table 23, 24, 25, 26, 27, 28. Parameter estimates for the indicators are given in Table 22.

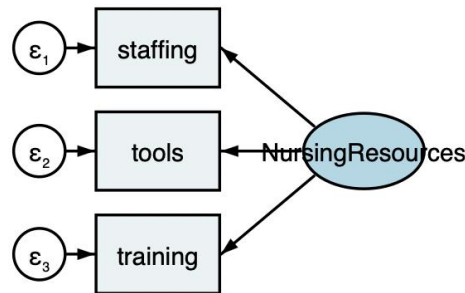


Figure 11. Measurement model of “Nursing Resources”

Table 23. Results of measurement model of “Nursing Resources”

Indicator	Standardized Regression Weight	Unstandardized Estimate	Standard Error	Significance
My work unit is adequately staffed.	.600	1		
I get the tools and resources I need to provide the best care/service for our clients/patients.	.852	1.142	.007	<.001
I get the training I need to do a good job.	.660	.739	.004	<.001

Measurement of Observed Variables

Perceived staffing adequacy. Nurses’ overall perception of staffing levels was measured by a single survey item asking the level of agreement/disagreement with the statement "My work unit is adequately staffed". Frequencies and distributions of the item are given in Tables 23 and 24.

Table 24. Percentages of the item “staffing”

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Missing	Total
My work unit is adequately staffed.	11.2%	20.0%	17.3%	32.1%	14.1%	5.3%	100%

Table 25. Distributions of the item “staffing”

Item	Mean	SD	Variance	Skewness	Kurtosis
My work unit is adequately staffed.	3.18	1.258	1.582	-.267	1.950

Perceived training adequacy. Nurses’ overall perception of training adequacy was measured by a single survey item asking the level of agreement/disagreement with the statement “I get the training I need to do a good job.” Frequencies and distributions of the item are given in Tables 25 and 26.

Table 26. Percentages of the item “training”

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Missing	Total
I get the training I need to do a good job.	1.1%	3.9%	9.4%	42.8%	24.6%	18.3%	100%

Table 27. Distributions of the item “training”

Item	Mean	SD	Variance	Skewness	Kurtosis
I get the training I need to do a good job.	4.05	.848	.719	-1.075	4.537

Perceived tool adequacy. Nurses’ overall perception of job tool adequacy was measured by a single survey item asking the level of agreement/disagreement with the statement “I get the tools and resources I need to provide the best care/service for our clients/patients.” Frequencies and distributions of the item are given in Tables 27 and 28.

Table 28. Percentages of the item “tools”

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Missing	Total
I get the tools and resources I need to provide the best care/service for our clients/patients.	2.5%	8.2%	12.1%	39.5%	20.2%	17.5%	100%

Table 29. Distributions of the item “tools”

Item	Mean	SD	Variance	Skewness	Kurtosis
I get the tools and resources I need to provide the best care/service for our clients/patients.	3.81	1.012	1.024	-.885	3.335

Perceived teamwork efficiency. Nurses’ overall perception of teamwork efficiency in their work units was measured by a single survey item asking the level of agreement/disagreement with the statement “My work unit works well together”. Frequencies and distributions of the item are given in Tables 29 and 30.

Table 30. Percentages of the item “teamwork”

Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Missing	Total
My work unit works well together.	1.2%	3.3%	8.3%	40.8%	45.9%	.3%	100%

Table 31. Distributions of the item “teamwork”

Item	Mean	Standard Deviation	Variance	Skewness	Kurtosis
My work unit works well together.	4.27	.846	.716	-1.374	5.210

Positive stress experience. The positive outcome in this study is operationalized as nurses perceiving the amount of job stress as reasonable. This positive stress experience reflects a sense of stress normalization that the nurse is confident to function as expected under job stress. This positive outcome is measured by a single survey item in the Press Ganey Employee Survey, asking the level of agreement/disagreement with the statement “The amount of job stress I feel is reasonable”. Frequencies and distributions of the item are given in Tables 31 and 32.

Table 32. Percentages of the item “positive stress experience”

Indicator	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Missing	Total
The amount of job stress I feel is reasonable	4.6%	13.0%	16.2%	40.3%	11.3%	14.6%	100%

Table 33. Distributions of the item “positive stress experience”

Indicator	Mean	Standard Deviation	Variance	Skewness	Kurtosis
The amount of job stress I feel is reasonable	3.48	1.069	1.143	-.652	2.693

Structural Model Evaluation

Overall Goodness of Fit

Two hypothesized structural models are given in Figure 9. Model “a” treats *staffing, tools* and *training* as observe variables, while model “b” treats them as indicators of an additional latent variable “Nursing Resources”. The two are nonhierarchical models that include the same variables but are not nested. The overall model fit was compared between the two. Akaike Information Criterion (AIC) and Bayes Information Criterion (BIC) are recommended in the descriptive comparison of nonhierarchical models (Kline, 2016). Smaller AIC and BIC indicate better model fit. The comparison of AIC and BIC along with other fit statistics is given in Table 33. Accordingly, model “a” had a better fit.

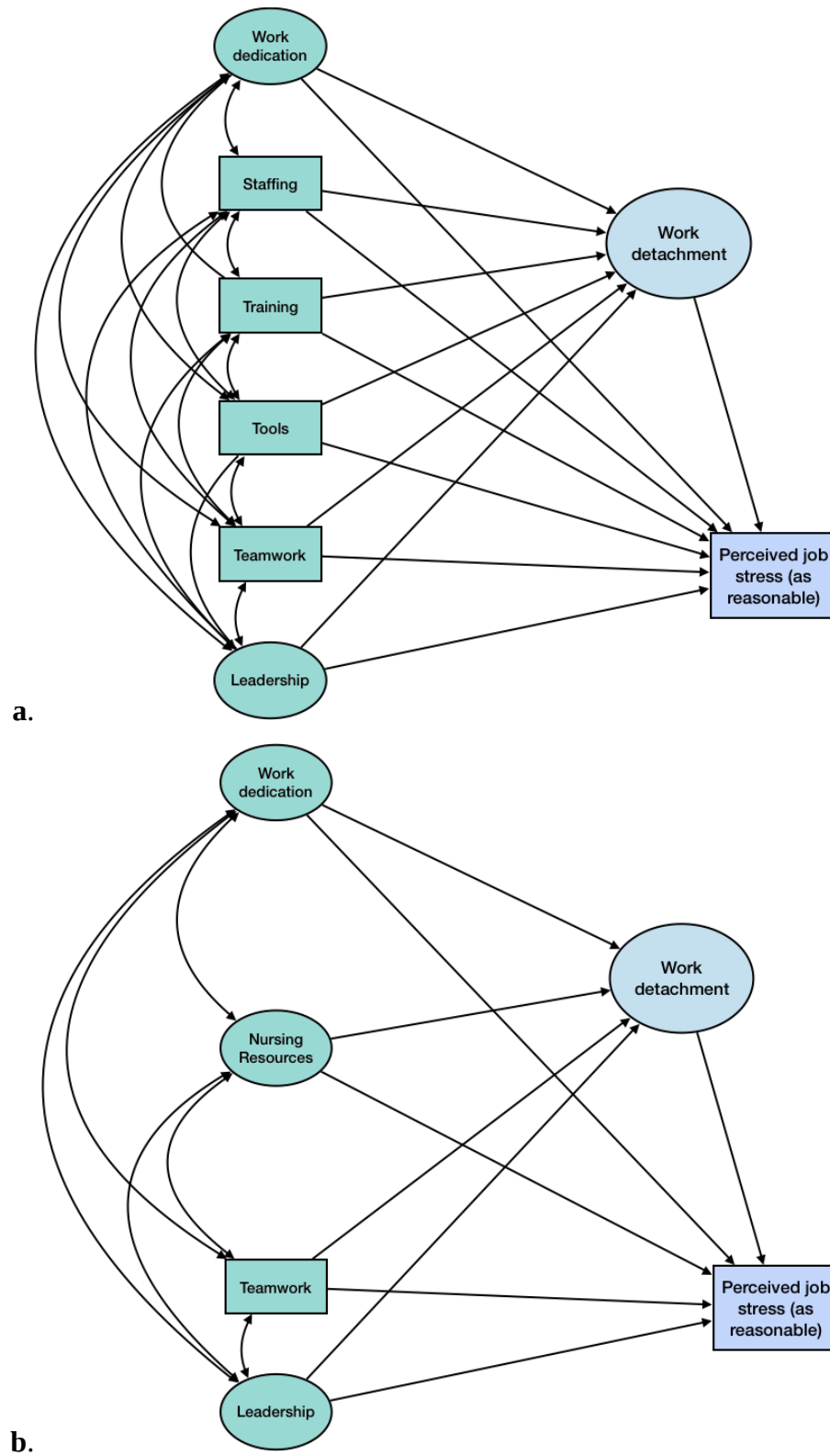


Figure 12. Hypothesized structural model “a” and “b”

Table 34. Comparison of fit statistics for nonhierarchical models

	Model a	Model b
χ^2 (p)	18469.198 (p < .001)	31920.145 (p < .001)
df	108	118
RMSEA	.037	.047
AIC	4.231e+06	4.244e+06
BIC	4.232e+06	4.245e+06
CFI	.986	.977
TLI	.980	.970
SRMR	.021	.028

Parameter-level Goodness of Fit

After the overall GOF, parameter-level GOF of model “a” was tested at a significance level of .05. All parameters were significant (Table 34). Notably, work dedication had a minimal direct effect (standardized coefficient = .006) on positive stress experience where $p = .016$ (95% CI .002 to .022). Other parameters were all significant at $p < .001$. To be careful about whether to keep the path between work dedication and positive stress experience in the model, further testing and adjustment were performed. The parameter-level GOF of the model was also tested at the significance level of .01, where the relationship between work dedication and positive stress experience became non-significant (99% CI -.001 to .025). Moreover, because there are multiple hypothesized relationships tested in the structural model, the chance of observing a rare event increases (Benjamini & Hochberg, 1995). That is, the likelihood of falsely rejecting a null hypothesis (Type 1 error) increases, especially when the sample size is large. Therefore, Bonferroni correction was applied to adjust significance α by dividing .05 (the original chosen significance level) by the number of hypothesized relationships tested in the model ($n = 13$) (Benjamini & Hochberg, 1995). The adjusted $\alpha_{pp} = .05/13 = .0038$. The coefficient between work dedication and positive stress experience (.016) was larger than .0038. Thus, after Bonferroni correction, the minimal direct effect of work dedication on positive stress experience became non-significant, while all other parameters (with $p < .001$) remained significant. Therefore, given the marginal coefficient and significance, the author decided to drop the path between work dedication and positive stress experience from model “a”. The updated model (“c”) is given in Figure 10. The fit statistics of model “c” were identical to that of the original model “a”, as shown in Table 35.

Table 35. Parameter estimates of the structural model

Relationship	Standardized Coefficients	Unstandardized Coefficients	Standard Error	Significance
staffing → positive stress	.331	.282	.002	p <.001
training → positive stress	.047	.059	.003	p <.001
tools → positive stress	.125	.132	.003	p <.001
teamwork → positive stress	.050	.064	.003	p <.001
Dedication → positive stress	.006	.012	.005	p =.016
Leadership → positive stress	.064	1	1	p <.001
staffing → Detachment	.207	.059	.001	p <.001
training → Detachment	.113	.048	.001	p <.001
tools → Detachment	.116	.041	.001	p <.001
teamwork → Detachment	.056	.024	.001	p <.001
Dedication → Detachment	.131	.086	.002	p <.001
Leadership → Detachment	.152	.799	.044	p <.001
Detachment → positive stress	.335	1	1	p <.001
staffing <--> training	.399	.442	.003	p <.001
staffing <--> tools	.512	.649	.004	p <.001
staffing <--> teamwork	.334	.350	.003	p <.001
staffing <--> Dedication	.278	.190	.002	p <.001
staffing <--> Leadership	.427	.036	.002	p <.001
training <--> tools	.562	.480	.003	p <.001
training <--> teamwork	.411	.290	.002	p <.001
training <--> Dedication	.402	.185	.002	p <.001
training <--> Leadership	.529	.030	.001	p <.001
tools <--> teamwork	.377	.318	.002	p <.001
tools <--> Dedication	.380	.209	.002	p <.001
tools <--> Leadership	.511	.035	.002	p <.001
teamwork <--> Dedication	.373	.169	.001	p <.001
teamwork <--> Leadership	.525	.030	.001	p <.001
Dedication <--> Leadership	.404	.015	.001	p <.001

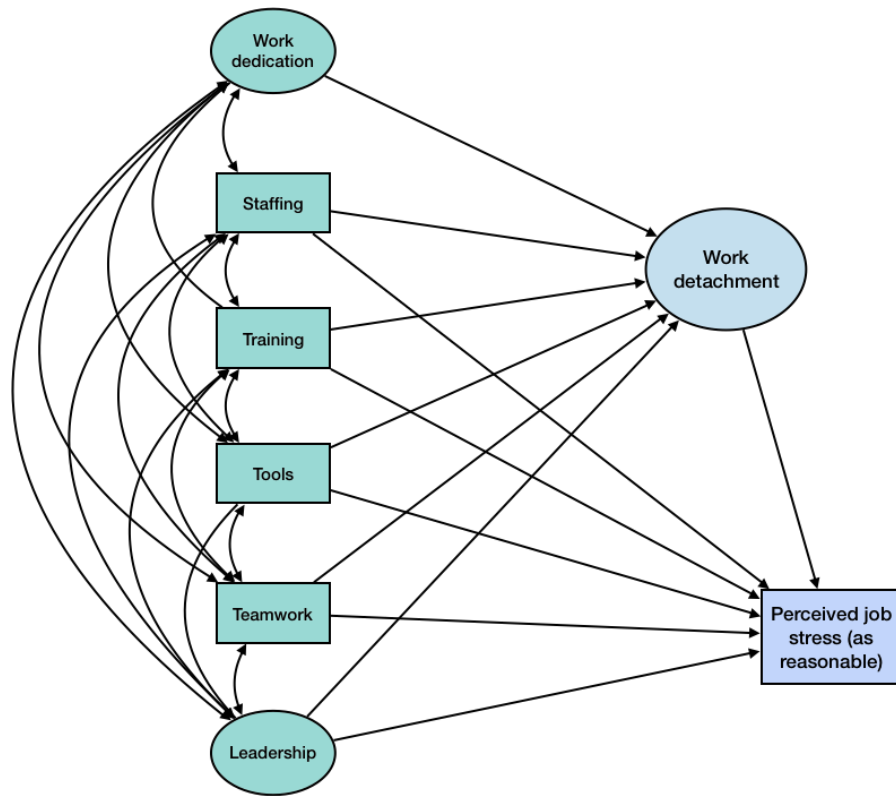


Figure 13. Structural model “c” after Bonferroni correction

Table 36. Comparison of fit statistics for model “a” and “c”

	Model a	Model c
χ^2 (p)	18469.198 (p < .001)	18474.962 (p < .001)
df	108	109
RMSEA	.037	.037
AIC	4.231e+06	4.231e +06
BIC	4.232e+06	4.231e +06
CFI	.986	.986
TLI	.980	.981
SRMR	.021	.021

Equation-level Goodness of Fit

The equation-level GOF of the structural model “c” was also assessed. The fitted variance, predicted variable, residual, and R-squared of the endogenous variables are shown in Table 36. These endogenous variables included the latent variable “Work Detachment”, the observed variable “positive stress experience”, and the indicators for “Work Detachment”, “Leadership”, and “Dedication”. The structural model predicted 99.09% of the total variance of all endogenous variables, 53.75% of the variance of “positive stress experience”, and 32.08% of the variance of “Work Detachment”. Given the generality and complexity of the variable “positive stress experience”, equation-level GOF was considered as satisfactory.

Table 37. Equation-level goodness of fit of the structural model

depvars	Variance			R-squared	mc	mc2
	fitted	predicted	residual			
observed						
DD1	.3883109	.2953723	.0929386	.7606592	.8721578	.7606592
DD2	.3601666	.2504972	.1096694	.6955038	.8339687	.6955038
DD3	.3246807	.1228391	.2018416	.3783381	.615092	.3783381
DD4	.2859676	.1122142	.1737535	.3924016	.6264197	.3924016
LD1	1.105679	.8108112	.2948677	.7333152	.8563383	.7333152
LD2	1.069149	.7679355	.3012138	.7182678	.8475068	.7182678
LD3	.7646204	.559975	.2046454	.7323568	.8557785	.7323568
posstress	1.138185	.6118239	.5263609	.5375435	.7331736	.5375435
LD4	.8032657	.5860016	.2172641	.729524	.8541218	.729524
LD5	.7407986	.4718586	.26894	.6369594	.7980973	.6369594
DT1	1.029886	.5815574	.4483285	.5646814	.7514529	.5646814
DT2	1.014583	.6999499	.314633	.6898893	.8305957	.6898893
DT3	.9995794	.8153112	.1842682	.8156543	.9031358	.8156543
DT4	1.066636	.7223275	.344309	.6772012	.8229224	.6772012
latent						
Detachment	.1282511	.0411274	.0871237	.3206787	.566285	.3206787
overall				.9908834		

mc = correlation between depvar and its prediction

mc2 = mc^2 is the Bentler-Raykov squared multiple correlation coefficient

Note. DD = Dedication; LD = Leadership; DT = Detachment; Posstress = Positive Stress Experience

Testing of Alternative Models

Alternative models of model “c” that are less restrictive and represent different patterns of effects among variables were tested, given in Figure 11. All alternative models had worse GOF than the hypothesized model “c”. The comparisons of fit statistics are given in Table 37. Thus far, the final model for hypothesis testing is established (shown in Figure 10).

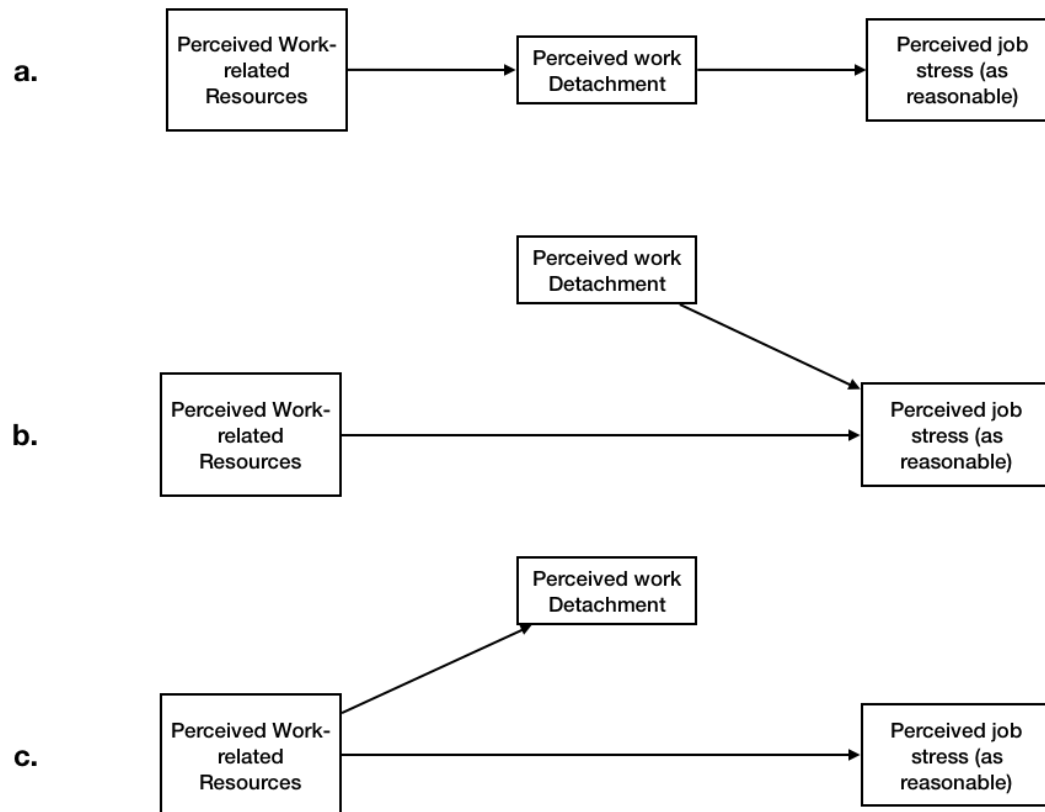


Figure 14. Alternative models

Table 38. Comparison of fit statistics for the final hypothesized model and the alternative models

	Hypothesized	Alternative a	Alternative b	Alternative c
$\chi^2(p)$	18469.198 (p < .001)	55128.992 (p < .001)	59107.407 (p < .001)	33983.564 (p < .001)
df	108	114	114	109
RMSEA	.037	.063	.065	.051
AIC	4.231e+06	4.268e+06	4.272 e+06	4.247 e+06
BIC	4.232e+06	4.268e+06	4.272 e+06	4.247 e+06
CFI	.986	.957	.954	.973
TLI	.980	.945	.940	.964
SRMR	.021	.047	.175	.038

Multi-group Comparison

This project seeks to evaluate the influence of nurses' length of service on the proposed relationships between perceived work-related resources, detachment outside of work and the positive outcome (i.e., perceiving the amount of job stress as reasonable). Nurses' length of service was divided into two groups: 5 years or less and 6 years or more. The overall guideline of grouping length of service is to minimize group size inequality that may cause misleading comparison results (Acock, 2013). The fit of the measurement models and the structural model will first be fitted for each group. The group comparison focuses on structural invariance, the unstandardized paths in the structural model. Before the testing of structural invariance, measurement invariance needs to be checked for the latent variables "Leadership", "Dedication", and "Detachment" (Kline, 2016). Measurement invariance demonstrates that latent variables have the same meaning to nurses having different lengths of service.

Upon the demonstration of measurement invariance (details in Chapter 4), structural parameters are then constrained to be equal across groups one at a time. These structural parameters include structural coefficients, structural intercepts, covariances of structural errors, etc. Typically, the GOF of the two hierarchical models is compared using the chi-square difference test (Likelihood ratio test) (Kline, 2016). A significant chi-square difference indicates that model fit is inequivalent between groups. Notably, the chi-square significance should be interpreted with

caution in this study. With a large sample, the chi-square difference will be significant even with trivial inequalities between groups. Thus, in addition to the chi-square value and p value, CFI is used to compare GOF across models (Cheung & Rensvold, 2002; Kline, 2016). Cheung and Rensvold suggested that if changes in CFI value $\leq .01$, the invariance hypothesis should not be rejected in very large samples even when the chi-square difference is significant.

Summary

Different from the extant quantitative inquiries that measured resilience among nurses directly by standardized psychological resilience/resiliency scales, this project adopts an evolutionary conception of resilience in the nursing context and applies it as a framework to guide the understanding of nurses' positive stress experience at work. This project takes a nursing perspective that values both nurses' personal qualities and organizational resources in nurses' adaptation to job stress, instead of taking a purely psychological perspective which poses pressures on the individuals when they fail to adapt. Methodologically, the employment of SEM allows this project to specify and test the hypothesized structural relationships between constructs of interest: nurse perceived work-related resources, the potential recovery mechanism, and the positive stress experience simultaneously using the existing dataset. On one hand, SEM verifies the given theory of nurse resilience. On the other hand, SEM offers a huge potential in the explanation of these constructs, their interrelationships, and the strength of these interrelationships within the framework of nurse resilience.

CHAPTER 4. RESULTS

This chapter described the results of hypothesis testing through the final structural model given in Figure 12. A total of 121,528 direct-care registered nurses were included in the analyses, approximately 69% of the total sample. Significance was estimated at the .05 level.

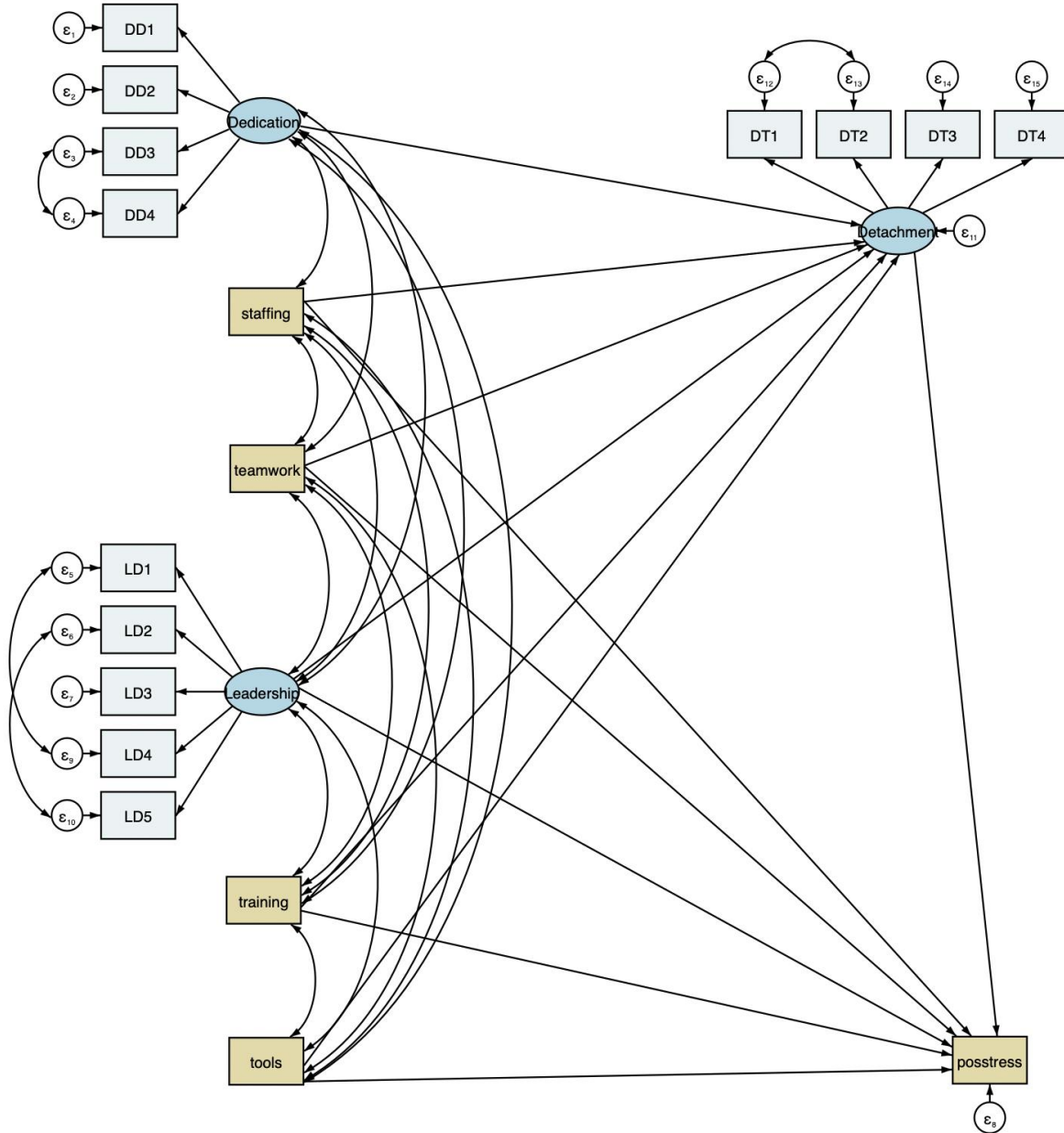


Figure 15. Final structural model

Hypothesis 1 Testing

Hypothesis 1: Resourceful nurses will be more likely to have positive stress experience.

Hypothesis 1 was supported by the data. The elements of perceived work-related resources were all significantly and positively associated with nurses' positive job stress experience. The strongest association was between perceived staffing adequacy and positive stress experience that one unit increase in staffing adequacy led to a .331 unit increase in nurses' rating of positive stress experience. The next important resource was the perceived adequacy of tools needed to provide the best care. One unit increase in tool adequacy led to a .125 unit increase in nurses' rating of positive stress experience. Perceptions of training adequacy, teamwork efficiency and good leadership had relatively smaller influences on nurses' positive stress experience (Standardized coefficients = .047, .051, and .065, respectively; all $p < .001$). Parameter estimates for the hypothesized relationships in terms of both unstandardized estimates and standardized regression weights for the structural model are given in Table 38.

Also, the positive correlations between elements of work-related resources were supported by the data. The elements of work-related resources perceived by the nurses had low to moderate correlations. For example, the correlations between perceptions of staffing adequacy, tool adequacy, training adequacy, teamwork efficiency and good leadership had the highest positive coefficients with standardized coefficients around .500 (all $p < .001$). All correlation estimates are given in Table 39.

Table 39. Results of relationships between work-related resources and positive stress experience

Relationship	Standardized Coefficients	Unstandardized Coefficients	Standard Error	Significance
staffing → positive stress	.331	.282	.002	$p < .001$
training → positive stress	.047	.060	.003	$p < .001$
tools → positive stress	.125	.133	.003	$p < .001$
teamwork → positive stress	.051	.065	.003	$p < .001$
Leadership → positive stress	.065	.077	.003	$p < .001$

Table 40. Results of correlations between work-related resources

Correlation	Standardized Coefficients	Unstandardized Coefficients	Standard Error	Significance
staffing <--> training	.399	.442	.003	p <.001
staffing <--> tools	.512	.649	.004	p <.001
staffing <--> teamwork	.334	.350	.003	p <.001
staffing <--> Dedication	.278	.190	.002	p <.001
staffing <--> Leadership	.427	.036	.002	p <.001
training <--> tools	.562	.480	.003	p <.001
training <--> teamwork	.411	.290	.002	p <.001
training <--> Dedication	.402	.185	.002	p <.001
training <--> Leadership	.529	.030	.001	p <.001
tools <--> teamwork	.377	.318	.002	p <.001
tools <--> Dedication	.380	.209	.002	p <.001
tools <--> Leadership	.511	.035	.002	p <.001
teamwork <--> Dedication	.373	.169	.001	p <.001
teamwork <--> Leadership	.525	.030	.001	p <.001
Dedication <--> Leadership	.404	.015	.001	p <.001

Hypothesis 2 Testing

Hypothesis 2: Resourceful nurses will be more likely to detach themselves from work outside of work.

Detachment from work outside of work was hypothesized as a mediator of the relationship between resourcefulness and positive job stress experience. The first component was to test the significant positive associations between nurse's perception of resourcefulness at work and work detachment outside of work (Hypothesis 2). The results showed that hypothesis 2 was supported by the data.

The elements of perceived work-related resources were all significantly and positively associated with nurses perceived levels of detachment from work outside of work. The perception of staffing adequacy in the workplace had the highest effect. One unit increase in the rating of staffing adequacy led to a .207 unit increase in the rating of perceived detachment outside of work.

Other elements of work-related resources had similar but smaller effects on nurses' detachment outside of work (standardized coefficient around .100; all $p < .001$), except for perceived teamwork efficiency that had the minimum (standardized coefficient = .056; $p < .001$). All parameter estimates are given in Table 40.

Table 41. Results of relationships between work-related resources and work detachment

Relationship	Standardized Coefficients	Unstandardized Coefficients	Standard Error	Significance
staffing → Detachment	.207	.059	.001	$p < .001$
training → Detachment	.113	.048	.001	$p < .001$
tools → Detachment	.115	.041	.001	$p < .001$
teamwork → Detachment	.056	.024	.001	$p < .001$
Dedication → Detachment	.131	.086	.002	$p < .001$
Leadership → Detachment	.152	.061	.002	$p < .001$

Hypothesis 3 Testing

Hypothesis 3: Nurses who are able to detach themselves from work outside of work are more likely to have positive stress experience.

The second component of the mediation analysis was to test the significant and positive association between perceived level of work detachment and positive job stress experience (Hypothesis 3). Results showed that hypothesis 3 was also supported by the data. One unit increase in the perceived level of detachment outside of work led to a .336 unit increase in nurses' rating of positive job stress experience ($p < .001$; Table 41).

Table 42. Results of relationship between work detachment and positive stress experience

Relationship	Standardized Coefficients	Unstandardized Coefficients	Standard Error	Significance
Detachment → positive stress	.336	1	1	$p < .001$

There is an important assumption in mediation analysis, that is the error terms of the latent variable “Work Detachment” and the error term of the observed variable “positive stress experience” are uncorrelated. This assumption was met in the final structural model. The total effects of resourcefulness on positive stress experience and the indirect effect mediated by work detachment were simultaneously estimated in SEM. The results are given in Table 42.

The total effect of perceived staffing adequacy on positive stress experience was the highest among the elements of perceived work-related resources. The majority of the effect of perceived staffing adequacy on positive stress experience was the direct effect (83%), with mediation through work detachment at 17%. In contrast, although the direct effect of work dedication on positive stress experience was not supported by the data, work dedication influenced positive stress experience through work detachment. The effects of other elements (perceived training adequacy, tool adequacy, teamwork efficiency, and good leadership) mediated by work detachment were ranging from 24% - 44%. Thus, overall, the mediating effect of perceived work detachment was supported by the data, although there were big discrepancies in magnitudes among elements of perceived work-related resources.

Table 43. Total effect and indirect effect of resourcefulness on positive stress experience

Relationship	Indirect Effect (Stand. Coef. / %)		Direct Effect (Stand. Coef. / %)		Total Effect (Stand. Coef. / %)	
staffing → positive stress	.070	17.46%	.331	82.54%	.401	100%
training → positive stress	.038	44.19%	.048	55.81%	.086	100%
tools → positive stress	.039	23.78%	.126	76.83%	.164	100%
teamwork → positive stress	.019	27.14%	.051	72.86%	.070	100%
Dedication → positive stress	.044	100%	/	/	.044	100%
Leadership → positive stress	.051	43.97%	.065	56.03%	.116	100%

Hypothesis 4 Testing

Hypothesis 4: The direct effect of perceived resourcefulness on positive stress experience (i.e., perceiving job stress as reasonable) (tested in Hypothesis 1) and the indirect effect mediated by work detachment (tested in Hypothesis 2 &3) will not differ by nurses' length of service.

Before testing Hypothesis 4, model GOF was assessed separately in the two samples, i.e., nurses having a length of service ≤ 5 years and ≥ 6 years. Results showed that the model fit both groups well, as given in Table 43.

Table 44. Comparison of fit statistics for two groups of nurses by length of service

	Length of Service ≤ 5 years N=64,594	Length of Service ≥ 6 years N=56,656
χ^2 (p)	10257.904 (p < .001)	8404.593 (p < .001)
df	109	109
RMSEA	.038	.037
CFI	.986	.988
TLI	.980	.983
SRMR	.021	.021

To test Hypothesis 4, measurement invariance of latent variables, “Leadership”, “Dedication” and “Detachment”, were first tested between two groups of nurses (i.e., service length ≤ 5 years vs. ≥ 6 years). Six models from no parameter constraints to the strictest constraints were tested sequentially (Table 44). Likelihood ratio test was used to compare model fit based on the differences in df and χ^2 value between a more restricted model and a less restricted model sequentially (e.g., model 2 vs. model 1, model 3 vs. model 2). Usually, a significant likelihood ratio test indicates that the more restricted model has a worse model fit than the less restricted. However, because the likelihood ratio test is sensitive to a large sample size, the results of measurement invariances for all three latent variables were always significant (Results not shown). Therefore, CFI differences were then employed to determine invariance. A CFI difference $\leq .01$ between two models indicates invariance (Cheung & Rensvold, 2002; Kline, 2016). The CFI comparison results for latent variable “Leadership”, “Dedication” and “Detachment” are given in

Table 45. The CFI differences were either zero or .001, well less than .01. Thus, measurement invariance of the three latent variables was supported between the two groups. That is, the measurement models of “Leadership”, “Dedication”, and “Detachment” had the same meaning to nurses of different lengths of service (≤ 5 years or ≥ 6 years).

Table 45. Measurement invariance testing steps

Model	Constraints
1	all parameters free
2	metric (pattern) invariance (loadings are invariant)
3	strong (scalar) invariance (loadings & intercepts are invariant)
4	strict invariance (loadings, intercepts & residuals are invariant)
5	strict invariance plus factor means are invariant
6	strict invariance plus factor means & covariances are invariant

Table 46. CFI values in measurement invariance testing

	CFI values					
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Leadership	.999	.998	.998	.997	.997	.997
Dedication	.998	.998	.997	.996	.996	.996
Detachment	1.000	1.000	.999	.999	.999	.999

After measurement invariance testing, structural invariance was checked for Hypothesis 4. With measurement model parameters constrained to be equal between the groups, model 1 with all path coefficients free and model 2 with all path coefficients constrained to be equal was compared. Similar to the testing of measurement invariance, the likelihood ratio test will not be trusted due to the large sample size in the project. Instead, CFI difference is employed to determine structural invariance. Model 1 and 2 both had a CFI of .985. Thus, structural invariance was supported by the data. That is, the relationships between the constructs tested in hypotheses 1, 2, and 3 did not differ between nurses with 5 years or less experience and 6 years or more experience.

CHAPTER 5. DISCUSSION

Summary of the Findings and Discussions

This project offers new insights into nurses' perception of job stress guided by a contemporary understanding of resilience as a process. Nurse resilience, as explored and defined based on evidence from both psychology and nursing, values personal qualities and organizational protectors in achieving good outcomes despite stress or adversity in the workplace. Resilient nurses are featured by their capability to "bounce back" or recover from biopsychospiritual disruptions at/from work and adapt to work environments over time. Using the 2018 Press Ganey employee survey data, this project seeks to capture an ideal image of a resilient nurse who is resourceful both internally and externally, takes advantage of chances to recover and grow, and eventually achieves positive outcomes. This study provided a heuristic model and a definition of nurse resilience that advances the concept clarification in nursing research. Although the operationalization of resilience as a dynamic process was not possible due to methodological limitations, this project services as an early-stage attempt of understanding more facets of the job stress phenomenon through the lens of resilience.

The hypothesized resource-recovery-adaptation framework for understanding nurses' job stress was empirically tested through structural equation modeling (SEM). Specifically, the project identified the personal qualities and organizational factors important for nurses' capability to recover, grow and adapt in the face of stress or adversity at work. Notably, the personal qualities commonly cited in resilience literature were largely unavailable in the Press Ganey dataset, such as nurses' self-efficacy, mastery/control, and social competence (Connor & Davidson, 2003; Davidson, 2018; Friborg, Hjemdal, Rosenvinge, & Martinussen, 2003). The only personal or professional quality included was nurses' dedication to the nursing profession. Supportive organizational factors included good nurse leader/supervisor, good teamwork, and adequate staffing level, tools/resources and training for care provision. The recovery experiences involved nurses detaching themselves from work psychologically, disconnecting from work-related communications, maintaining good sleep and enjoying their free time. The good outcome of interest was nurses' positive stress experience, i.e., perceiving the amount of job stress as reasonable.

The results revealed that resourcefulness had a significant impact on nurses' positive job stress experience. The impact of organizational resources was supported with various magnitudes while the direct effect of the only personal/professional quality, dedication to the nursing profession, was not supported. The trivial impact of work dedication can be attributed to two reasons. First, the effect of work dedication on positive stress experience was relatively small as compared to the impact of organizational protectors. When the correlations between all resource elements were taken into account, the small impact of work dedication can be suppressed to be marginal or even non-significant. Second, the poor differentiation of the levels of work dedication among nurses significantly limited the potential in exploring its contribution to positive stress experience. Organizational protectors were found to contribute to nurses' positive stress experience, where perceived staffing adequacy in care units had the strongest power. Organizational factors as stressors, such as problems with peers/supervisor/physicians, inadequate staffing level and high workload, had studied widely among nurses, especially in acute care settings (Abraham et al., 2018; Karimi, Leggat, Donohue, Farrell, & Couper, 2014; French, Lenton, Walters, & Eyles, 2000; Peter, Hahn, Schols, & Halfens, 2020; Teo, Pick, Newton, Yeung, & Chang, 2013). Low staffing level and the related high workload had found to increase nurse job stress and led to various negative outcomes such as poor well-being, lower job satisfaction, burnout and turnover (Griffiths et al., 2020; Lake, Riman & Sloane, 2020; Cristina Gasparino et al., 2021). This project adds to the evidence that nurses' perception of staffing level has a remarkable impact on positive stress experience, as compared to other organizational protectors (i.e., adequate tools, training and good leadership). Specifically, the impact of perceived staffing adequacy on nurses' positive stress experience was almost 2.5 times the impact of adequate tools for care, 3.5 times the impact of good leadership, and 5 times the impact of adequate training and good teamwork.

Also, the results indicated that nurses' perceptions of work-related resources (i.e., personal and organizational protectors) were correlated, especially between perceived staffing level, tools for care, training, and leadership. This finding is consistent with the empirical evidence regarding the dynamic nature of supportive work environments (Brown, Smith, Jeffers, & Jean Pierre, 2021; Cristina Gasparino et al., 2021; Henshall, Davey, & Jackson, 2020; Majeed & Jamshed, 2021). For example, the role of competent nurse leaders in nurturing supportive work environments is well documented and studied, such as promoting collegial collaboration, leading to favorable patient and nurse outcomes (AONE, 2015; Greco, Laschinger, & Wong, 2006).

Furthermore, the results revealed the importance of detachment from work outside of work in achieving positive stress experience among nurses. Remarkably, the impact of work detachment outside of work was comparable to that of nurse perceived staffing level at work. These findings bridge the evidence gap in nursing research surrounding the role of psychological and cognitive detachment from work outside of work in nurse job stress management. Collectively, a supportive work environment and nurses' dedication to the profession all contributes to nurses' detachment outside of work. This finding suggests the significance of supportive work environments that enables efficient task completion and problem solving at work and allows psychological and cognitive detachment after work. This finding also suggests that professional training and leadership can play a role in transmitting positive views of managing a good work-life balance through efficient detachment (Braun & Peus, 2018; Tawfik et al., 2021).

Finally, the results showed that the impact of work-related resources and detachment outside of work on positive stress experience did not differ between less experienced and more experienced nurses. Nurses of various experiences did report invariant interpretations of the measures for leadership, dedication to the nursing profession, and detachment from work outside of work. This finding suggests the universal importance of the work-related resources, especially the perceived staffing adequacy, and work detachment outside of work in job stress management among nurses of diverse work experiences.

Implications

The findings of this project have several important implications. Clinically, it was evident that nurse perceived staffing adequacy and their levels of detachment from work outside of work were both important at comparable magnitudes to nurses' positive stress experience. This importance does not differ among nurses of different lengths of service. This universal importance informs future clinical interventions and leadership strategies for nurse job stress management. As the significance of work detachment outside of work to job stress experience has not gained adequate attention in nursing research, more organizational emphasis and empirical research on this role are warranted.

Theoretically, the project was guided by a contemporary understanding of resilience as a dynamic process where both nurses' personal qualities and organizational protectors play a role. Resilience theories complement traditional stress theories and help unfold more layers of the

complex job stress phenomenon. This project serves as an early-stage exploration of nurse resilience as a process and provided a heuristic model for future testing and modification. Notably, the integration of work and nonwork lives is supported by the findings that efficient recovery experience in nonwork lives impact nurses' perception of their work lives. The process theory of resilience was statistically tested applicable in guiding the formation of research hypotheses in this secondary analysis, although the dynamic nature of the resilience process was not tested due to methodological limitations. Nonetheless, this project opens up the floor for future discussion and research on what resilience is in nursing that leads to the mindset shift from pure psychological or social perspectives to an integrative nursing perspective.

Methodologically, this project used SEM to structure the relationships between variables and allowed more flexibility and higher accuracy in hypothesis testing as compared to traditional regression. This project demonstrated the benefits of employing latent variables in nursing research in the context of SEM, where measurement reliability, measurement error estimation, and model fitness to data all adds to the confidence of research findings.

Study Limitations

There are several limitations related to the data and the design of this study that could influence the generalizability of findings.

Sampling Issues

The data was not designed to be representative of the registered nurse population in the United States, although the large sample was from various healthcare organizations in multiple states. Also, this study did not account for any potential hierarchical or clustered structures at the care unit and organization levels. For example, nurses working in acute care settings may perceive job stress differently from those in outpatient settings. There were two reasons for not considering multilevel modeling in this project. First, multilevel modeling is not allowed by SEM in STATA (StataCorp, 2021). Second, unit-level data is not available in the dataset, while organization types, such as hospital vs. non-hospital, may be identifiable with the help of Press Ganey personnel. Further, there was a sizable proportion of data missingness (31%). Responding or not to high-missing variables depended on nurses' demographic characteristics.

Measurement Issues

Measurement errors in several variables were not accounted for due to practical constraints from single-item measures. In the structural model, teamwork/collaboration, staffing level, adequate tools and adequate training were measured by single survey items. The reliabilities of these single-item measures were unclear and thus were assumed to be 1.00, i.e., the variables were measured perfectly without errors. In comparison, the error terms of the latent variables, i.e., work engagement, work detachment and leadership, were taken into account.

In addition, the skewness of most variables in this study could potentially influence parameter estimation in SEM. Most variables, except nurses' perceptions of staffing adequacy and job stress, had responses clustered in the top categories of "Strongly Agree" and "Agree". Although the normality assumption of SEM was met, the high skewness in some variables could potentially influence model fit assessment and parameter estimation. One adjustment for skewed data in STATA is the quasimaximum likelihood (QML) estimation. QML handles nonnormality by adjusting standard errors. QML still uses maximum likelihood to estimate parameters but standard errors are adjusted by Satorra-Bentler corrections (Satorra & Bentler, 1994). Adjusted results using QML estimation indicated that the GOF statistics computed with Satorra-Bentler corrections were similar to those based on normal theory maximum likelihood in the current analysis (results not shown). This finding supports that with the current methods, the final structural model fits the data equally well. Notably, Satorra-Bentler corrections only adjust the GOF statistics but not the coefficient estimates between variables.

Design Issues

Perhaps the most salient limitation of this study is the cross-sectional design. As discussed previously, a comprehensive exploration of nurse resilience as a process and the understanding of nurse job stress within the resilience framework requires longitudinal study design. Longitudinal design can track nurses' adjustment to adapt in the face of job stress. Specifically, nurses' personal/professional qualities may be relatively stable but other organizational variables can be changing over time. In addition, with longitudinal data the reciprocal relationships between constructs can be tested, as illustrated in the heuristic model of the resilience process. This study,

however, serves as an early-stage attempt using a cross-sectional design where no changes over time or reciprocal effects were accounted for.

Additionally, even though this secondary analysis did not seek to explore what is valuable to the nurse being classified as resilient or not, there were omitted personal qualities (that are not available in the dataset) that can be important to nurses' positive stress experience. Moreover, due to the lack of literature in this area, there are likely to be other important protectors/resources for nurse resilience besides the introduced personal and organizational factors, such as nurses' physical and mental health and job compensation (that are either unavailable or having high missingness (>50%) in the dataset).

Further, the quality of SEM results depends on the validity of the theories informing model specifications (Kline, 2016). Due to the lack of similar studies, this study cautioned about specifying a model that is both conceptually and empirically reasonable. But applying a newer theory in understanding job stress among nurses could potentially pose risks of inappropriateness in model specification. Additionally, the linear nature of SEM can be a fundamental limitation in studying the complex job stress phenomenon. For example, the potential recovery mechanism tested as a mediator in this project can be a moderator in a non-linear model in future research, as suggested by evidence outside of the nursing context. Meanwhile, even in linear models, longitudinal data is favored over cross-sectional data in mediation testing.

Directions for Future Studies

Extended Inquiries

The current analysis tested the moderating effects of nurses' length of service on their perceptions of variables and on the relationships between variables using multiple-group comparison in SEM. The same approach can be applied to other nurses' demographic factors, such as age, gender, race, shift, and employment status. Also, this study tested the comparison between two groups of nurses, but SEM does allow comparisons between multiple groups that could potentially improve the precision of findings.

Future studies may extend the inclusion of personal qualities and interpersonal support systems when data allows. For example, self-efficacy is an important quality well-recognized in nursing literature. Future studies may also include nurses' mental and physical health measures in

the model, for example, as moderators. Mental illness such as a diagnosis of depression, for instance, may fundamentally affect nurses' ability to cope, recover and adapt in the face of job stress or adversity. Furthermore, future inquiries may explore other potentially important positive outcomes among nurses, such as satisfaction with specific domains of work lives, professional quality of life, and their perceived quality of care provision. Last but not least, the current model can be extended by exploring the potential influences of nurses' positive stress experience on other important clinical measures such as nurses' well-being, satisfaction, retention and burnout.

Adjusted Inquiries

The design of the current study can be adjusted to explore more layers of complex phenomena like nurse resilience and job stress. Longitudinal study design could significantly expand the capability and the precision of the current SEM model in exploring relationships between variables. Also, besides the aforementioned multiple-group comparison in SEM, multiple-level modeling in generalized SEM (gSEM) can be applied to allow research questions relevant to other, especially multiple, hierarchical or clustered structures such as organization type, unit type, and location (e.g., metro vs. non-metro).

Conclusion

This research seeks to clarify the conceptualization of resilience in nursing and understand the influencers of nurses' positive stress experience in the workplace. The resilience model illustrates one possible way in which future research into nurses' work experiences, especially positive experiences, can be carried forward. The model highlights the interplay of nurses' personal and organizational resources and the role of recovery alongside active coping in the face of stress or adversity. Results of this secondary analysis, from structural equation modeling, provides insight into the nature of the relationships between nurses' resources, recovery experience, and their positive job stress experience. Additionally, this research suggests future avenues of inquiry in understanding nurse work experiences, highlighting the need for longitudinal analysis. Prospective areas of future research include individual and organizational differences (e.g., nurses' demographic characteristics and organizational characteristics) in the resilience process, extended inclusion of personal qualities and their interplay with organizational factors,

the testing of reciprocal relationships, and the exploration of nurses' positive adaptive outcomes and their links to nurse and nursing outcomes.

APPENDIX A. BIVARIATE CORRELATIONS

```
. spearman posstress staffing training tools teamwork DT1 DT2 DT3 DT4 LD1 LD2 LD3 LD4 LD
> 5 DD1 DD2 DD3 DD4,stats(rho) star(0.05)
(obs=121528)
```

	posstr-s	staffing	training	tools	teamwork	DT1	DT2	DT3
posstress	1.0000							
staffing	0.5997*	1.0000						
training	0.4548*	0.4100*	1.0000					
tools	0.5189*	0.5100*	0.5842*	1.0000				
teamwork	0.3707*	0.3388*	0.4298*	0.4022*	1.0000			
DT1	0.5273*	0.3700*	0.3641*	0.3787*	0.2975*	1.0000		
DT2	0.5151*	0.3612*	0.3652*	0.3782*	0.2971*	0.8116*	1.0000	
DT3	0.5166*	0.3860*	0.3999*	0.4088*	0.3320*	0.6646*	0.7364*	1.0000
DT4	0.4535*	0.3442*	0.3591*	0.3645*	0.2935*	0.6168*	0.6868*	0.7593*
LD1	0.3956*	0.3747*	0.4781*	0.4674*	0.4358*	0.3205*	0.3171*	0.3601*
LD2	0.4325*	0.4041*	0.4610*	0.4648*	0.4379*	0.3350*	0.3241*	0.3693*
LD3	0.3926*	0.3594*	0.4922*	0.4588*	0.5101*	0.3231*	0.3130*	0.3623*
LD4	0.3832*	0.3583*	0.4724*	0.4586*	0.4476*	0.3129*	0.3071*	0.3555*
LD5	0.3594*	0.3222*	0.4089*	0.3868*	0.4197*	0.3025*	0.2904*	0.3331*
DD1	0.2706*	0.2293*	0.3633*	0.3416*	0.3306*	0.2534*	0.2599*	0.2954*
DD2	0.2912*	0.2425*	0.3796*	0.3524*	0.3626*	0.2549*	0.2590*	0.3110*
DD3	0.2004*	0.1823*	0.2965*	0.2720*	0.2823*	0.2220*	0.2300*	0.2592*
DD4	0.2018*	0.1795*	0.3062*	0.2672*	0.3022*	0.2433*	0.2512*	0.2875*
	DT4	LD1	LD2	LD3	LD4	LD5	DD1	DD2
DT4	1.0000							
LD1	0.3199*	1.0000						
LD2	0.3252*	0.7170*	1.0000					
LD3	0.3237*	0.7194*	0.7031*	1.0000				
LD4	0.3193*	0.7775*	0.7028*	0.7291*	1.0000			
LD5	0.2976*	0.6727*	0.7454*	0.6688*	0.6802*	1.0000		
DD1	0.2679*	0.3029*	0.2999*	0.3441*	0.3364*	0.2762*	1.0000	
DD2	0.2779*	0.3348*	0.3275*	0.3836*	0.3747*	0.3103*	0.7265*	1.0000
DD3	0.2467*	0.2573*	0.2388*	0.2948*	0.2995*	0.2366*	0.5974*	0.5148*
DD4	0.2756*	0.2785*	0.2631*	0.3285*	0.3308*	0.2654*	0.5647*	0.5281*
	DD3	DD4						
DD3	1.0000							
DD4	0.6785*	1.0000						

Note. Posstress = positive stress experience; DD = dedication; DT = detachment; LD = leadership

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