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Perceptions of Health and Wellness Among Transit Industrial Workers

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Perceptions of Health and Wellness Among Transit Industrial Workers

by
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Sir Isaac Newton once said, “If I have seen further than others, it is by standing on the shoulders of giants.” I dedicate this dissertation to Betty Smith, Gregory, and Lapedtra Singleton. I stand here today because of your love and the support of your shoulders.

Perceptions of Health and Wellness Among Transit Industrial Workers

Brianna Michelle Singleton

ABSTRACT

Guided by the National Institute for Occupational Safety and Health conceptual framework for worker well-being, this qualitative study explored the perceptions and beliefs regarding the health, well-being, and health and safety related behaviors at the intersection of personal characteristics and professional responsibilities in a convenience sample of electricians and transit vehicle mechanics working for the Bay Area Rapid Transit in California. The nine participants were recruited from five transit railyards in urban cities during their shifts and were interviewed individually outside work hours. Using thematic analysis, five themes emerged: health equals workability; hazard awareness and normalization; coexisting with chronic pain; health behavior influenced by personal and social factors not health access; and professional expertise. Study findings indicate how conditions of employment impacted worker well-being in the context of structures that connected worker experiences in a shared time and physical workspace. These workers strongly believed that health was the ability to work for as long as they chose by maintaining their professional skills and by being aware of, managing and normalizing workplace hazards even if it was at their personal detriment. They coexisted with chronic pain primarily by ignoring pain for personal and collegial reasons, even though lifelong employer-based health care was available. Diagnosed mental health conditions were not as readily acknowledged as were physical health conditions. There is much occupational health nurses could do, using a mix of traditional and newer strategies, to enhance worker health, well-being, and safety and to respond to our changing post-COVID-19 pandemic work-world and its workers.

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Chapter One

INTRODUCTION

Work is fundamental to human health (International Labour Organization [ILO], 2022a, 2022b). Participating in a work environment, free from immediate harm and long-term health consequences, while protecting and maintaining overall health and safety, is a human right (ILO, 2022a). Most adults spend a significant portion of the day, consequentially, a large portion of their adult life, working for an employer (ILO, 2022b). Steady employment provides financial capital to access basic physiological needs such as food, water, shelter, security, and the ability to reach ideals of achievement (MacDermid et al., 2008; Maslow, 1943; Wipfli et al., 2021). Economic benefits can provide access to leisure activities, health insurance, and education attainment choices, or highlight social inequality and segregation (Dipietro Mager & Moore, 2020; Hämmig & Bauer, 2013; Oakes & Kauffmann, 2006). Work is the socioeconomic tapestry uniting material and nonmaterial resources by allocating power, security, opportunities, and social status. People often prefer non-standard work arrangements or dangerous working conditions rather than unemployment and no steady income (ILO, 2016). In doing so, workers make trade-offs between their health, maintaining gainful employment, or pursuing career advancement.

How a person feels, thinks, and behaves while working in an emotional or psychological state of unwellness can produce changes with personal and social consequences (Leka & Jain, 2010). Different states of unwellness exist on a continuum, ranging from minor ailments to increased risk of morbidity and mortality, and can be the result of different triggers of varying degrees of intensity, duration, and frequency of underlying health conditions (Kubzansky et al., 2014; Paris & Hoge, 2010). Consequences of unwellness can lead to changes in physiological

functioning and can trigger poor job performance, social disturbances, and poor health outcomes (Leka & Jain, 2010). The impacts of occupational-associated mental health disorders include unnoticeable presenteeism, decreased productivity, production cessation due to accidents and injuries, unplanned loss of work days, costly disability care, and death on the job (Amiri & Hosseini, 2021; Institute for Health Metrics and Evaluation, 2021; ILO, 2016). Subjective reports of 'fair' or 'poor' mental health are associated with nearly 12 unplanned absences each year, as compared to 2.5 unplanned absences among those reporting 'good' or 'excellent' mental health (Witters & Agrawal, 2022). Unplanned absences cost the average employer $340 per day for full-time workers and $170 per day for part-time workers (Witters & Agrawal, 2022). Poor mental health can negatively impact health indirectly through the development of maladaptive health behaviors such as smoking, alcohol consumption, physical inactivity, and unsafe behaviors (Kubzansky et al., 2014; World Health Organization [WHO], 2022).

Worker health, well-being, and safety are increasingly important areas of concern for advancing occupational health nursing research and clinical practice. Workplaces, especially in high-risk industries, can potentially harm workers or impede their access to health care (Dipietro Mager & Moore, 2020; ILO & WHO, 2022). Nursing professionals are uniquely positioned to identify, address, help decrease exposures to physical and psychosocial occupational hazards, and reinforce business development, growth, and sustainability milestones (Purba & Demou, 2019; Witters & Agrawal, 2022; WHO, 2022). Safe, healthy, and inclusive workplaces not only enhance mental and physical health, but also are likely to reduce absenteeism, improve work performance and productivity, boost staff morale and motivation, and minimize conflict between colleagues (WHO, 2022). Nurse-led population-level interventions that address health promotion and well-being can prevent premature mortality from noncommunicable diseases by modifying

occupational health risks (WHO, 2022). Equipping occupational health nurses with the knowledge and skills to advance worker safety serves as a significant deterrent from industrial and occupational harm, builds a gateway towards early injury detection and connection to adequate care, and provides meaningful rehabilitation and safe return to work outcomes (Garrosa et al., 2010; Yeung et al., 2005).

Significance of the Problem

The National Institute for Occupational Safety and Health (NIOSH) introduced the National Occupational Research Agenda (NORA) in the mid-1990s as a research-industry partnership protecting and promoting worker health and safety (NORA & NIOSH, 2023). The NORA national framework focuses on the transportation, warehousing, and utilities sector (NORA & NIOSH, 2018). Occupations within the transportation, warehousing, and utilities sector provide transportation of passengers and cargo, warehousing and storage for goods, scenic and sightseeing transportation, and support activities related to various modes of transportation. In the United States (U.S.), the transportation, warehousing, and utilities sector reports over 145,000 mechanics, electrical workers, railyard engineers, installation and maintenance workers (collectively referred to as transit industrial workers), who maintain and operate municipal, state, and federally funded forms of public transportation (U.S. Bureau of Labor Statistics, 2020b). The typical demographics of a transportation, warehousing, and utilities worker is a middle-aged, non-Hispanic Black male with a high school diploma and health insurance (U.S. Bureau of Labor Statistics, 2023a, 2023b).

Industrial work consists of a diverse group of skilled workers performing complex tasks in synchrony to execute various intricate and routine assignments. A range of physical, ergonomic, chemical, psychological, and safety hazards put transit industrial workers at risk for

dangerous situations impeding their ability to live long, healthy, accident-free lives (Niedhammer et al., 2008; U.S. Bureau of Labor Statistics, 2020b, 2023a). Industrial workers are responsible for tasks that require full attention, such as disassembling machinery, repairing and replacing broken components, testing malfunctioning machinery, and adjusting and calibrating equipment (U.S. Bureau of Labor Statistics 2020a). Emotional disengagement and cognitive distraction can impair an employee's internal safety mechanisms (that is, concentration and engagement) and can increase an employee's chances of judgment errors resulting in harm (Wachter & Yorio, 2014). Exposure to occupational hazards, coupled with the need for attention to safety precautions, has disastrous results when workers concurrently experience long-term and intense physical, emotional, and cognitive strain causing them to be less engaged with their work (Demerouti et al., 2003; Motowidlo & Van Scotter, 1994).

According to the U.S. Bureau of Labor Statistics (2023a), fatal transportation injuries increased by11.5% in 2020, and transportation incidents remained the most frequent type of fatal events, accounting for 38.2% of all work-related fatalities in 2021. Among the transportation, warehousing, and utilities sectors, a worker dies every 101 minutes from a work-related injury (U.S. Bureau of Labor Statistics, 2023a, 2023b). The rate of these fatalities is highest among non-Hispanic Black men, followed by Latino or Hispanic men. Installation, maintenance, and repair occupations had 475 fatalities in 2021, an increase of 20.9%. Almost one-third of these deaths were among vehicle and mobile equipment mechanics, installers, and repairers. Understanding why transit industrial employees work when they feel cognitively, physically, or emotionally unwell, especially when concentration and alertness are critical in maintaining safety, has important implications for improving the health of the organization and the workforce.

Study Purpose and Research Aims

The purpose of this qualitative research study was to contribute novel information about worker health, well-being, and health and safety behaviors among urban, non-bus operator workers in the transit industry, which is an understudied worker population as compared to other workers in the transportation, warehousing, and utilities sectors and workers in the non-transportation, non-warehousing, and non-utilities sectors. Thus, contributing to fill a gap in the literature about worker experiences among the transit industrial worker population, specifically how these workers perceived workplace conditions that impact, intertwine, enhance, and mitigate their health, well-being, and health and safety behaviors in a shared time and physical workspace. This was one of the few studies that explored qualitatively both the physical and mental health and well-being of urban industrial transit workers. To the best of my knowledge, Battle and colleagues (2015) were the only researchers to publish a qualitative research study on substance use, mental health and coping mechanisms among transit workers.

Using thematic analysis, I explored the perceptions and beliefs regarding the health, well-being, and health and safety behaviors at the intersection of personal characteristics and professional responsibilities in a sample of electricians and transit vehicle mechanics who worked for the Bay Area Rapid Transit (BART). The aims of the study were to (a) describe how BART electricians and transit vehicle mechanics defined health and well-being, (b) characterize the health beliefs and health and safety behaviors of BART electricians and transit vehicle mechanics, and (c) explore personal and professional conditions that influenced the health, well-being, and health and safety behaviors of BART electricians and transit vehicle mechanics.

Statement of the Research Problem

The research body of knowledge addressing adult worker health, well-being, and health and safety behaviors is severely underdeveloped for non-service-oriented occupations, particularly for industrial workers in the transit industry. The literature illuminating worker well-being for social professions, such as teachers, social workers, and firefighters, is abundant; however, a paucity of research exists for machine-based workers, blue-collar workers, industrial workers, assembly line workers, and process workers (Le Blanc et al., 2008; MacDermid et al., 2008; Schaufeli & Salanova, 2014). Close analysis of existing worker health and well-being literature yields minimal information about industrial workers' beliefs and perspectives on health, well-being, and health and safety behaviors. The extant literature quantifies and broadly categorizes the workers' experiences without regard to the different types of work performed by different worker populations. Understanding qualitatively the nuanced experiences and idiosyncrasies within different worker populations, particularly those who work in the understudied non-bus operator sector, can illuminate these workers' apprehensions, distresses, attitudes, realizations of health symptoms, health behaviors, work performance, safety, and their day-to-day work experiences, including internalized feelings of group membership, from their perspectives and sociocultural contexts (Bültmann & Brouwer, 2013).

Definitions of Terms

Worker well-being. The definition of worker wellness or well-being in the literature is imprecise and inconsistent, including quantitative measures to assess worker well-being, which limits comparability across studies (Chari et al., 2018). For this study, worker well-being was defined conceptually as the worker's assessment of the quality of their health, emotional state, working life, and fulfillment of basic conditions at work and beyond that is necessary for a

person to thrive (Ahonen et al., 2018; Chari et al., 2018; Dipietro Mager & Moore, 2020; Forst et al., 2020).

Health. Varying definitions of health have received criticism for not being distinguished from other concepts, such as happiness, or for focusing only on physical health but not mental health (Árnason & Hjörleifsson, 2016; Elrick, 1980; Honjo, 2004; McCartney et al., 2019). Moreover, there is not a consensus about the attributes of health specific to worker populations (Árnason & Hjörleifsson, 2016). Taking these criticisms into consideration, health in this study was defined conceptually as a value-based, aspirational state, characterized by a person's perception of one's optimal physical and mental vigor, well-being and functioning, quality of life, longevity, and risks for developing communicable and noncommunicable diseases (Árnason & Hjörleifsson, 2016; Elrick, 1980; McCartney et al., 2019).

Health behavior. Health behavior was defined conceptually for this study as an attitudinal- and belief-based action related to health promotion and protection, illness prevention, or improvement, maintenance and restoration of one's health (Conner & Norman, 2015).

Employment. In this study, employment referred to a legal contract between an employee and employer (Ahonen et al., 2018).

Work. In this study, work was defined conceptually as the skills, capacity, or willingness to complete tasks for which pay is received (Ahonen et al., 2018; Hirschi et al., 2019.; Powell et al., 2019).

Occupation. In this study, occupation referred to a socially defined group of workers with shared skills and knowledge conferred through training, certification, or degree (Ahonen et al., 2018).

Assumptions of the Study

The underlying assumptions of this study were that language is conceptualized as reflecting the true nature of things, people are contextually situated in their unique realities, and their beliefs are formed through lay associations externally derived from community members (Braun & Clarke, 2012; Coutu et al., 2013). The workers who participated in this study were assumed to have similar job demands and access to health resources through a shared employer. Worker well-being is neither within the full volition of a worker's individual agency nor is it acontextual to the micro- and macro-level structures influencing worker health, well-being, and health and safety behaviors.

Employment was presumed to function as a concentrated hierarchy of power with rules, expectations, financial compensation, division of labor, ownership, rewards and penalties governing the contract between employee and employer (Ahonen et al., 2018). Work was presumed to affect workers' perceptions, attitudes, beliefs, and actions regarding their health, well-being, and safety (Ahonen et al., 2018; Hirschi et al., 2019.; Powell et al., 2019). The employer creates working conditions—when, where, and how long people are expected to perform labor—and provides the parameters and the tools essential to completing job tasks. Work is (ideally) free of hazards and complies with government regulations (Ahonen et al., 2018).

Moreover, in this study, work was presumed to be a social determinant of health: "conditions in the environments in which people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks" (U.S. Health and Human Services, 2022, p.16). Understanding the broader reach of worker health and safety shifts the onus of wellness away from the employee to the employer and industry to

account for the extensive work-adjacent factors enhancing or impeding health and health-associated behaviors. Poor work conditions can influence social status, access to healthcare, and can lead to socioeconomic inequalities and worse health outcomes for vulnerable populations (Demakakos et al., 2018; Dipietro Mager & Moore, 2020; Forst et al., 2020; Wipfli et al., 2021).

Investigator's Epistemology, Research Orientation and Standpoint

Every qualitative and quantitative researcher should ask: What is the relationship between the knowledge that I seek to create and me as the researcher? This question helps a researcher to think through one's epistemology (Braun & Clarke, 2021), which refers to the theory of knowledge and the capacity of knowing (Locke & Peña-Guzmán, 2021; Toole, 2023). Epistemology illuminates conscious and unconscious beliefs regarding how the social world functions and operates, and what constitutes a problem worth studying (Peña-Guzmán & Spera, 2017); it influences the research orientation and the researcher's personal standpoint about phenomena; and it is how researchers know what they know, and the degree of certainty that knowledge is true (Locke & Peña-Guzmán, 2021).

In qualitative research, epistemology theorizes the structure of knowledge, consciously acknowledges underlying assumptions, and justifies how knowledge informs the meaning of data or answers about the nature of knowledge claims from the data (Alligood, 2021; Willig, 2012). Three broad approaches characterize types of epistemological knowledge: (a) realist knowledge, (b) phenomenological knowledge, and (c) social constructionist knowledge (Willig, 2012). Realist, phenomenological, and social constructionist epistemologies are not mutually exclusive forms of knowing; however, each shapes the understanding of assembled data (Figure 1.1). Clearly identifying the epistemology from the "family of approaches" where there are "some

close relations, some distant relations, some extended kin, some odd cousins, and a few nasty divorces" is crucial in upholding research integrity" (Drisko, 1997, p. 186).

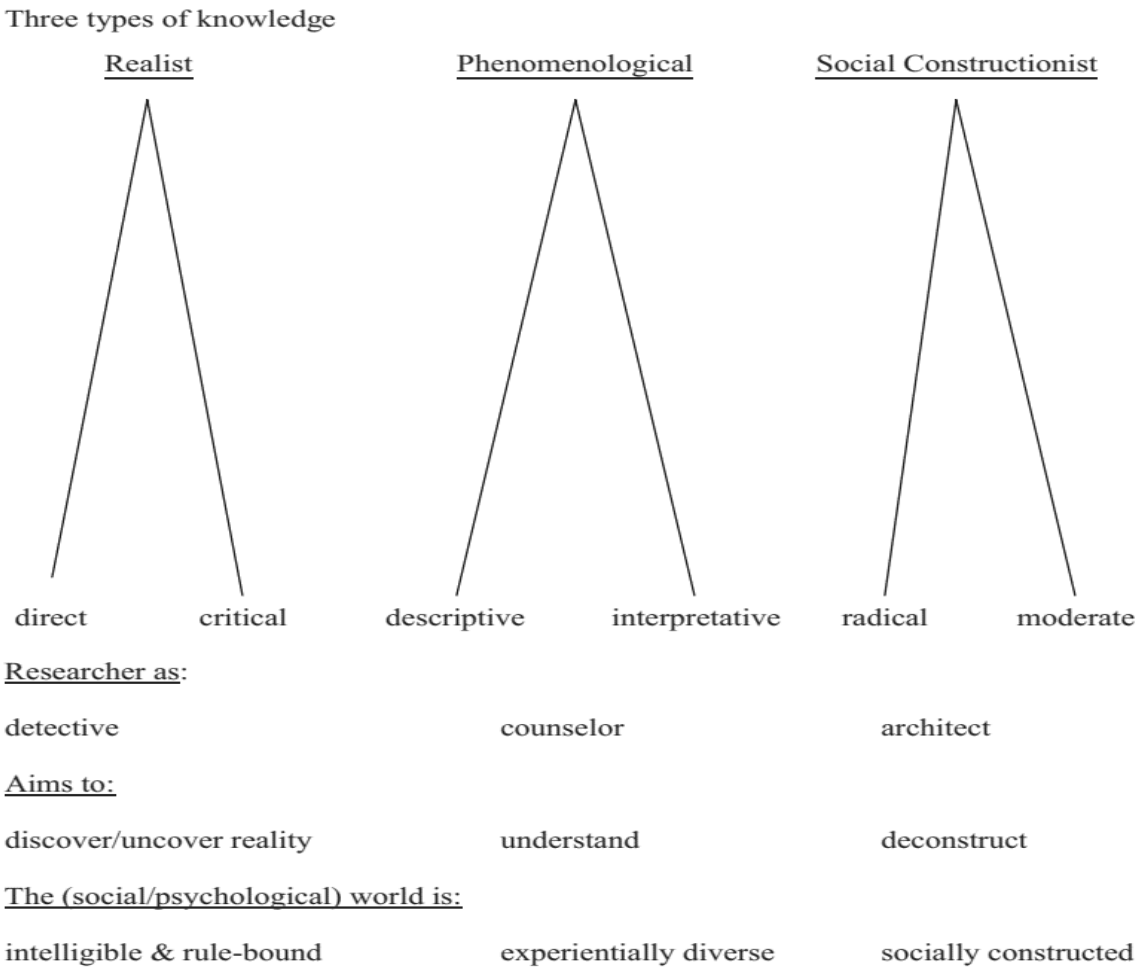

Fig. 1.1 *Types of Epistemologies*

The epistemological underpinning of this study was the realist or essentialist approach, which seeks to obtain a comprehensive understanding of the study participants' description of their experiences of the social world; not as fact, but as a sequence of experiences of being part of a group (Willig, 2012). Key features of the realist approach, differentiating it from other epistemological approaches, are that it is independent of the researcher, and research participants

are social agents possibly unaware of concealed mechanisms and conditions informing their overt behaviors and experiences. Whether a person's internal perspective is congruent to their external experience of the world is explored (Peña-Guzmán & Spera, 2017). Research participants' words are taken at face value, regardless of evidence otherwise.

I grappled with the idea that the social constructionist epistemology was more appropriate for this study. The social constructionist epistemology seeks to understand the structures of knowledge of process through how people talk about the structures (Willig, 2012). From this standpoint, knowledge is produced and reproduced through spoken and written social discourses. Whereas from a realist standpoint, knowledge is experienced. Social constructionist epistemology is most prevalent in discourse analysis and research that include written documents to enhance conceptualization of knowledge (Peña-Guzmán & Spera, 2017). Discourse analysis is concerned with the systems in operations that affect and inform, beliefs, values, and behaviors (Matandela, 2017). These systems influence what we believe is normal, natural, and just (Toole, 2023). From the social constructionist epistemological standpoint, a researcher seeks to understand the system. In contrast, realist epistemology seeks to understand a person's experience of the system. Realism centers a person's experiences and sense-making through that person's understanding, perception, and motivation. Social constructionism centers around identifying factors and processes that shape and influence people's experiences, and the rules and norms that regulate and govern human behaviors or practices within the system (Braun & Clarke, 2021).

I am deeply drawn to the social constructionist epistemology because I am a Black feminist scholar and I believe collectivism and socialism are the foundations for creating a more just world. Black feminist thought centers on critical insight of the intersections between "race,

class, gender, sexuality, ethnicity, nation, ability, and age operate not as unitary, mutually exclusive entities, but as reciprocally constructing phenomena that in turn shape complex social inequalities" (Hill Collins, 2015, p. 14). This dissertation has challenged me to honor the dueling, separate parts that I bring to this study: the research scholar and the nurse; the public health perspective and the heart of a labor activist; and the desire to tear down systems of injustice while helping people find reprieve within those same systems.

Positionality Statement

Self-reflection acknowledging the researcher's positionality is imperative to the integrity of qualitative research. Positionality is claiming space, social identity, and group membership by examining one's access to power or disadvantages due to oppression in social hierarchy structures (Bloemraad, 2022). Positionality is a reciprocal relationship to how we experience and engage in the world. An investigator's identity structures explain her social world, which in turn, influence the study's design and interpretation of results. Black feminist thought leaders argue that a particular standpoint is achieved, not merely a personal perspective or opinion rooted in political awareness and engagement (Hill Collins, 2012; Toole, 2023).

Positionality results from a person developing a framework and awareness that understand how one's lived experience is shaped through power dynamics (Toole, 2023). A person's work is the outgrowth of her experiences, and this person's standpoint is her position from where she questions power and discrimination (Hill Collins, 2012; Toole, 2023). Positioning is not necessarily a hierarchy, but one's standpoint is relative to the standpoints of others (Toole, 2023). Researchers are fallible, biased and responsible for co-creating knowledge. We must be able to discern our voice from attempting to give voice to participants'

unacknowledged pieces of narrative. Researchers must acknowledge our active role in filtering, editing, and forming the information that we receive.

I am a practicing occupational health Nurse Practitioner (NP) experienced in providing care to manufacturing workers. I have a Master of Public Health degree, a Master of Nursing degree, and I have been researching, working, and advocating in the occupational health and labor movement for over 10 years. A master's level education generates invisible and inaccessible opportunities for many others. I did not haphazardly stumble into a meeting with BART officials. Nor is it by pure luck or accident that you are reading this dissertation, paving my journey towards the highest rung of academic achievement.

I originally planned to study workplace violence when I applied to the PhD program; however, I changed my course of study and research focus after I participated in the Occupational Health Internship Program, which explicitly focuses on union and worker center rights. This program requested that my research partner from Ohio State University and I create a health and safety survey for the Washington Metropolitan Area Transit Authority workers. The clear delineation between non-Hispanic Black frontline workers and non-Hispanic White managers was a stark reminder and current emblem of the historical racist roots of the nation's capital. This division along racial lines, among a plethora of identities allowing for variable access to power, resources, status, and money, is ubiquitous and is often replicated in work environments across different industries throughout the US. The work environment is a regular physical space where those who are more at risk for harm (and often paid less with more precarious job security) commingle with those who are untouched by systemic injustice.

I have worked numerous precarious jobs before becoming a NP. As a NP, my most stable and secure form of employment, I have cared for marginalized patients pushed to society's

fringes. Providing health care services to current and former sex workers challenged my set beliefs regarding the meaning of selling one's body as a form of labor. I concluded that being injured or harmed by the job, especially resulting in permanent disability or death, is the true essence of selling one's body. I write this respectfully and humbly; therefore, I champion fervently for workers' rights and protections.

Conclusion

There is a need to explore qualitatively the unique physical and mental health and well-being, and perceived health and safety behaviors of the non-bus operator, transit industrial worker population, such as electricians and transit vehicle mechanics. Studying this worker population contributes to a gap in the literature that may help to better understand these workers' overall health, well-being and quality of life at work and outside of work; to identify opportunities to enhance worker health and safety; to design interventions that focus on prevention and address workers' needs from a holistic perspective; and to advocate for better worker-centered safety policies.

Overview of Dissertation Chapters

Including this chapter, this dissertation contains five chapters. In Chapter 2, the National Institute for Occupational Safety and Health conceptual framework for worker well-being and a literature review of relevant occupational health, well-being, and safety research on adult industrial workers are presented. In Chapter 3, I detail the qualitative methodology, from study conception through data collection, used to address the study purpose and aims in an adult sample of electricians and transit vehicle mechanics who were connected in a shared time and physical workspace. Results of the thematic analysis are presented in Chapter 4. The selected, salient themes represent important aspects of the participants' beliefs and perceptions about

worker health, well-being, and health and safety behaviors, and their awareness of the structural systems influencing their experiences. Relevant participant quotations are presented to illustrate their beliefs and perceptions. In Chapter 5, I discuss the study findings, strengths and limitations, and implications for future research, occupational health nursing practice, education, leadership and administration, and advocacy and policy for worker well-being within the context of the National Institute for Occupational Safety and Health conceptual framework for worker well-being. I also present contextual information about how the BART, the union, and the state and local laws impact workers' health and well-being.

Chapter Two

CONCEPTUAL FRAMEWORK

In this chapter, the National Institute for Occupational Safety and Health (NIOSH) conceptual framework for worker well-being, which guided this study, is presented. In addition, the results of a systematic search of relevant literature regarding the health, well-being, and health and safety behaviors of urban, adult industrial transit workers is discussed from the perspective of the NIOSH conceptual framework for worker well-being.

NIOSH Conceptual Framework for Worker Well-Being

The NIOSH conceptual framework for worker well-being is an encompassing framework that resulted from a multi-layered process consisting of a comprehensive scoping literature review of various disciplines, and an expert panel to determine the definitive constructs of measurement (Chari et al., 2018). Within this framework, worker well-being is defined as an "integrative concept that characterizes quality of life with respect to an individual's health and work-related environmental, organizational, and psychosocial factors" (Chari et al., 2018, p. 590). Worker health is centered within both work-related and community contexts. The underlying assumptions of the framework are that worker well-being should encapsulate both work and non-work settings, and that worker well-being should be comprised of both subjective (worker perceptions and beliefs) and objective (worker environment and living conditions or standards) domains. Five domains comprise the framework: (a) workplace physical environment and safety climate; (b) work evaluation and experience; (c) workplace policies and culture; (d) health status; and (e) home, community, and society (Table 2.1 and Figure 2.1). Not shown, 20 subdomains and 58 constructs are nested within the five domains (Chari et al., 2018).

Table 2.1 *NIOSH Conceptual Framework for Worker Well-Being Domains, Subdomains, and Subdomain Constructs*

Domain	Subdomain	Subdomain Constructs
Workplace physical environment and safety climate	Workplace safety conditions	Perceptions of and satisfaction with safety climate
	Workplace design	Workplace design; environmental conditions; physical surroundings; pleasantness; disability and other accommodations
	Workplace conflict and civility	Experience with harassment; incivility; discrimination
Workplace policies and culture	Salary/rewards	Satisfaction with wages; advancement potential; recognition
	Benefits	Types of benefits provided; satisfaction with benefits
	Workplace culture	Respect; fairness; perceived organizational support
	Workplace health culture	Organizational commitment to health; resources/programs
	Work-life integration	Flexibility; perception of balance; organizational support for work-life balance; work/family conflict
Health status	Physical health	General/overall; presence of specific conditions
	Mental health	General/overall; stress; depression; anxiety
	Health-related behaviors and lifestyle	Physical activity; alcohol use; smoking; diet; sleep
	Functionality/disabilities	Physical; mental; cognitive
	Injuries	Experience of injuries; severity
Work evaluation and experience	Satisfaction	Overall job satisfaction; supervisor/ management; peers and coworkers; job security
	Meaning and organization of work	Meaningful and purposeful work; autonomy; control; vigor; dedication; absorption; demands; engagement
	Affect	Positive emotions at work; negative emotions at work
Home, community, and society	Life satisfaction	Overall life satisfaction
	Financial health	Financial security
	Social relationships	Social support
	Community engagement and lifestyle	Types of activities engaged in; satisfaction with engagement

Fig. 2.1 *National Institute for Occupational Safety and Health Conceptual Framework for Worker Well-Being*

Workplace Physical Environment and Safety Climate

The characteristics of the workplace physical environment and safety climate domain are mainstay areas of interest for occupational and environmental health research, practice, and policy (Chari et al., 2018). These characteristics or subdomains include workplace safety conditions, workplace design, and workplace conflict and civility. Work exposes employees to stressors and places them at risk for biological, physical, ergonomic, and chemical hazards and harms (Leiter & Maslach, 2003; Wiatrowski, 2012). This domain is based conceptually on the job strain model, which illustrates linkages between employment conditions, occupational risks, and adverse health outcomes (Parker et al., 2017). The job strain model presumes workplace conditions and contexts relevant to performing job tasks; that is, workplace factors that influence

worker health, safety, injuries, and accidents (Zhao et al., 2019). From this perspective, risks to workers' physical and mental health occur when workers face high workload demands combined with low decision latitude. When physical, psychological, social, and organizational resources are provided to workers, physical and emotional strains are reduced, achievement of work objectives is increased, and workers' professional development is enhanced (Schaufeli & Bakker, 2004). Contrarily, exposure to excessive job demands can lead to worker exhaustion, and lack of adequate resources can lead to worker disengagement and reduced motivation (Demerouti, 2015; Demerouti et al., 2003).

Workplace Policies and Culture

The workplace policies and culture domain relates to organizational policies, programs, and practices that have significant repercussions on worker health and well-being (Chari et al., 2018). This domain includes key concepts, such as worker satisfaction with wages, benefits, rewards, recognition and advancement potential; perceived organizational commitment and availability of resources to worker health; and organizational support for work-life balance and integration. This domain is based conceptually on the efforts-rewards balance model, which is an integrated model that highlights the relationship between worker efforts and availability and accessibility of workplace resources and rewards on worker health outcomes (Siegrist, 1996; Siegrist & Peter, 1994).

Behavioral economics emerged from the efforts-rewards balance model and highlights the relationship between worker effort required to meet job demands and reciprocity of job rewards and acknowledgements (Siegrist, 2016). Similar to the job strain model, behavioral economics posits that employers' redesigning the way work is performed in the context in which it is performed can positively influence worker health and productivity outcomes; this in turn can

prevent and reduce organizational stress, increase health-promoting behavior among workers, enhance organizational and worker development, and increase return-to-work rates among workers with disability and ill health (Siegrist, 2016). These positive work health behaviors potentially can improve other areas of workers' non-work lives (Chari et al., 2018)

Health Status

The health status domain addresses aspects of workers' lives relating to their physical and mental health and well-being, lifestyle health behaviors, and disabilities and injuries (Chari et al., 2018). The health status domain is based conceptually on the job-demands and resource model of burnout, which posits the mechanism that influences the relationship between work and its impact on mental health. The job-demands and resource model of burnout presumes that exposure to excessive job demand leads to exhaustion, and lack of adequate workplace resources leads to worker disengagement and reduced motivation (Demerouti et al., 2001). Alternatively, adequate job resources launch the motivational process, prompting increased worker engagement and commitment. Both pathways eventually affect organizational outcomes and workers' personal health (Demerouti et al., 2003, 2014).

Work Evaluation and Experience

The work evaluation and experience domain refers to workers' appraisal of the quality of their job, occupation, or career path (Chari et al., 2018). This domain is characterized by workers' overall job satisfaction with supervisors and managers, peers and coworkers, and job security; whether their work is meaningful and purposeful and gives them a sense of autonomy and control; and workers' positive and negative emotions at work. This domain is derived conceptually from the person-environment fit model, which describes how incongruency between employees and the work environment can produce psychological, physiological, and

behavioral tension, increasing workers' risk for morbidity and mortality (Edwards & Harrison, 1993). A 'misfit' is either a contradiction between a worker's ability to meet work demands, or experiences or opportunities offered by the workplace differs from worker goals or aspirations (Edwards & Harrison, 1993). The person-environment-fit model explains the process of assessing workplace resources to minimize, tolerate, or eradicate the stressor and the stress response the stressor induced (Edwards & Rothbard, 2000).

Home, Community, and Society

The last domain of the NIOSH conceptual framework of worker well-being is home, community, and society (Chari et al., 2018). This domain encompasses the external context or aspects of workers' personal lives influencing their well-being. Underpinning this domain is role theory, which focuses on worker characteristics, motivations, and circumstances driving recurring behaviors, patterns, and actions (Hadida & Tarvainen, 2015). Role theory centers the worker's health and quality of life around contextual factors, relationships, social behaviors, and support systems to determine how and why they are exposed to different hazards (Kawachi & Berkman, 2015; Leslie et al., 2019).

Roles are a set of behaviors determined by socially defined expectations and structures wherein people exchange mutual trust, respect, and fulfill obligations (Kawachi & Berkman, 2015). Participating in assigned work roles (e.g., manager, nurse, or technician) can transcend into formulating a corresponding personal identity outside the workplace (Xanthopoulou et al., 2012). Performing professional and vocational roles fulfill goals, values, and beliefs to boost personal and professional identities (Sluss, 2011); and provides people with a sense of intellectual identity and the financial pay associated with performing work roles that strongly influence social status, access to other resources, and enhance quality of life (Xanthopoulou et

al., 2007). Work and personal lives shape one another, as people occupy several roles simultaneously to satisfy needs, reach goals, and overcome challenges (Hirschi et al., 2019; Powell et al., 2019).

Review of Relevant Literature

One-third of Social Security Disability Insurance beneficiaries are absent from work due to musculoskeletal injuries or conditions (Social Security Administration et al., 2023). Data from the 2019-2021 National Health Interview Survey reveal that depression, anxiety, and emotional problems were the leading causes of disability among working aged adults (Zablotsky et al., 2022). Seventy-six percent of U.S. workers report at least one mental health condition that impact negatively both their job performance and physical health (Mind Share Partners, 2022). Increased rates of work accidents and injuries due to distraction, disengagement, cognitive impairment, and illness lead to lost workdays, lost revenue, and increase health costs for both employer and employees (Ko et al., 2010; Street & Lacey, 2019). The purpose of this review was to appraise relevant, extant occupational health literature addressing the health, well-being, health behaviors, and safety of machine-based adult workers in the transit industry, with a particular focus on the mental health and well-being of this specific worker population.

Much of the current literature focuses on workers' physical health and well-being. Yet 25% of the adult population will experience a mental health disorder at some point in their life (Rens et al., 2020). Post the COVID-19 pandemic, suboptimal levels of reported low mental health, emotional distress, and mental illness are at a record high (Mind Share Partners, 2022). Five of the 10 leading causes of disability worldwide are related to mental health conditions (Social Security Administration et al., 2023; Wickizer et al., 2018). Mental health disorders,

burnout, depression, anxiety and work-related stress, cost the global economy $16 trillion due to absences, lost productivity, and associated health outcomes (Patel et al., 2018).

Search Strategy and Data Extraction

A systematic search of the PubMed, CINAHL, Cochrane Library, Google Scholar, Embase, and PsychInfo databases was conducted to find articles related to the relationship between adult machine-based, industrial workers and their physical and mental health and well-being, in addition to health and safety behaviors in the workplace. Medical Subject Headings (MeSH) keywords used to search the databases were "wellness", "wellbeing", "mental health," "physical health," "health behavior," "safety," "workplace wellness," and/or "wellness programs." To specify and refine the search parameters for specific worker populations, the following keywords were used in conjunction with the aforementioned MeSH keywords: "operator," "machine-based worker," "transit worker," "shift worker," and/or "blue-collar worker." The PubMed and Google Scholar databases yielded the highest numbers of records from a variety of occupational health journals.

The health, well-being and safety of non-computer-based, non-healthcare workers appear to be largely understudied as evident by the disproportionate underrepresentation of machine-based, industrial workers in the published literature. Depending on the combination of search terms, initial searches revealed 2,400 to 14,000 records. For example, a Pubmed search for worker health and well-being [((worker health [MeSH Major Topic]) AND (wellness [MeSH Major Topic])] yielded 14,000 records. Every search keyword, especially when focused on specific worker populations, had to be further refined. Many of the searches resulted in studies about other types of workers: health care workers, teachers, police officers, firefighters, and social workers. Keywords, such as "operator," "machine-based worker," "blue collar," "public

transportation worker," and/or "shift workers" were used to specify the worker populations of interest. This search strategy, however, yielded many irrelevant studies. For instance, when searching for articles addressing the health needs of "machine-based workers" the search yielded many miscellaneous articles about machine learning and exercise health programs.

With the assistance of a UCSF librarian, the search strategy still yielded a low number of relevant studies, which highlights the dearth of literature regarding the health, well-being and safety of machine-based workers. With the librarian's assistance, the refined search strategy yielded 450 unique records for the past 20 years, 2004 to 2024. The following criteria were used to exclude records: (a) not published in the English language; (b) not relevant to the study purpose and aims, (c) sample not from the transportation, warehousing, and utilities sectors, (d) sample included pilots, bus operators, ambulance operators, truck drivers, or immigrant workers and people in precarious work arrangements (e.g., rideshare drivers), and (e) wellness was defined only as productivity-related (i.e., absences or physical disability). After applying these criteria to the 450 records, the abstracts of 39 records were selected and appraised for quality. Twenty-four of the 39 abstracts were rated as being of moderate quality. After reading the 24 articles, 20 studies were selected for this literature review. Three of the studies were qualitative.

Discussion

The discussion of the literature review is organized around the previously described five domains of the NIOSH conceptual framework of worker well-being: workplace physical environment and safety climate; workplace policy and culture; health status; work evaluation and experience; and home, community, and society. The result is the identification of the relationship between person, workplace and community factors and the perceived and measured physical and mental health, well-being, and health and safety behaviors of machine-based workers.

Workplace Physical Environment and Safety Climate

Occupational health and safety research and practice prioritizes industry safety outcomes (BLS, 2022a). Working with and around machinery poses a serious risk for harm, injuries, and accidents. Industry standards champion the use of installing alarms and other safety features to the environment to enhance worker safety; however, burgeoning research suggests there are some unintended effects leading to decrease safety behavior. Four studies examined the relationship between the workplace and machine-based workers' sense of well-being. In one study of U.S. coal miners, workers accustomed to redundant alarms were not only less likely to heed the alarm's warnings, but they also reported feeling safe (Ruff et al., 2011). The alarms did not heighten these workers' awareness of the risk of danger, indicating potentially the impact of alarm fatigue on worker safety. Moreover, the workers had difficulty finding the source of the alarms and determining which alarms prioritized imminent danger (i.e., if they heard the alarms while wearing hearing protection). The paradox of alarm fatigue—alarms designed to increase safety cause workers to ignore the alarms and put them at increased risk for accidents and injuries—is well documented in the industrial machinist industry (Zhao et al., 2019).

In the other three studies reviewed, researchers investigated how work is organized, particularly through ergonomics and workplace programs meant to proactively prevent injury. Among European forest workers, having an ergonomic program in place was shown to be a significant predictor of increased mental health; however, the mechanism by which the program improved mental health outcomes was unclear (Andres & Wade, 2012; Hanse & Winkel, 2008). Among bus operators, increased equipment-related ergonomic problems were positively associated with emotional and physical exhaustion and burnout (Cunradi et al., 2009b).

Workplace Policy and Culture

Company culture and safety climate have a significant impact on employees' feeling of safety. Increased perception of being in a safe work environment decreases the likelihood that workers will be involved in an accident (Yovi et al., 2022). Safety climate is defined by management policies, procedures, and practices that create a work environment in which workers evaluate the multiple facets of perceived and actualized commitment to safety within their organization (Yovi et al., 2022). In two studies, researchers examined mental health and workplace culture. Yovi and colleagues (2022) demonstrated that access to resources, personal responsibility, peer and supervisor support, and expectations to maintain safety were factors that contributed to a safe work environment. Mościcka-Teske and colleagues (2017) found that machine operators in Poland who reported higher levels of stress, partially due to an unsafe work environment, were more likely to have a negative impact on the functioning of the whole organization, resulting in more frequent accidents.

Work Evaluation and Experience

Three studies evaluated how workers' perceptions of work contributed to worker mental health symptoms. In one study of Polish operators, the factors that contributed to a stressful work experience were beliefs, fears, and perceived insufficient control over their work, risk of dismissal, limited chances for promotion, and unclear rules (Mościcka-Teske et al., 2017). As compared to the general population, the same group of workers also reported an increased prevalence of post-traumatic stress disorders, reactive depression, or suicidal thoughts or attempts. Similar findings were found in another study of Norwegian automation workers (Schwabe & Castellacci, 2020). Although these high-skilled workers reported having a

rewarding job experience and overall satisfaction, they were more likely to report fear of replacement as compared to low-skilled workers at the same company. The researchers reported that their findings follow industry trends: higher education and skill levels increase the likelihood of mental anguish. Similar to findings in the literature, Harvey et al. (2017) found an association between increased rates of common mental health problems and conditions of a stressful work environment: high job demand, low job control, low workplace social support, efforts-rewards balance, low organizational procedural justice, low organizational relational justice, organizational change, job insecurity, temporary employment status, atypical working hours, bullying, and role stress.

Health Status

The consequences of work-related stress have been shown to result in unfavorable work safety outcomes, disadvantageous worker health behaviors, and increased cardiovascular disease and premature mortality (Hammer et al., 2015; Hammer & Sauter, 2013; Leka & Jain, 2010). Five studies examined the impact of work conditions on well-being and mental health outcomes of machine-based workers. In one study, Japaridze et al. (2022) compared the mental health outcomes of industrial workers and administrative staff at the same company. The industrial workers were exposed to industrial vibration, noise, and workplace air pollution with dust and toxic compounds; the administrative staff were not. Findings revealed that nervous system, respiratory and mental health illnesses were almost 5 times, 3.6 times, and 4.8 times, respectively, higher among the industrial workers. Similar differences were found for cardiovascular, eye, and musculoskeletal ailments. The researchers concluded that the high frequency of occupational health effects in the main group and higher odds ratios indicated a determinative relationship between the health effects and exposure to working conditions.

Burnout compromises cognitive functioning and prevents individuals from responding appropriately to novel, changing, or complicated tasks or situations (Katsavouni et al., 2016; Oosterholt et al., 2015). When a worker feels burned out, their energy may be insufficient for behaving thoughtfully and remembering to follow instructions (Halbesleben, 2010; Houghton et al., 2016). For machine operators in Poland, excessive or chronic stress at work resulted in a range of negative consequences for employees, including problems with concentration, addictions, anxiety disorders, and burnout (Mościcka-Teske et al., 2017). High rates of excessive or chronic work-related stress have been shown to contribute to the development of mental and psychosomatic disorders such as headaches, recurrent migraines, stomach ulcers, vomiting, insomnia, sleep disturbances, increased muscle tension, and sexual disorders (Mościcka-Teske et al., 2016). This finding is supported by other studies linking job demands to health issues such as stomach problems, depression, and high blood pressure (Blanc et al., 2008; Hanse et al., 2008; Le Borgne et al., 2018). Among forest workers, Hanse and colleagues (2008) found that stress, sleep problems, and headaches increased as work-related stressors increased (Hanse et al., 2008). Other researchers have shown an association between the reporting of more depressive symptoms and more frequent, unpredictable work schedules among transit workers (Helmkamp et al., 2018). Conversely, Cavallari and colleagues (2021) found that less depressive symptoms were reported in workers who had increased schedule control. Among Chinese bus drivers, workers were more likely to suffer from somatization and phobia as compared to the general population (Wang et al., 2021).

The relationship between work conditions and health behaviors, coping mechanisms, and substance use have also been studied in various worker populations. The development of maladaptive health behaviors such as smoking, alcohol consumption, physical inactivity, and

unsafe risk-taking impact perceptions of wellness and realized health outcomes (Kubzansky et al., 2014). Four studies reviewed highlight the association between worker health behaviors and their mental health. Among operators in the forestry industry, risk-taking behaviors or 'courage tests' were prevalent among workers who survived or witnessed co-workers who survived unsafe actions (Heinrich et al., 2016; Yovi et al., 2022). This behavior led to an increased willingness of workers to accept risks and increased the likelihood that an accident would occur (Heinrich et al., 2016; Yovi et al., 2022).

Smoking and excessive alcohol consumption have been widely studied and documented among industrial workers (Amiri & Hosseini, 2021; Chagas Silva et al., 2003). A meta-analysis found that 40% to 50% of global industrial workers were current or former smokers (Amiri & Hosseini, 2021). Furthermore, rates of both anxiety and smoking were more prevalent in stressful work environments (Amiri & Hosseini, 2021; Jiang et al., 2014). Excessive alcohol consumption, a known occupational health and safety hazard, has been observed in a fifth of industrial workers (Chagas Silva et al., 2003). Among transportation, warehouse, and utilities workers, 15% of the workforce are current smokers, and about 75% of the workforce considers themselves as a drinker as compared to 6% of smokers and 66% of drinkers in the general population (Helmkamp et al., 2018). These workers were more likely to have started drinking at an earlier age, to have more adverse health outcomes and comorbidities, and were less likely to use health-related services, particularly seeking help for their alcohol use (Chagas Silva et al., 2003). Specifically, among transit workers, more widely studied in bus operators, this workforce was more likely to engage in smoking and alcohol use than the general population (Battle et al., 2015). A heavy drinking culture and tobacco use have also been observed among blue-collar

workers for bonding and camaraderie and for compensatory coping with difficulties at work and home (Leka & Jain, 2010).

Home, Community, and Society

There is a scarcity of studies on work-family relationships among shift workers, even though most people work so they can have the economic means to create a life outside of work that feels meaningful and significant (Iskra-Golec et al., 2017). Work-family conflict occurs when role pressures from work and family are mutually incompatible, creating conflict in access for time, ability to perform obligations, or difficulty accessing other resources (Iskra-Golec et al., 2017). Antagonistically, work-family facilitation is a form of synergy in which resources gained in one role make it easier to perform the other role. Work-related stress manifests in personal life as interpersonal conflicts and disruption of social routines (Mościcka-Teske et al., 2016). Among transport service workers, rotating shift systems were associated with negative spillover in shift workers with families (Iskra-Golec et al., 2017); however, stable shifts, and workers who had their preferred shifts led to more positive family life balance because it allowed for greater flexibility in childcare coverage and participation in personal activities.

Transit industrial worker qualitative studies. Three qualitative studies were found during the literature review search process. In one study, 53 bus operators who worked for a metropolitan transit system in southern California described how work directly or indirectly affected their health and their ability to practice a healthier lifestyle (Dobson et al., 2017). The participants described how the sedentary nature of the job impacted their food choices, which impacted their weight, sleep, and energy level. Battle et al. (2015) conducted 11 focus groups with 71 San Francisco Muni bus operators who were current and former smokers to understand their readiness or success with smoking cessation and their experiences with smoking cessation

aid offered through their employer. Sidhu and An (2019) explored the health and safety concerns of bus operators with the Amalgamated Transit Union Local #265 in San Jose, CA . The participants were asked about their opinions of split shifts and were asked to rate their health on a scale of 1 to 10. The average rating was 5.81, indicating a majority of participants rated their health as 'fair.'

Conclusion

The literature is sparse regarding the health, well-being, health behaviors, and safety of machine-based adult workers in the transit industry, particularly as it relates to the mental health and well-being of this specific worker population. There were few intervention studies to guide further research and practice and inform policy about how best to address machine-based workers' well-being, in particular their mental health; and in turn how their mental health impacts safety in the workplace. This gap in the literature might be related to the lack of in-depth descriptions of these workers' experiences to design and test the efficacy of relevant interventions.

Only three qualitative studies in the last 20 years focused on the experiences of transit workers. All three studies, however, were conducted with bus operators in the San Francisco Bay Area, not non-bus operators such as transit vehicle mechanics and electricians. Understanding the unique experiences and perceptions of well-being among transit industrial workers can help researchers to understand the unique vulnerabilities and areas of opportunities by identifying who has been excluded or underserved in traditional workplace health, wellness and safety programs. If occupational health and safety researchers and practitioners do not consider the larger social context and fail to recognize work as a social determinant of health, we effectively uphold systems and structures of inequity (Wipfli et al., 2021). This qualitative study contributes

to the gaps in the literature about the health, well-being, and health and safety behaviors of transit industrial workers, an understudied worker population, connected in a shared time and physical workspace.

Chapter Three

RESEARCH DESIGN AND METHODOLOGY

In this chapter, I summarize the research process from study conception through the data collection process. Multiple approvals were required to recruit participants at the Bay Area Rapid Transit (BART) worksites during work hours. Nine people, working at five BART railyards throughout the Bay Area, agreed to discuss their perspectives on health, well-being, and health and safety behaviors. Each participant was interviewed once, using a semi-structured interview guide. Each interview lasted about an hour. The questions in the interview guide examined the participants' career span, training experience, previous work history, experience at BART throughout the years, and aspirations to advance in the company and/or retire. At the time of each scheduled interview, all but one employee was currently working. An evaluation of the study's research rigor concludes this chapter.

Research Design and Aims

This cross-sectional, qualitative research study employed thematic analysis to explore the perceptions and beliefs regarding the health, well-being, and health and safety behaviors at the intersection of personal characteristics and professional responsibilities in a sample of adult electricians and transit vehicle mechanics who worked for the BART. The aims of the study were to (a) describe how BART electricians and transit vehicle mechanics define health and well-being, (b) characterize the health beliefs and health and safety behaviors of BART electricians and transit vehicle mechanics, and (c) explore the personal and professional conditions that influenced the health, well-being, and health and safety behaviors of BART electricians and transit vehicle mechanics.

The UCSF Institutional Review Board (IRB) approved this study (IRB number: 22-37721). The study required additional permission from both the Regional Transportation District Board of Directors (BART's governing and managerial body) and the Service Employee International Union (SEIU) 1021 (workers' union representation). The study investigator reached out to Board Director Simons regarding the possibility of conducting the study with workers. Director Simons responded favorably to an email inquiry and connected the investigator to the BART's Assistant General Manager. The study was presented to several department directors and was conditionally approved, pending SEIU 1021 agreement allowing onsite recruitment. The SEIU 1021 leadership and members granted permission to recruit and interview workers about work-related health issues. Further emails confirmed approval to move forward, and the investigator was provided onsite access to five BART locations.

Participants and Setting

The study population of electricians and transit vehicle mechanics were preselected by the BART Regional Transportation District Board of Directors and SEIU 1021. Neither the Board of Directors nor the Union provided reasons for why they selected these two groups of workers. The entire population of electricians and transit vehicle mechanics comprised approximately 150 persons. I was able to interact with 124 (83%) workers on recruitment days, although only nine agreed to be interviewed. The nine participants worked at five BART railyards throughout several Bay Area cities in California: Daly City, Concord, Hayward, Oakland, and Richmond. These cities represent xx different counties. Eight of the nine workers were men. All participants were employed with BART for over 10 years and were members of the same union. Eight of the participants worked as transit vehicle mechanics and one as electricians. There were no participants from the Daly City railyard. None of the participants

worked on the night shift. Due to the small sample size, representation of locations, work shifts, marital status, race/ethnicity and other easily recognizable defining demographic characteristics were intentionally withheld to protect anonymity.

This convenience sample of nine participants was drawn from 124 workers, who responded to a demographic survey but chose not to participate in the study. Recruitment is discussed in the "data collection" section of this chapter. The demographics of the survey respondents are presented in Table 3.1. Of the 124 respondents, the median age was 49 years, ranging from 23 to 69 years. About half of the respondents were 50 years and older, almost 75% were transit vehicle mechanics, most of them worked at the Concord (32%), Hayward (29%), and Richmond (20%) locations, most of the respondents worked the day shift (43%), and half of them plan to retire in 10 years or more.

Table 3.1 *Characteristics of the Mechanic and Electrician Demographic Survey Respondents* (*n* = 124)

Characteristic	*n*	*%*
Age (years)		
24 and younger	2	1.6
25 to 39	33	27.0
40 to 49	26	21.3
50 to 59	42	34.4
60 and older	19	15.6
Job title		
Electrician	31	25.2
Transit vehicle mechanic	92	74.8
Worker location		
Concord	39	31.7
Daly City	13	10.6
Hayward	36	29.3
Oakland	11	8.9
Richmond	24	19.5
Work shift		
Day	53	42.7
Evening	32	25.8
Night	39	31.4
Plan to quit, leave or retire		
Less than 1 year	3	2.4
	16	12.9

Characteristic	*n*	%
1 to 5 years	24	19.4
6 to 9 years	62	50.0
10 years or more	19	15.3
Unsure		

To provide context for the work performed by the participants, a description of the BART their position's duties and responsibilities is provided. According to the job posting, to work as a BART transit vehicle mechanic, applicants must have a high school diploma, a general educational development certificate, or a recognized equivalent. They must have a minimum of one-year full-time equivalent of verifiable journey-level experience in the installation, maintenance, or repair of mechanical systems and components similar to those found in the district's revenue vehicles. Additional experience with electromechanical, hydraulic, and pneumatic systems is a desirable skillset. The BART transit vehicle mechanics are expected to work in confined spaces and lift equipment weighing up to 70 pounds. Transit vehicle mechanics work weekends, holidays, off-hour shifts and occasional emergency overtime. In December 2023, the starting pay for transit vehicle mechanics ranged from $29.65 to $38.76 per hour.

According to the job posting, to work as a BART electrician, applicants must have completed an apprenticeship program with at least one year of full-time equivalent verifiable journey-level experience in the installation, maintenance, or repair of varied electrical systems and equipment prior to working at BART. Some electricians have additional experience with high voltage industrial or plant equipment. The BART electricians must also possess a valid California Class "B" commercial driver's license with a satisfactory driving record. Electricians are expected to be physically capable of working in confined spaces. The physical requirements of the job include being able to walk long distances over various terrains including, but not limited to uneven, wet, or inclined ground; climb stairs and ladders to a height of 90 feet; lift up

to 100 pounds to waist level; perform overhead with hand and power tools; and be medically cleared to wear a respirator. Starting pay for BART electricians was $29.65 per hour in December 2023.

Data Collection

Recruitment. Qualitative researchers recruit a population sample to maximize data collection efficiency and bolster the validity of the results representing the overall population (Bengtsson, 2016). Recruitment occurred at five BART railyards during the day, evening, and graveyard pre-shift safety meetings in the following urban cities in California: Daly City, Concord, Hayward, Oakland, and Richmond. Only currently employed BART transit vehicle mechanics and electricians present at work on the day of recruitment were eligible to participate in the study. There were no exclusion criteria prohibiting eligible workers from participating in the study.

The investigator attended each pre-shift meeting to explain the research study and to recruit potential participants. Recruitment materials included a written consent form describing the purpose of the study (Appendix A), a form requesting demographic information (Appendix B), and a blank contact information form distributed to workers in manila envelopes (Appendix C). Demographic data collected were job classification, work location, gender, tenure at BART, employment status, current shift, number of hours worked this week, age, marital status, race/ethnicity, and estimated years until they intend to quit or retire from BART.

Workers not interested in participating in the study placed their blank forms in manila envelopes and returned the materials before starting their shift. The investigator assured confidentiality by receiving all recruitment materials—blank and completed forms—in manila envelopes. Forty-seven people returned the contact form, indicating interest in participating in an

interview. The study investigator contacted each of the 47 people; nine agreed to be interviewed. Of the 38 interested people who did not participate in the study, several people did not respond to the study investigator's calls, voice messages, or text messages. The investigator successfully contacted some potential participants who asked additional questions before ultimately declining. At the time of each scheduled interview, all but one employee was currently working.

Interview Protocol. All interviews took place in distraction-free, private areas over Zoom or in an agreed upon public location away from the BART premises and outside of participants' work hours. The researcher conducted all the interviews to the point of saturation, resulting in a total of nine interviews. Data saturation, considered the "gold standard" within qualitative research, was confirmed once no new information was provided by participants and no additional people were available to be interviewed. All participants were reassured confidentiality and were allowed to stop the interview at any time. At the conclusion of the interview, participants were asked if they would like to rescind parts or the whole conversation from the record. All participants agreed to keep their interview intact.

One-on-one interviews encourage participants to cultivate an internal reflection of an event or experience through a narrative in an authentic voice (Atkinson & Silverman, 1997). Interviews allow for individuals to describe their system of beliefs (Toole, 2023). Open-ended questions elicited spontaneous responses, thoughts, and opinions shared by the workers. A digital voice recorder captured the 45- to 85-minute interview sessions. The interviews contained many intoned and non-verbal elements (i.e., pauses, gestures, tones, and tempo changes), which were incapable of being captured simply by voice recording alone (Charmaz, 2006; Hammersley, 2010). The investigator wrote field notes during the interview to document non-verbal expressions elicited during the interview.

Open-ended interview questions created an interactional space between the investigator and the participant to cover a broad range of experiences (Charmaz, 2006; Charmaz, 2014). Participants were first asked to describe their decision to work at BART. Many participants began their answers describing the benefits of working at BART. Next, participants described their previous work experiences leading up to their employment at BART. The conversation moved to describing the work that they performed at BART and how they remained safe at work. This included describing key stakeholders (management, safety team, and co-workers) involved in maintaining safety. The conversation about general responsibility for safety led to personal experiences of work-related injury and harm, which led to discussing personal beliefs about health. The interview guide is provided in Appendix D.

Data Analytic Approach

Qualitative research meets the empirical world through a systematic and rigorous investigation of patterns forming into concepts, insights, and understandings (Creswell et al., 2011; Taylor et al., 2015). Qualitative research develops a descriptive dataset from interviews, focus groups, ethnographic observations, and written documents to place context and meaning to lived experiences and human inquiry that does not conform to bioscientific laws (Creswell et al., 2011; Creswell & Plano Clark, 2017). A deeper appreciation of people, places, and contextual influences develops through non-standardized, adaptable methods of rich and complex data generation retaining the complexity and the uniqueness of each participant (Ritchie et al., 2013). Contrary to quantitative research, which tests preconceive models, hypotheses, and theories, qualitative research generates new understandings about how people give meaning to significant events in their lives (Taylor et al., 2015). Meaning formation derives from both the respondent and the researcher, as they consider the significance of events during the interview process

(Ritchie et al., 2013). At its core, qualitative research is an investigative method to uncover new information, ideas, and add nuance to the established knowledge base evaluating persisting social issues (Hallingberg et al., 2018). W.E.B. Du Bois eloquently described in his essay, "Striving of the Negro People," the levels of awareness of one's self as 'other' in the world he inhabited.

Holloway and Galvin (2017) provide a clear differentiation between research methodologies and data analysis approaches within qualitative research designs. Three predominant qualitative research methodologies—grounded theory, ethnography, and phenomenology—differ in epistemological perspectives and particular theoretical orientation to guide the data collection and analysis processes (Bengtsson, 2016; Creswell et al., 2011; Ritchie et al., 2013; Vaismoradi et al., 2013). These three established research methodologies maintain a consistent and coherent epistemological method of research design, data collection and analysis with set philosophical underpinnings (Holloway & Galvin, 2017; Holloway & Todres, 2003). However, some researchers opt out of adhering to an entire research methodology and select a transtheoretical tool or technique better suited to their research question and constraints (Bengtsson, 2016; Braun & Clarke, 2021).

Data analysis approaches, such as thematic analysis, are a flexible set of data analysis tools. Flexibility does not infer inconsistency or incoherence (Braun & Clarke, 2012). All adequate qualitative and quantitative research are subject to epistemological, theoretical, ethical, and procedural concerns if the researcher lacks diligence, consistency, and self-awareness throughout the process (Bengtsson, 2016; Holloway & Todres, 2003). Thematic approaches guide novice researchers toward developing critical research skills: identifying, analyzing and reporting patterns within data (Braun & Clarke, 2006, 2012; Vaismoradi et al., 2013). Thematic research approaches, specifically grounded theory and thematic analysis, focus on identifying

differences and similarities between multiple research informants to develop interpretations into underlying meaning of the phenomenon of interest (Ritchie et al., 2013). In comparison, where grounded theory is the research methodology, thematic analysis is the data analytic approach (Braun & Clarke, 2006).

Thematic analysis is independent of theory, epistemology, and predetermined assumptions about the nature of the data, thus making it conducive and appropriate for a wide range of research studies (Braun & Clarke, 2006). Thematic analysis is a broad method, often not explicitly claimed, when researchers analyze qualitative data without claiming one of three predominant qualitative research methodologies (Braun & Clarke, 2006; Holloway & Todres, 2003). Employing thematic analysis as a data collection and analysis framework is a flexible research tool, compatible with both essentialist and constructionist paradigms (Braun & Clarke, 2006, 2021; Clarke & Braun, 2017; Willig, 2012). Thematic analysis, through the realist epistemology, captures people's experiences of being part of their culture or group membership to highlight broader social systems at work. It works well for understanding homogenous groups of people. Epistemic peers are people who have similar or comparable knowledge or experiences by virtue of social position (Toole, 2023). Realist epistemology, using thematic analysis, supports the evaluation of social processes, psychological mechanisms, and decision-making processes to determine patterns, regularities, structures, or laws of behavior.

Reflexivity and Rigor of the Methodology

Thematic analysis has limited interpretative power if researchers do not engage and participate fully in the reflexive process, anchoring research claims to a theoretical framework (Braun & Clarke, 2006). The reflexive process is the deliberate attempt to unravel hidden assumptions and many layers and to reveal divergences between the researcher's thoughts and

the participants' words (Braun & Clarke, 2021). This process aids researchers in determining genuine conclusions from the data rather than reporting a random pattern of responses (Oakes & Kauffmann, 2006).

Although thematic analysis is often seen as a value-free, structureless framework to perform qualitative inquiry, researchers adhere to established qualitative research standards of rigor to produce trustworthy results. Standard evaluation criteria avail qualitative research results to independent scrutiny (Nowell et al., 2017). Lincoln and Guba (1985) established widely used criteria for achieving qualitative research rigor through four pillars: credibility, dependability, confirmability, and transferability.

Credibility is regarded as consistent representation of the study participants' views (Lincoln & Guba, 1985), and is achieved through an external check of the adequacy of the references and is reflected in the final presentation of the data (Nowell et al., 2017). Credibility is the confidence in the representation and faithfulness of multivocal truths and value of the research findings, and the ability to make sound judgments based on research accounts (Barusch et al., 2011; Davies & Dodd, 2002). Techniques include prolonged engagement at the research site, persistent observations open to multiple influences, triangulation of data from multiple sources, and member checking (Lincoln & Guba, 1985). Considerate planning adapts to the restrictions imposed by external factors such as time, resources, and participant access (Bengtsson, 2016). Credibility also considers the internal resources of the research team, specifically pre-understanding to minimize bias during the analysis process and data misrepresentation (Bengtsson, 2016; Elo et al., 2014). Qualitative methodologists support collecting and analyzing data from interviews, observations, government documents, videotapes, newspapers, letters, and books (Strauss & Corbin, 1990; Charmaz, 2014, p.22).

For this study, all recruitment activities were conducted during the participants' work hours. I took time off work from my job to recruit Monday through Friday during all three shifts. Surprisingly, in-person recruitment during a post-pandemic world created minor barriers. Accessing workers at work to inquire about work issues prevented some people from participating in the study and offered a diverse perspective from those who felt safe to speak up. When research is created as a team, some investigators scrutinize multiple data sources to determine if they can triangulate toward key findings and themes (Bengtsson, 2016; Forero et al., 2018). For this study, no other data sources were available to support triangulation, although BART's YouTube channel provided short videos featuring BART workers. One video featured a transit vehicle mechanic's perspective of the job (albeit it was biased towards presenting the company favorably). Additional information sources supporting the investigator's body of knowledge were compiled from the demographic forms collected during recruitment, the Regional Transportation District Board of Directors meeting minutes, publicly available information on the internet, and two books about BART's historical legacy.

The next two criteria to evaluate the rigor of a qualitative study are research dependability and confirmability. Research dependability focuses on the transparent documentation of the study's procedure, data changes, and researcher's decisions encapsulating the final conclusions (Bengtsson, 2016; Lincoln & Guba, 1985; Nowell et al., 2017). Confirmability ascertains if the results are grounded in the data (Lincoln & Guba, 1985), and refers to the neutrality of the results to the point that it can be supported independent of the original study investigator (Bengtsson, 2016; Forero et al., 2018). A codebook is used to provide an evidence trail of the research process, and multiple investigators perform audit trails documenting theoretical and methodological research issues (Bengtsson, 2016; Nowell et al.,

2017). Creating reflexive memos or keeping a personal, reflexive research journal serves as another method of dependability and confirmability rigor. The study investigator, a nursing PhD candidate, worked with a dissertation committee member to ensure the genuineness of the research design, and that careful consideration of data collection and management steered the development of themes and considerations of the research study's impact.

Lastly, transferability is the degree in which the representative sample, depicting their view of the phenomena, can be generalized to other members of the group or to other contexts and settings (Bengtsson, 2016; Forero et al., 2018). Qualitative studies often make very limited, but in-depth claims about the phenomenon of interest (Bengtsson, 2016; Elo et al., 2014). Study findings can offer small answers to big questions, provide new insights, increase understanding, or practical actions (Bengtsson, 2016). In this study, transferability was achieved through data saturation as opposed to recruiting a large sample size based on a power analysis.

Resultant themes from a rigorous research process capture the truth and trustworthiness of the data, reflecting a dynamic process occurring within a social phenomenon (Bengtsson, 2016). Themes for this study resulted from a data-driven inductive approach strongly linked to the data (Boyatzis, 1998; Braun & Clarke, 2006). The final themes do not fit into the preexisting interview guide questions, nor the researcher's analytic preconceptions (Braun & Clarke, 2006). As compared to a similar data analysis approach—content analysis—the themes from this study are not a count of how often something appears in the data; the data were examined beyond surface-level meanings to describe the sample's perceptions and beliefs about worker health, well-being, and health and safety behaviors. Trustworthy results describing the phenomena, in relation to the research aims, are consistent with the participants' perspectives while providing context to their circumstances (Bengtsson, 2016).

Conclusion

From the realist epistemological standpoint, thematic analysis provided a systematic yet flexible approach for organizing qualitative data, generating codes, and interpreting data from the interviews of nine BART electricians and transit vehicle mechanics to describe their beliefs and perceptions of health, well-being, and health and safety behaviors at the intersection of personal characteristics and professional responsibilities in the context of structures that connect worker experiences in a shared time and physical workspace. Through reflexivity and adherence to qualitative research rigor, the researcher was able to use a data-driven inductive approach to derive themes from interview data that represent the participants' perspectives not the researcher's analytic preconceptions.

Chapter Four

ANALYSIS AND RESULTS

This chapter presents the themes derived from one-on-one interviews with nine urban transit industrial workers, specifically electricians and transit vehicle mechanics, regarding their beliefs and perceptions about their health, well-being, and health and safety behaviors at the intersection of personal characteristics and professional responsibilities in the context of structures that connect worker experiences in a shared time and physical workspace. Occupational health research situates worker health within structural, functional, and emotional states consistent with the worker's group membership (McCartney et al., 2019). In the context of this study, perception refers to the identification of important components of a worker's social and work life rather than one's inner thoughts and beliefs (Locke & Peña-Guzmán, 2021; Peña-Guzmán & Spera, 2017). Intersubject perceptions are fundamentally social, relational and embodied, giving an intimate knowledge of a core self that interacts with a social world (Locke & Peña-Guzmán, 2021; Peña-Guzmán & Spera, 2017). I was interested in both the perceptions and beliefs of the participants.

This chapter is divided into two sections. The first section is a continuation of the previous chapter, in which the data analytic approach—thematic analysis—was described. In this section, the thematic analysis process that was used during and after data collection is described. The second section of the chapter focuses on the study results. Themes derived from participants' depictions of their health, well-being, health beliefs and behaviors, and safety are presented, and were compared to the different characteristics of participants' intrinsic beliefs and attitudes influencing responses to their conditions. Although the participants provided an abundance of

information, highlighted are the most salient features unique to urban transit industrial workers. Quotes are lightly edited for clarity.

Thematic Analysis

Thematic analysis is a data analytic approach used to understand the events, realities, meanings, experiences, and worldview of participants to explore what makes a particular experience possible among several people and explain a collective perspective (Bengtsson, 2016; Braun & Clarke, 2006, 2012, 2017, 2021; Toole, 2023). This approach was developed primarily by the seminal works of Braun and Clarke (2006, 2012, 2017, 2021), Holloway and Todres (2003), and Boyatzis (1998). Thematic analysis is the process of systematically identifying and comparing text to create codes, and then comparing codes to create themes that are compatible with both the realist and constructionist epistemologies (Bengtsson, 2016; Braun & Clarke, 2006, 2012, 2017, 2021). The underlying assumptions of thematic analysis are (a) language is conceptualized as reflecting the true nature of a person's truth and reality; (b) participants are contextually situated within unique realities; and (c) beliefs are formed through lay associations externally derived from community members (Braun & Clarke, 2012; Coutu et al., 2013).

Thematic analysis is appropriate for exploratory research in which the researcher searches for variations in process and alternative interpretations of phenomena (Braun & Clarke, 2006). This approach was especially useful for helping this researcher to understand the participants' reasoning processes that informed their decisions and perceptions about their health, well-being, and health and safety behaviors, regardless of whether these decisions were practical, illogical, rational, or conflicting (Coutu et al., 2013). In thematic analysis, the researcher carefully and systematically analyzes the data, identifying core elements and characteristics of the data and interpreting the meaning of the data contextually (Bengtsson, 2016). Thematic

analysis is a flexible data analytic approach that can be adapted to any sample size and constitution, data collection methods, and approaches for generating meanings of the data (Clarke & Braun, 2017).

In the context of thematic analysis, the researcher acknowledges that participants are immersed in their lived experiences even as they consciously or unconsciously reflect on it. Lived experiences are not static experiences of the past, but rather are temporally dynamic experiences—simultaneously ongoing and historical—as people evolve and change their perspectives over time (Peña-Guzmán & Spera, 2017). Social phenomena constantly evolve as a person experiences, reflects, and adapts to a changing environment (Corbin & Strauss, 1990). The result of a well-done research study employing thematic analysis is a holistic, unified embodied feeling for the phenomena of interest; that is, a better understanding of the stories participants shared of what events occurred in their lives and how they believed it influenced the study outcomes (Holloway & Galvin, 2017). This type of analysis helps to create individual, specific sociohistorical context of events as the person recounts these events, without presuming a set of universal truths (Oakes & Kauffmann, 2006).

Audio Recording and Transcription

Thematic analysis begins when the investigator listens to and transcribes the audio recordings of interviews to text (Bengtsson, 2016; Holloway & Galvin, 2017). I listened to an audio recording within 72 hours after interviewing a participant to ensure that the entire conversation was properly recorded and to document my thoughts or lasting impressions. Listening repeatedly to audio recordings and reading the transcribed text of the audio recordings allows the investigator to experience more fully the participant-researcher dynamic while not actively participating in the interaction (Bengtsson, 2016). Personally, listening to my own voice

and cadence, how often I interjected, made assumptions, and unintentionally put words in a participant's mouth was annoying.

Audio recordings of the interviews were uploaded to Microsoft Word's cloud-based transcription service and then localized to the investigator's personal computer. The yearly subscription fee for Microsoft 365 included unlimited transcription of audio files and direct-to computer dictation. Microsoft 365 generated a timestamped transcript of each interview, delineating each speaker. The automated transcriptions were fairly accurate, confirmed by my reading the transcriptions while simultaneously listening to the audio recordings. As I re-listened to each audio recording, I read and corrected errors in the text of each transcription on my computer. Typical transcription errors were misinterpretation of words and phrases, eliminating or partially capturing participant statements, and adding additional text from background noise. I added notations in the text to indicate where emphases, pauses, and changes of tone in speech occurred. I deleted filler words in speech, such as "ok" and "um," ensuring that no other words were deleted to maintain the integrity of the participant's conversation.

Corrected and validated transcripts from the participants' audio recordings were imported to NVivo 14 for analysis (QSR International, 2024). NVivo 14 is an easy to use, relatively intuitive, and affordable qualitative data management computer software that is ideal for novice researchers. Additionally, the web-based interface for NVivo 14 offers an abundance of online tutorials making it easy for an investigator to learn how to use the program and receive the maximum benefits from its features. I performed multiple reads of the transcribed data in NVivo 14 to identify significant ideas and constructs across interviews to create initial codes, substantiating workers' understanding of their health, well-being, and health and safety behaviors.

Coding and Theme Development

I used inductive coding to create codes, which are units of text representing a concept or idea from the raw data to blend into themes and theories (Bengtsson, 2016; Chandra & Shang, 2019; Corbin & Strauss, 1990). Inductive coding is the process of reading, listening, and summarizing raw data to develop concepts, themes, or a process model from the interpretation of the data (Chandra & Shang, 2019; Corbin & Strauss, 1990). I used a layered approach to organize the data, constantly comparing developed codes to one another and to the data (Bengtsson, 2016; Riger & Sigurvinsdottir, 2017). I expanded, eliminated, and merged codes to reduce the volume of text and to identify salient points related to non-bus operator, transit industrial workers rarely represented in the literature. The goal of coding is to systematically illustrate the quality and texture of participants' experiences, accurately representing their perspectives in code generation and distilling meaning to the codes (Willig, 2012).

I created a codebook during the coding process (Appendix E). A codebook is a type of data management tool that can be used to systematically organize similar or related text to assist in the interpretation of qualitative data by documenting the formation of themes from codes (Crabtree & Miller, 1999). I organized text and generated codes based on the overall aim of the study: characterize the perceptions and beliefs regarding the health, well-being, and health and safety behaviors at the intersection of personal characteristics and professional responsibilities in a sample of electricians and transit vehicle mechanics who worked at five railyards for the Bay Area Rapid Transit (BART). Initial codes and themes evolved from the way questions were organized in the interview guide. Sometimes, similar exemplar texts did not fit any theme and were not included for further analysis (Braun & Clarke, 2021). To derive themes, I followed the

coding structure proposed by Boyatzis (1998): label or name the code, define the code, and describe how to know when the theme occurs.

Constant comparative analysis was used to derive the final themes. Vaismoradi and Turnunen (2013) defined a theme as "a coherent integration of the disparate pieces of data that constitute the findings" (p. 402). Themes represent data patterns of and in-depth understanding and coherence of study phenomena among multiple perspectives rather than a singular truth or broad generalization (Bengtsson, 2016; Boyatzis, 1998; Fereday & Muir-Cochrane, 2006). The meaning of a code or theme is specific to the context of the person being interviewed—a person's history, cultural beliefs, and life situation (Willig, 2012). Coding and identifying themes is a deliberate, stringent, and active process during which the investigator's role is to give an honest account or representation of the participants' perspectives and how they are linked or connected as opposed to giving voice (Braun & Clarke, 2012, 2021). For instance, there could be a reason why a person who is happy or discontented with the job may have chosen to divulge certain details for this study.

Complex, evolved, and nuanced codes results from deep and prolonged engagement with the data (Braun & Clarke, 2012). As insight shifts and changes, codes expand and contract to capture developing and deepening interpretation of the data to develop the themes (Braun & Clarke, 2021). I documented this process in memos, but this information is not included in this dissertation. I analyzed and parsed codes from the data to ensure that the selected themes represented the data accurately; and to unite the meaning of the codes into themes. I thought the codes and themes would develop extemporaneously or unpredictably, but this did not occur. Because each participant was asked the same or similar question using the interview guide, the result was a preset framework that grouped the data accordingly; thus, preventing participants'

narratives to emerge in an eclectic, unsystematic and non-sequential manner. As similarities across participant narratives emerged during the simultaneous data collection and data analysis process, repeated areas of identical experiences occurred, indicating data saturation; at which point, data collection was ceased.

Results

Five themes emerged from the thematic analysis of nine BART transit industrial workers' narratives: (a) health equals workability, (b) hazard awareness and normalization, (c) coexisting with chronic pain, (c) health behavior influenced by personal and social factors, not health access, and (e) professional expertise (Table 4.1). Also presented in Table 4.1 are the subthemes, if applicable, a description of each theme, participants' indications of each theme, and what the theme does not represent.

Table 4.1 *Themes Characterizing the Health, Well-being, and Health and Safety Behaviors of Urban Transit Industrial Workers* (*n* = 9)

Theme	Subthemes	Theme Description	Participant Indications	Code Exclusion
Health equals workability		Health is the ability to work for as long as possible.	Expressed ability to work in the distant future	Code does not include references to the past or pausing from work to manage a short-term health condition
Hazard awareness and normalization	• Minor injuries • Environmental hazards	Working safely includes the awareness and normalization of risk and harm.	Noticed defects in the environment or report near misses	Code does not include unsubstantiated claims of problems
Coexisting with chronic pain		Managing chronic pain is part of the worker health experience.	Recalled a health condition that did not have a clear beginning or end	Code does not include injuries that resolved with first aid or were not related to work

Theme	Subthemes	Theme Description	Participant Indications	Code Exclusion
Health behavior influenced by personal and social factors, not health access	• Health access • Personal and social factors	Workers delay utilizing employer-based health care due primarily to personal and social reasons rather than to health care access.	Admitted to needing health care but have not initiated care	Code does not include non-work-related health conditions
Professional expertise	• Skills • Ability • Confidence	Cognitive, behavioral and intellectual development is crucial for staying healthy and in the workforce.	Expressed their skills, ability or talent, and confidence to solve problems	Code does not include participants' evaluation of skills related to a hobby

Health Equals Workability

The "health equals workability" theme represents participants' perception and belief that worker health is the ability to work for as long as possible. Participants were asked two questions about health: What is your definition of health? and Are you healthy by your own definition? Each participant responded either with their definition of health, but most of them provided a list of healthy behaviors and lifestyle health choices that they believed would sustain their ability to continue to perform paid work today and for as long as they choose. In general, participants defined health as actively engaging in labor and participating in the workforce without limitations. All but one participant deemed themselves healthy. Participants identified non-clinical external health markers, such as work pace and meeting productivity quotas, as signifiers of health. One person specifically mentioned that working up a sweat was an indicator of good health and well-being. The only self-defined unhealthy participant was the person who was on a medical leave while recovering from shoulder surgery. A representative quote of the "health equals workability" theme is below.

> [*Three second pause] I'm going to say that my definition of healthy would be where I can go to work, and do 8 hours of work, and come home and go again the next day, right. Where I, as long as I can do, I would consider as long as I could do my job every day that I'm healthy.*

Most participants had thought about retirement. All participants cited BART's generous pension and lifelong medical care as the primary incentive to work for BART. One participant, without hesitation, knew the exact number of years and months left until the day the participant plans to retire. All but two participants intended to retire from their current position as a transit vehicle mechanic or electrician. These two participants aspired to move into other work that require different skills. One participant would like to work as a trainer; the other participant would like to become an engineer. A participant in the late 50s intends to continue working for as long as possible. The reasons expressed by this person were the benefits, the consistent and predictable social and structural aspects of the job, and the need to have things to do and people to see; this person expressed value in having routines. The person was unsure how he or she would replace those structures during retirement. The person said,

> *So when they get 55, or 65, 63, whatever the retirement age. They could double dip, you know. They could get their money from their previous jobs while they have the job here, too. So, their income would be better. But if they work in one place, that's the only income they have. So that's one of the reasons I moved to BART. So, when I'm old enough I could get my retirement at [redacted] while I'm working here, OK. Since most people work until they're 70 anyways. Thank you to our previous governor. He changed our retirement to what now? Yeah, 62. Most people work 'till like 70 anyways, though.*

Hazard Awareness and Normalization

The "hazard awareness and normalization" theme represents participants' perception and belief that working safely includes the awareness and normalization of risk and harm. The two subthemes were minor injuries and environmental hazards. Maintaining health depends on recognizing and responding appropriately to workplace hazards. All participants were astutely aware of actual job hazards or experienced work-related minor injuries. Seven participants reported past injuries; five participants reported specific incidences of harm; four participants described seeking health care for a work-related injury at some point in their career, and two participants described barriers by management to initiate health care. Six participants recalled

minor injuries, which included cuts, bruises, and acute pain that resolved with rest or first aid. Four participants shared stories of specific incidents that caused pain from a minor incident that resulted in a more serious injury. Three participants gave examples of cumulative repetitive injuries over time that have become a normal part of their lives. No one expressed concern or discontent about the frequency or management of minor injuries in the workplace, as described by this participant:

> *I got hurt one time on a Friday and I told the boss. I said, you know, I [whispering to self] What was it like? My arm or something? My wrists? I hit it just right and I smacked it. I slammed this wrist in between two seats one time. So it was on a Friday, and it was a weekend and I told him, I said, you know, and I only have an hour or two left to work, and I'm like, he says, "You want to go medical?". I said no. I said I'm going to see how it feels by Monday, cause you know you get bruises and that, and after a while they go away. And so, Monday came and it really, I mean it really hurt, but it didn't hurt as bad as it was hurting on Friday. So, I'm like, you know, I don't need to go to medical. You know it's your choice. If you want to go. But a lot of us, if we get hurt, like on the weekend or towards the weekend on our days off, we're like, a lot of us are like, you know something, we just wait till we come back to see how we feel. If we don't feel that good, then we're going to go to medical that day. You know, most of our fore workers were like, "OK, no problem." Some of our fore workers are like, "Oh, you don't want to go to medical? OK., 'denied medical'". And they immediately write on the paperwork, 'denied medical' instead of writing, 'will follow up on Monday after the weekend of relaxation'. You know what I mean? So, it all depends. I haven't been to workman's comp in a long time, but I might end up be going shortly.*

Most participants reported their day-to-day work was not strenuous; however, there were aspects within the environment that could cause serious harm or death. Prompted by questions regarding safety, all participants discussed their acute awareness of environmental hazards and the shared responsibility and assumption of risk. Seven participants reported times when they were fearful or cautious of a hazard in the work environment. They collectively shared 23 instances of hazards in the workplace, including obvious structural deficits, slippery floors from oil, and broken items on the floor that could have resulted in slips and falls. The most ominous workplace hazard was the electrical third rail that provides 600 to 750 volts of electricity to

power the BART trains (BART, 2024a). One participant described how a misstep caused a fall inches away from the electrical third rail.

In response to their awareness of a workplace hazard, participants evaluated the skill and merit of their coworkers and management to help solve workplace problems. Their experiences with coworkers to help deal with workplace hazards were primarily positive; whereas their experiences with management to address structural issues related to workplace hazards were mixed, depending on the general manager. Participants placed responsibility for workplace safety on the general manager, union, station chief, and safety committee. Five participants described asking for help to deal with job hazards. In the quote below, two participants shared how they addressed their safety concerns with management.

> *Exactly! No handrails now. I brought it to their attention. Now, I knew what I was doing, talking to [redacted] about it. They went and bought a saw and all of this stuff, and they actually allowed me to go out there, even though they got sort of dinged by maintenance, it's called buildings. But they'll do anything when it comes to the building trade, right? I mean, hammer, nail, stuff or whatever it takes to build anything. They're supposed to do it, but this is a safety issue. They let me go ahead and build it, the Superintendent of the shop, but they got dinged for it. They fought for it, because of the safety thing. Long story short, I got to come over here, I went to [redacted location] for a year and then out here to [redacted location] for three years. And they have no platforms, which is, that's a different thing. But if they have platforms out there, they still don't have handrails on it. They've been told! You know, and every time they found one platform out of compliance, it was a $10,000 fine in one day. [redacted location] got hit with a $40,000 hit just because of that. Guess what? Everything shut down, and everyone out there and got busy on the hammer and nails building a handrail.*

Through awareness of danger and participants' ability to be proactive or actively avoid workplace hazards contributed to their maintaining good health, safety and workability. As one participant said, "[we] work more safe, we don't say slow. We say, more safe." Another participant said that workers must be the most responsible for their safety because they have the most to lose in unsafe working conditions. These workers were primarily responsible for their and others' safety. For example, one participant refused a specific assignment for months because

the protocol for the task was inaccurate and missing a key tool. A few participants admitted to engaging in unsafe workplace practices, such as not donning required personal protective equipment. One participant chose to forgo mandatory dressing in special work coveralls when the person's size was not readily available. Despite participants providing examples of working in unsafe work conditions, the general agreement among the participants was that unsafe situations were outliers rather than the norm. None of the participants stated that they worked in unsafe conditions while at BART. Participants said working at BART was relatively safer and less physically demanding as compared to their previous jobs. Five participants described working at other automotive and aeronautical jobs that were significantly more hazardous than BART. One of them said,

> *You know what? Despite what do, we have to go through, I would recommend it for a friend. It's an easy job, actually. It's easy. You don't have to work that much. If you put in good effort, it's easy. I don't mind. That's why I don't want to be a manager. Some managers do a good job, but they may not like a person. They may overload them, or they may get overloaded and try to deploy work. But for the most part, days are pretty easy. I kind of got blessed in a way of being here. I would recommend the job now, but you know not all of the jobs that have pensions and stuff, they restructured stuff now where they're going to stay a lot longer.*

Coexisting with Chronic Pain

Chronic pain is a set of stable, progressive, or transitory symptoms ranging from mild discomfort and moderate limitation to debilitating pain disrupting major areas of life for most days over the previous six months (Von Korff et al., 2016). The "coexisting with chronic pain" theme represents participants' perception and belief that managing chronic pain is part of the worker health experience. Participants believed that being healthy can include experiencing chronic pain as long as it does not force them out of the workforce entirely. A majority of participants expressed nuance regarding their experiences with and beliefs about work-related chronic pain. Minor injuries were prevalent, and participants believed that minor injuries

associated with work were to be expected to a degree; however, such minor injuries lacked urgency or significance to some participants. As compared to participants who were electricians, participants who were mechanics appeared to have the more physical job. The most physically intensive job task among the mechanics was being on the "move crew." Mechanics performed move crew up to three times a week, and ideally not on consecutive days due to the physically intensive nature of the task. These workers used lifting tools and built custom tools for heavy equipment. Two participants reported having a medical restriction for their knees, which prevented them from working on the move crew. Another participant had a medical accommodation that exempted this person from working on the move crew because of having a shorter arm reach and leg stride, which posed an increased risk for injury.

Six participants described the onset and consequences of work-related chronic musculoskeletal pain, including shoulder, knee and wrist pain. They parsed out their chronic pain experiences due to their current job from cumulative chronic pain as a result of working in the industry for a decade or longer and/or as a result of the natural aging process. One participant who was placed on temporary total disability had been experiencing chronic shoulder pain for several years before deciding on surgery through employer-provided health care. Another participant stated a need for surgery but was intentionally delaying care. Two participants stated they were working with chronic pain, but they had not reached the point of seeking treatment. Most participants did not seek health advice from family or friends for work-related injuries, even though one participant reported having a partner who is a health care provider. Participants reported talking to coworkers about work-related pain instead of family members or non-work friends. When I asked a participant "When did you start noticing the pain," the person responded,

> *I don't think that there was no, I don't think that there was a moment. There have been just aches and pains, here and there. I'm really messed up.*

When I followed with the question, “When did you notice that the pain became a problem for you,” the person responded,

> *[pause] Like I said you get little nicks and cuts and bruises every day, you know. And then sometimes you think to yourself, ‘man this pain aint going away’, but then it does, a little later, yeah. And then you go back to work, you do the same thing and you’re fine, but only for a short time.*

Health Behavior Influenced by Personal and Social Factors, not Health Access

The theme, “health behavior influenced by personal and social factors, not health access,” represents participants’ delay in utilizing employer-based health care due primarily to personal and social factors rather than health care access. All participants indicated that accessing desired health care posed no issues for them. Health care benefits, particularly lifelong medical, were a strong impetus for why many participants left their previous employer for their current position at BART. Two participants regularly visited a primary care provider. Other participants did not have, nor did they believe they needed a primary care provider. Among participants who did not have a primary care provider, the reasons cited were they engaged in “wellness” practices, such as exercising, using wellness apps, and practicing herbal complementary regimens. Other types of complementary health care approaches, such as acupuncture, were not mentioned by any participant. The workday routine that embedded regular health-promoting activities of a participant is described below.

> *So, I get up at 1:00 o'clock in the morning. I get you know, I get ready and everything like that. So by 1:30, 1:45 I'm in my gym. I work out for about an hour and a half. So at 3, about 3:30, between 3:00 and 3:30, I'm done. I get my lunch together. I have a little break I have a little, I get all my vitamins together. I go to work, I get to work around on average 4:30. I checked my emails. I make my breakfast there at work, so I have oatmeal. And then at 6:00 o'clock, so when I get to work, I'm ready to go. I don't believe in getting to work at 6:00 o'clock clocking in and getting to work. I was always raised with you start work at the time you get paid. I get paid from 6:00 o'clock on. At 6:00 o'clock I start working. But I don't wanna jump into it. I wanna change my clothes, get my work clothes on. Have it in my mind what I plan on doing.*

Participants who delayed seeking health care for work-related musculoskeletal injuries shared one common perception: “It wasn’t their turn to go on medical leave.” One participant, currently engaged in the health care system to manage chronic pain and dysfunction, reported working until symptoms were too severe for self-management even with modified work restrictions, and this participant is now in need of surgery. This participant, however, chose to delay surgery in consideration of coworkers whose health conditions and life situations were believed to be worse than his or her situation. Thus, this participant waited to allow a coworker to take medical leave and to allow recuperation time for another coworker who recently had surgery. Moreover, this participant noted that a different coworker had surgery years ago and the surgery seemed not to have helped; this coworker’s experience also influenced this participant’s decision to delay seeking health care. Five participants reported knowing at least one person they personally knew, knew of in general, or a coworker who needed or recently had surgery. Many participants reported not wanting to leave coworkers with heavier workloads while they recovered from surgery; thus, they delayed surgery, despite having shoulder, knee, and wrist pain from injuries. One participant said,

> *And I don't really want to screw the guy and say, ‘hey, I'm leaving, man, you know?’. But, so I’ll hold on as long as possible. I mean you learn to live with a lot of the pain. But when it gets to be too much. You just go and, like I say, the older you get the more it gets messed up. You've got to go see a doctor. So, I'm just trying to hold off as much as possible, you know. I know he's got, he's got issues at home [...] So he's going to be gone for a while too. And that's going to leave me there all alone and there's half the stuff I cannot do there because I haven't been trained on that stuff yet.*

Another participant said,

> *Well, there's only one other person in my section that I'm, that's working. The other guy is out, he just went on industrial. He went out for his wrists. So I mean, I don't want to, I feel like I don't want to screw the guy that, you know, give him all the stuff to do. As I can get there and do something, it helps out. I don't want to sit there and just say, oh, yeah, I'm going to go to medical, get out of here and sit around.*

Participants who were not actively engaged in the health care system often perceived themselves as healthy, even if they had health conditions that indicated otherwise. One participant connected weight gain to poor mental health, while another participant recalled a period of constant internalized anger and expressed rage as a telltale sign of "unhealthiness." Two participants provided anecdotes of seeking mental health care for non-work-related stressful situations. One participant shared a story about seeking mental health care services during a difficult time in the person's personal life. This participant said the situation eventually resolved on its own, and while therapy did not help solve the issue, the person learned valuable skills about conflict resolution. Another participant used mental health apps, mindfulness and de-escalation techniques to help cope and "find peace" during a personal, stressful time. A different participant sought care from a therapist due to work-related stress. The person said,

> *Yes, after all that, being a shop steward. So what this, what this psychiatrist told me -- being [race redacted] as I preferred a [race redacted] psychiatrist, ... And he told me this, "So if you're trying to do something, to fight for something, it's going to create, you know, resistance and it's probably not better for you." He goes, 'in my position', he told me, "I got a degree in theology and I got a PhD in Psychology. It would take someone like me to deal with that type of situation your in." You know it's [pause] hard. You either got to be way over on the left and just don't care and be that extreme and just crazy, you know. Or you gotta be something like that, you gotta be so well-rounded, and most of the people there, you know, that that type of level, they're gonna have to be more or less on the crazy side. Yeah, I'm just saying this to be honest, to deal with this, to be blunt.*

I expected participants would share more freely about physical health issues than about mental health issues. Participants were more open to talking about their personal stressors rather than work-related stressors. Although a few participants mentioned "difficult and challenging times" in their lives, no one indicated they had a diagnosed mental health condition. They, however, readily indicated a diagnosed physical health condition. For instance, no participants mentioned having or being diagnosed with depression or anxiety. Two participants were asked if

they feared being stigmatized or rejected by others if they sought health care for physical or mental health needs. Both participants said “no.”

Seven of the nine participants indicated stable home and financial lives. No participant mentioned financial or job instability as a reason to delay seeking health care. None of the participants indicated they would refuse health care for any financial or personal reason other than consideration of timing to enter care. Two participants shared that they were managing constant family-related stressors. None of the participants admitted to excessive drug or alcohol use other than an occasional beer for special occasions. As a government-funded agency, BART performs random employee drug tests (Bay Area Rapid Transit, 2024a). Not one participant mentioned seeking services or therapy through work channels, such as employee wellness and assistance programs.

Professional Expertise

The “professional expertise” theme represents participants’ perception and belief that cognitive, behavioral and intellectual development is crucial for staying healthy and in the workforce. Professional expertise refers to the knowledge, astuteness, physical and mental skills, ability or talent, and confidence to perform one’s job. This group of highly skilled workers must think critically to routinely solve challenging problems. Participants described instances of troubleshooting problems, building specialized tools, challenging managers regarding written procedures, and performing special projects with their unique skillset. Representative quotes of professional expertise are presented below.

> *Some of us actually make and fabricate our own tools to do a certain job. I can't get behind this bolt back here and there's something in the way right here, so I'm going to make a wrench. It comes like this, up and over, and I can sit it there. You'd be able to get to it, but my hands are too big. I can't reach around inside of a little area to do something like that, so stuff like that, what we make, that's why we have our own toolbox. And, and plus, it's easier walking five feet than it is 40 or 50 feet to get a change of a tool.”*

You know, if I have a special project, I, I'm a, you know, mentally I'm a fabricator. I like building stuff and so if I'm in the middle of a project I'll think about it, different ways to do it. I'll think about stuff like that trying to make it better."

Most participants stated their day-to-day work was not particularly difficult. They reported high-level satisfaction with their jobs, especially as compared to their previous jobs. Four participants briefly mentioned new hire, on-the-job training and stated that it was adequate; however, two people stated the need for ongoing, periodic training. The data did not demonstrate a connection between participants' professional expertise and an avocation or hobby. Participants reported they enjoyed their hobbies, but their hobbies were not related to their work.

Conclusion

Conditions of employment impacted the perceptions and beliefs of worker health, well-being, and health and safety behaviors in the context of structures that connected worker experiences in a shared time and physical workspace in a sample of electricians and transit vehicle mechanics working in the industrial transit sector. These workers strongly believed worker health was the ability to work for as long as possible, as long as they were aware of and managed workplace hazards; however, this was often to their detriment because they normalized workplace risks that should not be normalized. Yet, the general agreement among the participants was unsafe situations were outliers rather than norm. Participants had a shared perception and belief that worker safety is a collective responsibility.

Many participants managed and coexisted with chronic pain by ignoring it, coping with it using non-medical, complementary therapies, or delaying treatment to the point of inability to perform physical work or activities of daily living. Despite chronic pain and other health conditions for which they did not seek or delayed health care, these workers perceived themselves as healthy because by choice they were not using the lifelong employer-based health care that was available to them. Many participants did not acknowledge mental health issues

although this finding does not appear to be related to fear of stigma or rejection by others. Continued development of professional expertise was critical to these workers as they aged in the transit industrial workforce or considered other occupations.

Chapter Five

SUMMARY, DISCUSSION, AND IMPLICATIONS

In this chapter, I present a summary of the study findings, followed by a discussion of the findings in relation to the study aims and existing literature. The discussion is organized in three sections: (a) worker safety behavior in shared time and physical workspace, (b) worker health, well-being, and health behaviors, and (c) worker characteristics, professional expertise, and job satisfaction. Following the discussion of the findings, context is given to better understand the findings in this sample of electricians and transit vehicle mechanics working for the Bay Area Rapid Transit (BART). I discuss the broader BART organization, unions, legislation and regulatory agencies—macro-level, upstream social determinants—that directly and indirectly impact worker health, well-being, and health and safety behaviors. Study strengths and limitations, including reflection on how design choices shaped the knowledge produced, are discussed. The chapter ends with opportunities for nursing research, practice, education, leadership and administration, and advocacy and policy to enhance worker health, well-being, and health and safety behaviors in the understudied non-bus operator, industrial transit worker population.

Summary of the Findings

Guided by the National Institute for Occupational Safety and Health (NIOSH) conceptual framework for worker well-being, this qualitative study explored the perceptions and beliefs regarding the health, well-being, and health and safety behaviors at the intersection of personal characteristics and professional responsibilities in a sample of nine electricians and transit vehicle mechanics working for the BART in California. The participants were recruited from five BART railyards during their shift and were interviewed individually outside work hours. Using

thematic analysis, five themes emerged: health equals workability; hazard awareness and normalization; coexisting with chronic pain; health behavior influenced by personal and social factors not health access; and professional expertise.

These workers strongly believed that worker health was the ability to work for as long as they chose by maintaining their professional skills and by being aware of, managing and normalizing workplace hazards even if it was to their personal detriment. Yet, the general agreement among the participants was unsafe work conditions were outliers rather than the norm. They had a shared perception and belief that worker safety is a collective responsibility. They coexisted with chronic pain primarily by ignoring pain for personal and collegial reasons, by coping with it using non-medical, complementary therapies, or by delaying treatment to the point of inability to perform physical work or activities of daily living even though lifelong employer-based health care was available. Despite chronic pain and other health conditions for which they did not seek or delayed health care, these workers perceived themselves as healthy. Diagnosed mental health conditions were not as readily acknowledged as were physical health conditions; however, this lack of reporting was not due to fear of stigma or rejection by others in their workplace or their personal and social networks. Overall, participants were highly skilled, believed they received adequate employer training, but ongoing, periodic training was needed. They reported high-level job satisfaction.

Discussion of Study Results

Worker Safety Behavior in Shared Time and Physical Workspace

The overall finding of this study demonstrated how conditions of employment impacted worker well-being in the context of structures that connected worker experiences in a shared time and physical workspace. Research from as early as the 1920s indicated that ‘work organization’

is the structure, constitution, and functioning of an organization simultaneously regulating employee health and well-being and the organization's productivity and marketplace success (Wilson et al., 2004). Tse and colleagues (2016) described worker well-being as the result of favorably constructed work conditions, enabling people to work effectively, efficiently, and safely while maintaining a positive perception of the job.

Contextual occupational factors, relationships, social behaviors, and support systems determine how and why people are exposed to different hazards (Grzywacz & Marks, 2000; MacDermid et al., 2008). Despite reporting workplace hazards such slippery floors, high voltage electrical rails, obvious structural deficits, and ergonomic challenges for those on the move crew, most participants indicated overall satisfaction with their workplace conditions and leadership management and administration, particularly as compared to their previous places of employment. They felt comfortable about refusing to perform work that they deemed unsafe. Working more carefully than expected was used as a form of injury prevention among these workers. They had a shared perception and belief that worker safety is a collective responsibility, as indicated by decades of research (Siegrist & Árvai, 2020).

A few participants admitted to engaging in unsafe workplace places, such as not using personal protective equipment (PPE). Lack of PPE use often indicates that workers may also be using other risky shortcuts and cognitive shorthand in other aspects of their jobs, leading to judgment and decision-making errors, or it may highlight a flaw in the process of how the task should be perform (Hammer et al., 2015; Siegrist & Peter, 1994; Wipfli et al., 2021). Workers cited a plethora of reasons to opt out of using available and functional PPE. Singular changes at the individual or administrative level may not be sufficient to eliminate workplace danger due to lack of PPE use. Given the number of barriers to PPE use, multilayered changes should be made

at the administrative, engineering, substitution, and elimination control levels to more effectively protect workers (Centers for Disease Control [CDC] & NIOSH, 2023).

A minority of the participants reported barriers by management to address workplace hazards and safety and to initiate health care related to a work-related injury. These workers relied primarily on coworkers and themselves to work safely and manage workplace hazards by normalizing workplace risks and harms, often at their personal detriment. This finding is consistent with worker risk behavior documented in other studies in which workers were found to exhibit unrealistically high levels of optimism regarding a range of hazards, and they were more likely to take unnecessary risks and perform non-standard, non-evidence-based work arounds (Siegrist & Árvai, 2020; Zhao et al., 2015). This contradicts the NIOSH conceptual framework for worker well-being, which indicates the employer, not employees, as having control of the most effective solutions to ensure worker protection (CDC & NIOSH, 2023).

About half of the participants mentioned their new-hire training was adequate, but they also indicated there is a need for ongoing periodic training. There is a need for deliberate, proactive employee education, training and reinforcement, and routine evaluation of the workplace environment to ensure that the risk management protocol is being implemented on a regular basis, even when employees indicate good perceptions about their shared physical workspace and their willingness to deal with minor injuries and coexist with chronic pain. Union representatives may need to be even more proactive to protect their worker members. As the literature indicates, workplaces especially in high-risk industries can potentially harm workers (Dipietro Mager & Moore, 2020; International Labour Organization [ILO], 2022b). Industrial workers are responsible for tasks that require full attention, such as disassembling machinery, repairing and replacing broken components, testing malfunctioning machinery, and adjusting and

calibrating equipment (U.S Bureau of Labor Statistics [US BLS], 2020a). Safe and healthy workplaces not only enhance worker health, but also reduce absenteeism, improve work performance and productivity, boost staff morale and motivation, and minimize conflict between colleagues (ILO & WHO 2022).

Worker Health, Well-being, and Health Behaviors

A range of physical, ergonomic, chemical, psychological, and safety hazards put transit industrial workers at risk for dangerous situations, impeding their ability to live long, healthy, and accident- and disability-free lives (Niedhammer et al., 2008; US BLS, 2020b, 2023a). In general, study participants defined health as actively engaging in labor and participating in the workforce without limitations. All but one participant deemed themselves healthy. To them health equals the ability to work for as long as they choose, regardless of whether they have a diagnosed physical or mental health condition or are not feeling well. Minor injuries that resolved with rest or first aid were considered part of the job. Most participants reported that their day-to-day work was not strenuous, nor was it particularly difficult; however, many of them coexisted or tolerated chronic pain (shoulder, knee, and wrist pain) due to partially healed, work-related musculoskeletal injuries and the natural aging process. Participants did not characterize injuries as causing intense pain, but the injuries did significantly interrupt work duties. They did not seek health care for their chronic pain, although musculoskeletal chronic pain is the most common reason that workers seek health care and pursue workers compensation claims (Dahlhamer et al., 2018; Wickizer et al., 2018). Attempting to maintain normal life activities while living with chronic musculoskeletal pain increases the risk for further injury and long-term disability (Siegrist & Árvai, 2020); which accounts for 30% of Social Security Disability Insurance recipients (Social Security Administration et al., 2023).

A majority of the participants believed that being healthy can include experiencing chronic pain if it does not force them out of the workforce entirely. If they can work and manage their chronic pain, they will work. The literature, however, indicates that chronic pain and delayed health care limit workforce participation (Wickizer et al., 2018). Limited workforce participation is performing at least 85% of the essential functions of one's job, with or without medical accommodations, while managing chronic pain (Von Korff et al., 2016). Workers in the US reported 2.6 million non-fatal occupational injuries in 2021 (US BLS, 2022a). The resulting cost to taxpayers was roughly $4.2 trillion toward direct health care spending and forfeited earnings due to lost work productivity (Peterson et al., 2021).

Many participants delayed seeking care for chronic pain and other work-related musculoskeletal issues because they did not want to take time off from work because it would be a burden on their coworkers, or they deferred to or prioritized their coworkers' need to take medical leave over their need for medical leave. Post-surgery recovery time ranges from two to eight weeks (University of California San Francisco, 2024). Workers are likely to return needing modified work duty for several weeks afterwards that limits the extent of their contribution. Moreover, asking for help and accessing employer-based health care requires discussing the injury with a supervisor, whose main concern is productivity, may have a negative or unsupportive reaction to the worker, and who serves as the gatekeeper to workers compensation. Occupational vulnerability, the financial need to work and maximize one's daily pay at the risk of losing one's job and paycheck completely, has been shown to reduce health care utilization (Thierry & Snipes, 2015); and thus, may deter some workers from reporting and seeking care for worker-related health issues for fear of being perceived as less capable of contributing equally as their coworkers (Santuzzi et al, 2014; Siegrist & Árvai, 2020).

Although not explicitly or implicitly stated, participants' actions and comments indicate that they believed they were responsible for staffing, or they might have had an unconscious fear of losing their job if they took time off work to attend to their health needs. At BART, continuous process manufacturing is used to assign work. This process requires task interdependence; that is, each person has a specific responsibility for the final product created by the team, has interpersonal communication skills and cognitive ability similar to their peers, and has shared responsibility for injury prevention and quality of work (Santuzzi, 2014). Continuous process manufacturing sites operate 24 hours a day, seven days a week, requiring scheduling through nights, weekends, and holidays (U.S. Bureau of Labor Statistics, 2020a). At BART, people work on part of the train, or the train component, and then turn it over to the next person in a shared structural and functional capacity. This interconnectedness in a shared time and physical workspace may be a factor why many workers consider their coworker's health care needs in relation to their health care needs. The findings suggest that management and union representatives may need to reassure workers that staffing is their responsibility, even when workers are asked to participate in staffing in consideration of workers' scheduling needs, flexibility and autonomy. Furthermore, workers may be unaware that federal and state job protections exist for some workers, along with disability pay. People taking time off for health care should be normalized.

Although all participants had lifelong employer-based health care, only two participants regularly visited a primary care provider. Participants appeared to be relatively healthy, and some of them engaged in health-promoting lifestyle health behaviors. Whereas worker health was the ability to work; well-being, wellness and health-promoting health behaviors were the active participation in a routine, prescribed lifestyle. The influence and positive association of healthy

lifestyle behaviors on morbidity, mortality, longevity, quality of life, functioning, and health outcomes is extensively and well-documented in the literature. To stay "healthy," participants used wellness apps, practiced herbal complementary therapies, or engaged in healthy lifestyle behaviors such as exercise. Their engagement in lifestyle health behaviors were no more unique to this worker population than to the general U.S. population.

None of the participants reported financial, home, job or other personal instability for not accessing and utilizing health care. None of them admitted to excessive drug or alcohol use other than an occasional beer for special occasions. This finding contrasts with findings of other studies that indicate in the absence of external supports, some workers turn to smoking, alcohol, and other substances and harmful behaviors to cope with the physical and emotional pain (Battle et al., 2015; Cunradi et al., 2009a; Street & Lacey, 2019). Of note is that their employer performed random employee drug testing. They relied on coworkers rather than family and friends for health advice regarding work-related injuries. This finding contrasts with one study that found social relationships outside work, with family and friends, influenced help-seeing behavior and utilization of health care among workers (Von Dem Knesebeck, 2015).

Diagnosed mental health conditions were not as readily acknowledged as were physical health conditions among the workers in this study. Yet, 76% of U.S. workers report at least one mental health condition, negatively impacting their job performance and physical health (Mind Share Partners, 2022). Mental health disorders cost the global economy $16 trillion due to absences, lost productivity, and associated health outcomes (Patel et al., 2018). A couple of participants shared that they were managing constant family-related stressors. No participant mentioned seeking services or therapy through work channels, such as employee wellness and assistance programs. When participants were asked, this lack of reporting and not seeking mental

health care was not due to fear of stigma or rejection by others in their work and personal social networks.

As previously discussed, many participants were coexisting with chronic pain. Although not observed frequently among workers participating in this study, the literature indicates that chronic pain has cognitive and psychosocial consequences that impact worker productivity, presenteeism, disability, health, well-being, and health and safety behaviors (Burke et al., 2015; Halicka et al., 2022; Loisel & Côté, 2013; Social Security Administration et al., 2023; Wickizer et al., 2018; Zablotsky et al., 2022). Work-related emotional, psychological and cognitive conditions include anxiety, depression, fatigue, sleep disorders, mood swings, burnout, stress, difficulty with communication and interpersonal relationships, and cognitive impairment that affects workers' confidence and ability to focus, concentrate, and learn new tasks (Purba & Demou, 2019; Witters & Agrawal, 2022; WHO, 2022).

Worker Characteristics, Professional Expertise, and Job Satisfaction

Overall, participants were highly skilled, believed they received adequate employer training, but ongoing, periodic training was needed. This group of highly skilled workers had to think critically to routinely solve challenging problems. Participants demonstrated an astute understanding of their craft and willingness to contribute to best safety practices when provided with the appropriate tools, or when they custom-designed, specialized tools to accomplish the work safely. Distraction, disengagement and cognitive impairment have been associated with increased accidents and injuries, illness, lost workdays, lost revenues, and health care costs for both employers and employees (Ko et al., 2010; Street & Lacey, 2019).

A majority of the participants were middle-aged men, with more than 10 years of work experience, who worked the day shift, and were members of the same union. The median age of

the U.S. workforce in 2022 was 41.8 years old; those 65 years or older accounted for 20% of the workforce (U.S. BLS, 2023b). The literature indicates that risky behavior in the workplace is usually seen in younger workers (Calzavara et al., 2019; Siegrist & Árvai, 2020). These transit industrial workers were tenured and experienced, and viewed their age as an advantage. One worker said that the only barrier to being a transit vehicle mechanic was not knowing how to be a mechanic. While some functional and physical changes may occur with aging, it does not necessarily impact negatively on workers' health and well-being, productivity, and ability to be safe. Older workers tend to have greater decision-making skills, long-term planning ability, adherence to rules, and concern for their coworker's safety; and are more likely to process successfully complex problems in unpredictable situations (Siegrist & Árvai, 2020).

Participants reported high-level job satisfaction. While most participants did not use the transit rail for which they worked, all of them found their job meaningful, and believed they provided a viable and necessary public service. They described their "high-skilled" job as a mix of routine issues and challenging problems that stimulated their intellectual curiosity and engagement, which has been associated with better worker health and well-being and increased workplace safety (Schwabe & Castellacci, 2020). Retirement was at least 10 years away for these transit industrial workers, who looked forward to coming to work. As workers age in the workforce longer than expected, the workplace will need to routinely evaluate if the work environment is adequate for long-term, sustainable employment (Oakman et al., 2018).

Social Determinants of Worker Health, Well-being, and Safety

The broader BART organization, unions, and legislation and regulatory agencies—macro-level, upstream social determinants—directly and indirectly impact worker health, well-being, and health and safety behaviors. These contexts provide a better understanding of the

study findings. Employers', unions', and regulatory agencies' enforcement of rules, regulations, legislation, and social policies is designed to improve poor working conditions and workplace safety, prevent or minimize worker physical and psychological harm, and negotiate fair wages (Dinlersoz & Greenwood, 2016). Social determinants of health are the conditions of the environments where people are born, live, learn, work, play, worship, and age, which affect a wide range of health, functioning, and quality-of-life risks and outcomes that influence individual and group differences (Dipietro Mager & Moore, 2020; Pronk et al., 2021). People are holistic beings participating in relationships and social customs to fulfill needs, obligations and aspirations in many contexts, whether at home, work, or elsewhere.

Bay Area Rapid Transit Organization

In the 50 years of operations, since 1974, BART has grown from 12 to 50 stations (BART 2024a). Envisioned by the Army-Navy Commission in 1947 to prevent dependence on automobiles and freeways, the first passenger rode the Transbay tube, which travels at 70 mph underneath water, to connect San Francisco to the East Bay, on September 16, 1974 (BART 2024a, 2024e). The BART is continually expanding its current 131 miles of rail tracks (BART, 2024a). The BART was operational when the 1989 Loma Prieta earthquake collapsed part of the Bay Bridge. The Washington Metropolitan Area Transit Authority and the Metropolitan Atlanta Rapid Transit Authority system is based on BART's blueprint (BART, 2024a, 2024e).

Several stakeholders are responsible for managing funding, safety, and performance of BART. The Regional Transportation District is funded by public sources and has oversight of BART (2024c). The Regional Transportation District is run by an elected Board of Directors and non-union staff. The General Manager is the chief executive officer of BART and reports to the nine-member Regional Transportation District Board of Directors. Members of the Regional

Transportation District Board of Directors represent and advocate for their district, and make decisions regarding major businesses in their districts, such as stadiums and housing (BART, 2024b). In addition to the Regional Transportation District Board of Directors and BART General Manager, the governor of California appoints an Inspector General, who conducts performance audits to analyze the efficiency and effectiveness of BART and who investigates fraud, waste, and abuse by BART (2024d, 2024c). The BART (2024c) receives funding from passenger and parking revenues, taxes, voter approved bonds, and local, state and federal governments. Financial assistance from the government supports the operation and maintenance of BART and its capital budget funds the construction, expansion, renovation, or replacement of BART's physical assets.

Unions

Three unions represent BART workers: (a) Amalgamated Transit Union (ATU) Local 1555, (b) joint counsel Service Employees International Union (SEIU) Local 1021, and (c) American Federation of State, County and Municipal Employees (AFSCME) Local 3993. The SEIU joint counsel has a professional chapter, and the chapter represents maintenance and clerical workers. The trades covered under SEIU 1021 are building workers; electrical helpers; quality team leaders; structures workers; system service workers; track workers; transit vehicle electronic technicians; transit vehicle mechanics; utility workers; and vehicle inspectors. The SEIU's publicly available handbook, which is outdated, outlines the union and member responsibilities and expectations for pay negotiation, work pace and safety, job security and pension, and procedure and protection from termination. The SEIU vigorously negotiates working conditions, and pay and cost of living increases, and protects established benefits such as pensions and lifelong health care.

A union representative or shop steward is an employee of an organization or who represents and defends the interests of their fellow employees in an official union member capacity (ATU, 2024a). Shop stewards, often elected by their peers, manage the grievance process through investigating workplace incidents and bringing concerns to management (ATU, 2024b). The relationship between the BART Regional Transportation District and the Unions is complicated. Participants in this study considered themselves as the starting point for worker safety but affirmed that the BART Regional Transportation District and the Union are equally responsible for worker well-being and safety. Participants who were shop stewards had to intervene between the Unions and the BART Regional Transportation District, which were stressful interactions. One participant discussed the emotional strain of being a union representative while also being expected to perform normal job duties. This person sought the assistance of a therapist.

Legislation and Regulatory Agencies

> *"Law has no meaning of relevance outside of society. Laws shape, and are shaped by, the society in which it functions. Laws are made by humans. It protects, controls, burdens, and liberates humans, non-human animals, nature, and inanimate physical objects. Like the humans who make it, Law is biased, noble, aspirational, short sighted, flawed, messy, unclear, brilliant, and constantly changing."* -Patricia Leary, Esq.

Laws shape workplaces and worker health, well-being, and health and safety behaviors. Industry specific occupational health and safety rules are regulated, monitored, and enforced through legislation (MacDermid et al., 2008). Legislated policy and enforcement lower the risk of injuries and promote enhanced work health, safety, and wellbeing (Thierry & Snipes, 2015). Some federal laws and regulations protect workers, such as a federal minimum wage; however, the experiences people have with their employer is largely based on the state in which they live (Economic Policy Institute, 2024). For example, states such as California and Massachusetts

have more proactive laws that favor worker rights and protections. Participants in this study worked in California. While no state is 100% worker friendly, there are some states such as Alabama, Georgia and Tennessee that consistently pass preemption laws suppressing worker rights by preventing the passage of additional laws that would empower workers.

In 2023, Michigan made history as the first state to repeal their "Right to Work" law (Cappalletti, 2023). Right to work laws allow employees to receive full benefits of union membership without requiring them to join a union or paying membership fees for representation. Non-dues paying workers are also represented by the union in contract negotiations and workplace disputes, granting them the "right to work." This is an effective strategy to weaken unions' bargaining power and putting unions at risk for becoming insolvent, as all the core functions of union work require substantial financial resources and commitments that are not guaranteed when workers are not required to pay dues. Workers' rights and unions' bargaining powers are also being eroded at the federal level. The Citizens United v. the Federal Election Commission court case set the precedent for corporate personhood, giving corporations some legal rights and responsibilities as if they were individuals (Citizens United v. the Federal Election Commission, 2010). Protected under the first amendment of the U.S. Constitution, corporations can donate unlimited amounts of money to political campaigns. The creation of political action committees allows large corporations to essentially buy politicians that will pass friendly or block prohibitive business legislation.

The Occupational Safety and Health Administration (OSHA), a federal government regulatory agency, sets and enforces protective workplace safety and health standards through providing workplace standards, information, training, and assistance to employers and workers. The OSHA is the governing body that receives whistleblower complaints, can issue fines, and

perform onsite inspections. The OSHA log is a federal requirement to record and report serious work-related injuries and illnesses including fatalities, hospitalizations, amputations, the loss of an eye (U.S. BLS, 2022b). The railyard of one participant offered a barbecue for workers as a reward for every 100 days that the site was without an OSHA reportable accident.

Strengths and Limitations

Strengths

The researcher being employed as an occupational health nurse is a strength of the study. Through the reflective process, there are things that I understood as important and relevant because of my occupational health work experience and expertise. This experience and expertise helped me to interact with participants through their lens to yield rich insight into their lived experiences as industrial transit workers. This study was as close to "in situ" as possible. It was an amazing opportunity to be allowed to enter BART private spaces and see the BART cars from a relatively unrestricted, wide-ranging view. I attended several pre-shift safety meetings and had casual conversations with managers and workers who were not part of the study. I was also given permission to visit the local union chapter SEIU 1021 location as well as the main BART office. I attended a couple of the BART Regional Transportation District Board of Directors meetings.

To receive affirmation and approval from the union and the BART leadership about the importance of conducting this study was another strength of the study. They allowed me to recruit for the study during the workers' shifts—allowing workers during paid time to learn about the study. One participant noted that the BART receives and rejects several requests for a variety of reasons to access its workers, worksites, and resources. I was allowed unconstrained entrée and access, which allowed the researcher to examine the collective experiences of workers in a shared time and physical workspace. Another strength of the study was the data were coded, and

themes were identified with guidance from a qualitative research expert who was a member of the researcher's dissertation committee.

Limitations

Research limitations occur for all studies due to many factors—research design, sample size and sampling, setting, methodology, funding, or practical restraints (e.g., doctoral studies). No single study can do more than offer partial contribution of new insight to the body of science on the topic (Willig, 2012). The study population of industrial transit workers—electricians and transit vehicle mechanics—was preselected by the BART and the union. Neither the BART nor the union provided reasons for why they selected these two groups of workers. The entire population of electricians and transit vehicle mechanics comprised approximately 150 persons. I was able to interact with 124 (83%) workers on recruitment days although only nine agreed to be interviewed. Transit vehicle mechanics outnumbered electricians; only one participant was female; no participants were interviewed at one railyard; no participants worked the night shift; and this was an older and experienced sample of workers. I did not reach out to workers who did not show for work, or who were on vacation, disability, or another type of leave of absence. Recruitment was limited to the workers who showed up for work on the days of recruitment. Thus, generalization of the study findings to the broader population of industrial transit workers is limited, particularly for female, younger and recently hired workers, workers who work the night shift, and those who are not electricians and transit vehicle mechanics.

In qualitative research, who is and who is not in the sample is a social construct that is influenced by participants, researchers, and people in the broader contexts or environments such as the union and the leadership for this study (Braun & Clark, 2021). Although data saturation was reached, themes derived from the data were not examined by railyard location, shift worked,

job tenure, gender, race/ethnicity, or other easily, recognizable defining demographic characteristics that could deidentify participants because of the small sample size. Finding outliers and negative cases for alternate explanations was not possible with this sample constitution and size. The cross-sectional design of this qualitative study contributed to not being able to determine cause and effect and to analyze behavior over a period of time. Moreover, the timing of the snapshot of the lived work experiences of the study participants is not guaranteed to be representative of the larger industrial transit population.

Although study data were coded and themes were identified with guidance from a qualitative research expert who was a member of my doctoral dissertation committee, allowing for data analysis consistency, this data analytic approach did not provide for multiple perspectives of the data from other researchers, experts, and/or the participants. A singular perspective prevents counterarguments and alternative explanations, limiting the generalizability of the study findings and the internal validity of the study (Braun & Clarke, 2021).

Implications for Research, Practice, Education, Leadership, and Policy

There is a need for worker well-being and wellness programs to address the physical health, mental health, lifestyle health behavior, and safety needs of workers, regardless of whether they seek advice, support, health care, and training and education, complain about work conditions, or report adverse work events (Campbell Institute, 2017). Worksites serve as optimal environments to implement population level interventions, and to evaluate the impacts on worker health, well-being, and health and safety behaviors to prevent premature disability, morbidity, and mortality from noncommunicable diseases. There are national worker well-being initiatives that are practice-, research-, and policy-focused that can be used as guidance to develop local,

worksite-specific programs. Two such initiatives are the Research Agenda (NORA) for Healthy Work Design and Well-Being Cross-Sector Council and the NIOSH Hierarchy of Controls.

The widely accepted NIOSH Hierarchy of Controls (Figure 5.1) outlines levels of controls that industries and employers can implement, from the least to the most effective controls or systems, to protect workers from injuries and illness (NIOSH, 2024). The least effective control to protect workers is PPE. In this study, PPE controls were in place; however, a few workers did not use the required PPE, which was available and functional at the worksite.

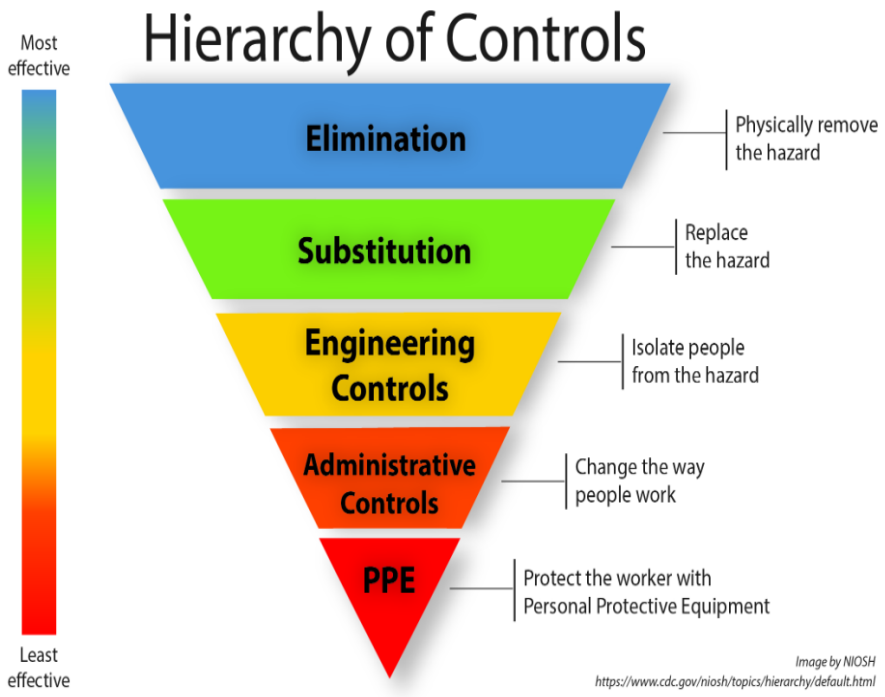

Fig. 5.1 *NIOSH Hierarchy of Controls to Protect Workers*

Administrative controls, systems to change the way people work, were employed for participants who were mechanics and worked on the move crew. These workers used lifting tools and built custom tools for heavy equipment. The use of engineering, substitution, and elimination controls instituted in the workplace were not reported by the participants. These types of controls are the most effective to prevent, protect and control worker injury and illness, but are the least

likely to be implemented by employers. There needs to be a deliberate effort by employers to plan, budget, implement, and evaluate the impact of more effective types of control on worker health, well-being, behavior, and safety.

The NORA for Healthy Work Design and Well-Being Cross-Sector Council, in partnership with NIOSH, champions research that guides the development of evidence-based, effective and practical tools and integrative approaches that multidimensional organizations can use to assess and address sources of physical, emotional, mental, economic, social, and occupational stressors to improve worker health and well-being (NORA & NIOSH, 2023, 2024). This framework can be used to develop a continuous quality improvement process to evaluate performance processes and outcomes, and create a workspace in which management and workers strive to improve quality by systematically and regularly examining common causes of variation for worker harms, injuries and illnesses; evaluate test of changes on organizational culture; quantify outcomes, using statistical analysis to identify and detail strengths and improvement opportunities; develop solutions; receive system, process and worker feedback; and share successes and lessons learned.

Program planning and continuous quality improvement to protect workers from harm, injury, illness, and disability is a task well-suited for advanced practice occupational health nurses, who can rigorously and systematically examine upstream, structural determinants of worker health, well-being and safety at both individual and population levels. Understanding the environment and its impact on those who are interacting in the environment is one of the pillars of the metaparadigm of nursing (Adler & Castro, 2019; Ross & Barnes, 2018). Equipping occupational health nurses with the knowledge and skills to advance worker health and safety serves as a significant deterrent for industrial and occupational harm, builds a gateway toward

early injury detection and referral to adequate care, and provides meaningful rehabilitation and safe return to work. This needed knowledge and skillset can be further expanded upon as nursing education transitions to the Doctor of Nursing practice degree, which focuses on improving access to care, quality of care, health equity, and other health challenges, not only from an individual level but also from a systems level (American Association of Colleges of Nursing, 2021).

Current educational, practice, research, leadership, and policy models for occupational health nursing, while classic and are the foundation upon which the discipline is built, are in need of reimagining with a mix of traditional and newer strategies to protect workers, promote worker health and safety behaviors, and ensure worker health and well-being proactively instead of reacting to the needs of the workforce when systems and its people are dysfunctional, are experiencing poor outcomes, and are in need of more human, capital, and funding resources. Current worker health and well-being and wellness programs and initiatives are not adequately responding to our changing post-COVID-19 pandemic work-world and its workers.

Traditional occupational health nursing strategies are still relevant such as worker health and well-being or wellness programs although more cognitive behavioral therapy and peer support networks need to be incorporated into these programs to deal with workers' mental health as indicated in this study and the literature (Cullen et al., 2018). There needs to be more focus on fostering a culture of early engagement in health care to deal with workers' coexisting with chronic pain and other musculoskeletal and physical health needs that are not to the point of workers' detriment as was found in this study and in the literature (Siegrist & Árvai, 2020). Worker orientation, education, training, and staff development are still needed, along with developing and implementing safety procedures; facilitating incident reporting and promoting

safety awareness; using visual displays of accident-free days posted at worksites to track safety performance; ensuring that systems controls are in place; compliance monitoring and tracking; identifying and assessing hazards; and advocating for policies and legislation that protect workers' health and safety.

Newer or more contemporary strategies that incorporate responsible and ethical use of technology that can be employed include using artificial intelligence (AI) and machine language to predict potential hazards and maintenance needs, allowing preemptive action. AI-driven virtual assistants can be used to provide real-time guidance and support to workers, ensuring adherence to safety protocols. Real-time alerts provided by personal assistant devices, such as mobile phones and tablet devices, can be used to locate and respond to adverse work events for workers and managers. Mindfulness and stress reduction training and programs, including aromatherapy, can be implemented to prevent, maintain and deal with workers' mental health and well-being. Occupational health nurses with specialized mental health training could provide access to remote, on-demand counseling and mental health support via telecommunications platforms. Perhaps, these psychological approaches might be better accepted than traditional psychological approaches and therapies that often involve intense, face-to-face interactions.

Immersive virtual reality training and advanced training simulations could be used for workers to practice and receive feedback on their responses to real-world emergency scenarios and high-risk situations. Health monitoring wearables, such as devices that continuously monitor vital signs, fatigue, and stress, could be explored, particularly if these devices are able to send alerts if parameters are outside safe limits. Lastly surveillance drones could patrol high-risk areas, detecting hazards or unauthorized access to dangerous areas, such as the electrical third rail noted by some study participants. These drones could be equipped with real-time video that

feeds to control centers. Occupational health nurses, managers, and workers will need education and training on how to use these technologies.

Conclusion

The conditions of employment impacted this sample of industrial transit workers' well-being in the context of structures that connected their experiences in a shared time and physical workspace. While they perceived health as their ability to work for as long as they chose, they often worked with chronic pain without utilizing available lifelong health care. While these electricians and transit vehicle mechanics were highly skilled, experienced workers, they occasionally normalized work hazards to their detriment. They deferred to their colleagues and the institution over taking care of their own health needs. This deference comported with their principles of work ethics, justice, and equity. Diagnosed mental health conditions were not as readily acknowledged as were physical health conditions, although they said it was not due to fear of stigma or rejection by others. Many workers did not have a primary care provider because they felt there was no need since they engaged in lifestyle health behaviors that reduced their risk for developing illness. Strong union representation and general satisfaction with employer benefits enhanced workers' sense of well-being. There is much occupational health nurses could do, using a mix of traditional and newer strategies, to enhance worker health, well-being, and safety. Current worker health and well-being and wellness programs and initiatives are not adequately responding to our changing post-COVID-19 pandemic work-world and its workers.

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Appendix A
Consent Form

UNIVERSITY OF CALIFORNIA, SAN FRANCISCO
CONSENT TO PARTICIPATE IN A RESEARCH STUDY

Study Title: Social Influence on the Physical and Psychological Experience of Occupational Burnout among Electricians and Transit Vehicle Mechanics in Urban Transit

Research Project Director:	Dr. Oi Saeng Hong, Professor and Director of PhD Program UCSF, Room 531 D, 2 Koret Way, San Francisco, CA. Phone: 415.502.5581 e-mail: OiSaeng.Hong@ucsf.edu

Study Coordinator:	Brianna Singleton, RN, MPH, AGPCNP-BC e-mail: Brianna.Singleton@ucsf.edu

This is a research study to understand how social experiences impact workers' perceptions of occupational stress. This research study also intends to characterize which physical, mental and emotional responses to burnout are most common in your occupation. The study researcher, Brianna Singleton, RN, PHN, MPH, AGPCNP-BC, from the Department of Community Health Systems, within the School of Nursing at the University of California, San Francisco will explain this study to you.

Research studies include only people who choose to take part. Please take your time to make your decision about participating, and discuss your decision with your family or friends if you wish. If you have any questions, you may ask the researchers.

Why is this study being done?

The study researcher, Brianna Singleton, designed a health and safety survey for transit workers at the Washington Metropolitan Area Transit Authority (Metro) in 2016. Two primary findings revealed 75% of participants felt that work-related stress was impacting their home life and that 52% of the workers have worked when they felt tired or ill.

The purpose of this study is to further expand knowledge of how work and home stress contribute to feelings of occupational burnout.

You are being asked to take part in this study because you are currently a full or part-time electrician or transit vehicle mechanic at the Bay Area Rapid Transit. In the previous study, the researcher observed that operators and non-operator have different stressors. In order to narrow the variability in work task, it was decided to focus this research project on workers with the job titles 'electrician' and 'transit vehicle mechanics'.

This is an independent research project done through the School of Nursing at the University of California, San Francisco.

Funding for this project is provided by The Southern California NIOSH Education and Research Center. Neither BART nor Service Employees International Union 1012 are paying this study.

There are no other financial disclosures.

How many people will take part in this study?

It is expected that 20 workers will participate in interviews during January 2023 and December 2023.

What will happen if I take part in this research study?

If you agree to participate in the study, the following procedures will occur.

1. Interviews
    a. Workers will be randomly contacted and asked to participate in a one-hour long interviews.
    b. There are some things about your general health, personal background, work, and home life that cannot be understood by survey questions alone. The purpose of the interviews is to understand those nuances.
    c. IMPORTANT: You do not have to participate in the interviews if you are contacted.
    d. You do not have to share your thoughts, opinions, or responses with you co-workers or supervisor. You do not have to let anyone know if choose, or choose not to, participate in the interviews.
    e. Each interview will last about 1 hour. The researcher will ask you to describe your experiences around work and home life balance.
    f. The researcher will make a sound recording of your conversation. After the interview, someone will type into a computer a transcription of what's on the tape and will remove any mention of names. The sound recording will then be destroyed. The researcher will be the only person who will listen to the interview or read the transcription of the interview.
    g. If you wish, there will be time at the end of the interview, which is not recorded, where you can debrief about you experience or ask questions.
        i. **Study location:** Interviews will be conducted at public locations as mutually agreed upon by the researcher and participant. If a meeting in person proves challenging, interviews over the phone can be arranged.

How long will I be in the study?

Interviews will last one hour each, to answer questions about you work and home life. You may be asked to participate in one or two follow-up interviews.

Can I stop being in the study?

It is important to reiterate that this is an independent research study conducted by researchers at the University of California, San Francisco. Your participation is completely voluntary and has no bearing on your job, work performance, or work evaluations.

You can decide to stop at any time. You do not have to share your thoughts, opinions, or responses with you co-workers or supervisor. You do not have to let anyone know if choose, or choose not to, participate in the research study.

Also, the study researcher may stop you from taking part in this study at any time if he or she believes it is in your best interest, if you do not follow the study rules, or if the study is stopped.

What side effects or risks can I expect from being in the study?

- Confidentiality: Your identity and research records will be kept as confidential as is possible. The information that you give will be coded with a number to help protect your privacy and that your responses can be tracked over time. Only the study staff will have access to the study files and completed surveys. At no time will any public reports about the study mention your name or the names of other participants. Any location information that you provide will be kept in locked or password protected files.
- Sharing Results: Periodically, the researcher will compile all of the information and share, in the form of a report and presentation with BART management and SEIU, 1021. At the completion of the project, results will be made available to all worker. No report or presentation will contain any identifying information about participants.
- Some of the discussion or interview questions may make you uncomfortable or upset, but you are free to decline to answer any questions you do not wish to answer or to leave the interview at any time.
- You will not be asked to reveal any behaviors related to illegal drug use, criminal behaviors, or offenses that may result in
- For more information about risks and side effects, ask one of the researchers.

Are there benefits to taking part in the study?

There will be no direct health benefit to you from participating in this study.

The information that you provide may help us to understand how work and home stress may impact health functioning, and if research findings can do anything to fix that.

What other choices do I have if I do not take part in this study?

You are free to choose not to participate in the study. If you decide not to take part in this study, there will be no penalty to you. This study has no impact on your job.

Will information about me be kept private?

We will do our best to make sure that the personal information gathered for this study is kept private. However, we cannot guarantee total privacy. Your personal information may be given out if required by law. If information from this study is published or presented at scientific meetings, your name and other personal information will not be used.

Important: No information about you will be reported back to your manager, supervisor or place of employment.

Authorized representatives from the following organizations may review your research data for the purpose of monitoring or managing the conduct of this study:

• Representatives of the University of California

Are there any costs to me for taking part in this study?

No. The sponsor has agreed to pay for all items associated with this research study.

Will I be paid for taking part in this study?

In return for your time and effort and travel expenses for participating in interviews, you will be compensated with $25 gift cards for the completed interview.

What are my rights if I take part in this study?

Taking part in this study is your choice. You may choose either to take part or not to take part in the study. If you decide to take part in this study, you may leave the study at any time. No matter what decision you make, there will be no penalty to you in any way. You will not lose any of your regular benefits, and you can still get your care from our institution the way you usually do.

Who can answer my questions about the study?

You can talk to the researcher about any questions, concerns, or complaints you have about this study. Contact the researcher, Brianna Singleton at Brianna.Singleton@ucsf.edu.

If you wish to ask questions about the study or your rights as a research participant to someone other than the researchers or if you wish to voice any problems or concerns you may have about the study, please call the Institutional Review Board at 415-476-1814.

CONSENT

This is your copy of the consent form for your records.

PARTICIPATION IN RESEARCH IS VOLUNTARY. You have the right to decline to be in this study, or to withdraw from it at any point without penalty or loss of benefits to which you are otherwise entitled.

Appendix B

Demographics Form

What is your job classification?

_____Electrician
_____Transit Vehicle Mechanic

Which location do you work at?

_____Concord
_____Daly City
_____Hayward
_____Oakland
_____Richmond

What is your gender? Female___ Male____ Transgender ___ Non-Binary____ Other_____

How long have you worked at BART? _____Years _____Months

Which best describes your employment status:

____Full time ____Part time ____Temporary ____Contractor

Which shift are you working today/ tonight? ____Day ____Evening ____Night

How many hours are you going to work this week? _____ Hours

How old are you? _____ Years old

What is your marital status? Single ___ Married ___ Divorced ___ Domestic Partnership ___

What is your race/ ethnicity? _____

When do you plan to quit, leave, or retire from your current position?

____In the next year
____Within the next 5 years
____In the next 5 — 10 years
____In 10 years or more
____Not Sure

Appendix C

Contact Form

If you would like to participate in an interview, please leave your contact information here:

Name: _____

Phone Number: _____

Where do you work:_____

What shift do you work: _____

What is the best time to call you: _____

Can I leave a voice message: _____

Can I send a text: _____

Appendix D

Interview Guide

1. Is this your first job?
2. Describe your daily responsibilities at BART.
    a. Follow-up: Does this require minimal, moderate, or maximal effort? Explain.
3. How would you describe the pace of your job?
    a. Follow-up: How would you describe the environment.
4. If you were a supervisor, how could you improve the workflow of the job?
5. How does your supervisor respond to issues?
    a. Follow-up: Is the response usually proactive or reactive? Positive or negative?
6. What are some of the strategies you use to stay safe at work?
    a. Follow-up: Are you provided everything you need to stay safe, or do come up with solutions to keep yourself safe?
7. Can you describe a situation in which you weren't comfortable in performing a job task?
8. How do you collaborate with your co-workers to solve problems on the job?
    a. Follow-up: How do you collaborate with your supervisor to solve safety problems on the job?
9. Have you ever been injured at work?
10. What is your definition of health
    a. Follow-up: By your definition, are you healthy?
11. Describe any health or wellness practices you do.
12. Describe your thoughts about work when you go home after your shift?
    a. Follow-up: Do you feel physically fatigued at the end of the day?
13. Describe other ways work has impacted your health or relationships?
14. How do you relax during your free time?
15. Would you recommend this job to a friend?
    a. Follow-up: Why or why not?

Appendix E

Codebook

Theme	Description	Cluster of Supportive Codes			Negative or Unique Cases			Dominant Code of the Cluster
		Code	Files	Ref.	Code	Files	Ref.	
Normalization of occupational hazards	Codes relate to aspects of the job that either increase or decrease a worker's exposure to occupational harm	Structure of job	5	5	Structure of job	6	16	Awareness of hazards and the structure of the job
		Fear and caution	7	10	Inexperience	2	4	
		PPE Use	3	3	Previous injury	1	1	
		Tools	7	11	Asserting bound	5	11	
		Training	4	7	Raising awareness	2	2	
		Awareness of hazards	9	23				
		Knowledge/Skills	6	8				
		Confidence/ Expertise	2	4				
		Merit and skill	5	6				
		Asking for help	5	8				
Direct relationship to harm	Codes connect anecdotes of direct an indirect experiences with work related injuries	Experience with management	3	3				Non-disabling injuries and seeking help
		Healthcare experience	4	5				
		Co-workers	4	8				
		Non-disabling	5	11				
		Seeking help	7	14				
Aging in the workforce	Codes relate to physical changes in the body over time	Positive outlook	3	7	Negative outlook	8	15	Non-musculoskeletal (MSK) ailments
		Body mechanics	3	4	Health status, non-MSK	9	19	
					Misc. illness	2	4	
					Chronic pain	4	10	
					Physical inability	8	13	
Ability to make and sustain future plans	Codes relate to plans after leaving their current job position	Finances	4	4	Forced	1	1	Pay and benefits
		Promotion	3	6	Inability	1	1	
		Pay Benefits	9	20				
		Retirement	8	13				
Relationship with others outside work	Codes connect references to personal relationships	Family (+)	4	4	Family (-)	5	7	Family life
					Family life	1	1	
Relationship with others within work	Codes connect references to employees interactions with others on the job	Social connections (+)	5	11	Social connections (-)	6	16	Positive and negative social connections
		Neutral social connections	2	4	Union rep (-)	2	4	
		Union rep (+)	5	5	Fairness	4	8	
		Conflict resolution	5	6				

Theme	Description	Cluster of Supportive Codes			Negative or Unique Cases			Dominant Code of the Cluster
		Code	Files	Ref.	Code	Files	Ref.	
Direct impact on the body	Codes describe perception of how work impacts physical health	Physicality of job	8	20				Physicality of job
		Work imp. health	5	7				
		Impact on shifts	7	10				
Mental health: internal self-awareness	Codes related to voiced internal reflections of aspects of wellbeing	Control	2	2	Boredom	1	1	Health beliefs
		Esteem	7	10	Not seeking care	3	3	
		Stimulation	3	4				
		Health beliefs	8	30				
		Self-reflect	3	3				
		Seeking help	5	9				
		Work thought	6	12				
Mental health: access to	Codes relate to experience with accessing mental health care	Delay care	3	6				Delay care
Individual control of health behaviors	Codes related to observable behaviors with intention to address health	Hobbies	7	19	Expression of emotion (-)	2	3	Contemplating accessing care
		Heal thyself	4	6	No expression	3	3	
		No substance use	5	7				
		Engage in health	5	9				
		Contemplating	8	9				
		Commuting	4	8				

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