Job Performance and Self-Efficacy of Final Assembly Workers in Southeastern Automobile Manufacturing Facilities

by

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Abstract

This study investigated the relationships between final assembly workers' job performance and self-efficacy as assessed by self-reported job performance and general self-efficacy instruments. Study participants were selected based on their employment at one of the Southeastern United States automobile manufacturing facilities primarily located in Alabama, Georgia, and South Carolina. A multivariate analysis of variance (MANOVA) was used to look for statistically significant differences in job performance or self-efficacy based on group membership in either of the independent variables (facility, job function, education level, race/ethnicity). The findings indicated that there were statistically significant differences in the two measures (job performance and self-efficacy) based on the facility where study participants were employed, their job functions, levels of education, and their race and ethnicity. Recommendations for practice and future research were discussed in the context of major adult education theories.

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In loving memory of my momma, Wanda Sellars.

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List of Abbreviations

NGSE	New General Self-Efficacy
SRMJP	Self-Reported Measures of Job Performance
NAICS	North American Industry Classification System
BLS	Bureau of Labor Statistics
MANOVA	Multivariate Analysis of Variance
ANOVA	Analysis of Variance
AMTEC	Automotive Manufacturing Technical Education Collaborative

CHAPTER I

INTRODUCTION

The American automotive industry contributes several million people to the American workforce and billions of dollars to its economy. According to the Bureau of Labor Statistics (BLS, 2020), the American automotive industry was employer to nearly 7.4 million individuals in 2019 (BLS). While the automotive industry was not officially designated by the North American Industry Classification System (NAICS), it was loosely defined by the Bureau of Labor Statistics (BLS) for reporting purposes (BLS). According to the United States Census Bureau, the primary purpose of the NAICS was to standardize the way differing government agencies classified and grouped business bodies for statistical analysis of the country's economy (United States Census Bureau, 2021). This was important to aid in understanding all of the bodies, businesses, and organizations that comprise the automotive industry. Based on the NAICS' classification, it can be determined that the industry was not merely anecdotally large but legitimately large based on the standardized way in which the industry was classified.

To further illustrate the impact of the American automotive industry, consider the federal government's response to the 2008-2009 financial crisis. As countries around the globe were injecting stimuli into their respective auto industries to avoid collapses, the American automotive industry provided an outright bailout for manufacturers, fearful that their demise would have a dramatic and lasting negative effect on suppliers and other industries (Stanford, 2010).
Hill et al. also shared information that discussed the the scope and significance that the collective US automotive industry had on the American job market (2010). Their data suggested that between direct employment, intermediate employment, and spinoff employment, the industry

served as an employer to over 7.9 million individuals that worked directly for manufacturers, a number that was slightly higher than reported nine years later by the BLS (Hill et al., 2010). The individuals counted in both BLS' figures from 2020 and Hill et al. in 2010 were identified as having worked in areas that were tasked with manufacturing individual parts and components used in vehicle production to the final assembly of automobiles (Hill et al., 2010). In addition, these individuals worked in areas that focused on company and organizational management, scientific inquiry and research & development, supply chain management, administrative, facilities, and support services. The roles mentioned above were the types that were commonly considered to be direct employment jobs, as the individuals in those roles were hired by, earned wages, and received benefits directly from the manufacturers.

Intermediate employment roles within the industry accounted for nearly 1.1 million jobs within the US automotive industry alone in the late 2000s. Suppliers were companies that manufactured and produced parts from raw materials using their professional and technical expertise that were ultimately used in the production of automobile parts and materials. These type of companies were considered the intermediate sector of the automotive industry (Hill et al., 2010). Spin-off employment was made up of automobile maintenance and repair shops, facilities, and wholesale entities that distributed and sold automobiles (Auto Alliance, 2018).

As automobile manufacturing in the United States continued its trajectory to be one of the most significant sectors in jobs and one of the biggest contributors to states' economic bottom-lines, states like Alabama, Kentucky, Mississippi, South Carolina, Tennessee, and Georgia were partnering with their local two-year institutions and trades-schools to offer academic and technical training programs that were specifically tailored toward preparing individuals for work

in manufacturing and training. Understanding the growing impact that the Southeast had on the automotive industry within the United States, Rutherford and Holmes discussed the importance of resiliency of the automotive manufacturing industry while also highlighting the impact the industry had on the American economy (2014). In 2018, the Auto Alliance found that the automotive manufacturing industry within the United States alone was responsible for 9.93 million jobs. This number was up nearly 3 million compared to those data previously reported approximately eight years earlier by Hill et al. (2010). Those jobs were responsible for 612 billion dollars in labor income annually (Auto Alliance, 2018).

Forty-four of the country's 50 states had auto-manufacturing-related jobs; and, the automotive industry was ultimately responsible for 6% of the country's gross domestic product (GDP) (Auto Alliance, 2018). In Alabama, the auto industry was responsible for 5.1% of the state's 133,337 person workforce and 7.15 billion dollars in labor income. The automotive industry in Georgia was responsible for 3.6% of the workforce in the state, 11.22 billion dollars in labor income, and a total of 220,310 jobs. Kentucky, the state in this study with the most manufacturing facilities of all those surveyed, had its automotive industry make up 6.3% of the workforce, or 157,759 jobs, for 9.25 billion dollars in labor income. Mississippi's automotive industry made up 4.4% of the state's workforce for a total of 68,687 jobs or 3.44 billion dollars in labor income. South Carolina's automotive industry made up 4.1% of the state's workforce for a total of 113,265 jobs and 5.88 billion dollars in labor income. Tennessee's workforce had 5.3% of its workforce contributed to by the automotive industry for 212,639 individual jobs and a total of 13.74 billion dollars in labor income (Auto Alliance, 2018).

Background on Training and Education in Automotive Industry

Assembly workers in automobile final and general assembly plants brought their previous educational attainment and training to the job. Mori and Kikuchi (1992) provided an undergirding for understanding how the automotive industry would later evolve into one that required a skilled labor force that was able to quickly adapt to and implement increasing technological means of production and manufacturing within the field. With this increase in technology and advancements in manufacturing practices, research needed to be conducted to understand how attitudes affected job performance and training needs across the industry (Judge et al., 1998).

In the past, researchers studied ways in which future on-the-job training could positively affect the efficiency and effectiveness of final assembly line workers' performance on the job. Cooney (1997) argued that firms, specifically those within the Australian market, would need to dramatically rethink how they trained final assembly line workers to better compete in the global market. Further, Hermawati et al. (2015) argued that the increased technological components of modern-day automobiles required advanced training techniques beyond the traditional skilled laborer and vocational training programs.

There have been several studies where the authors discussed the incipiency and importance of virtual training as the preferred and most economical way to train individuals within the automotive industry (Hermawati et al., 2015; Ordaz et al., 2015; Carruth, 2017; Gorecky et al., 2015). Gorecky et al. (2015) further argued that virtual training would lead to better overall training for employees and reduce costs associated with the manufacturing process.

Statement of the Problem

While there were significant changes within actual vehicles that precipitated a discussion on how the automotive industry itself was in the process of changing, discussions in the mid-2000s caused scholars and those within the industry to assess how a potential shortage of skilled workers would negatively affect the industry (Chen, 2020). Some scholars suggested that the best way to fill the skills gap — to best prepare individuals for roles in automotive manufacturing — was to engage community colleges and allow them to lead the education and training for these roles (Chen, 2020). However, there remained a gap in the literature that focused on how final assembly workers felt about their abilities to learn and implement new tasks and new information and how they viewed their performance in their roles as final assembly workers. The skills gap was expected to create a shortfall of skilled workers to the tune of 2,000,000 workers by 2021 (Giffi et al., 2015). Many other employers across varying industries have expressed their concerns about the skills gap, and that increases in technology both in the workplace and in the products being manufactured, built, and created were causing the increase in the skills gap and limited abilities of workers (Schoene, 2012).

There was also an imminent shift within the automotive industry that was predicated on the need to increase operational efficiencies and competitiveness with other manufacturers while decreasing costs associated with production and overall vehicle emissions. Gorecky et al. wrote about the need for manufacturers to reduce costs associated with automobile manufacturing; and, they suggested that one way this could be done was through more intentional and effective ways of training that reduced time, errors, and defects in manufacturing and reduce the resources needed to provide those training experiences (2015).

With the global community concerned with climate change, most manufacturers were beginning to seek ways to maintain — and even increase — market share while simultaneously meeting the aforementioned goals centered around environmental conscientiousness and energy efficiencies. Thus, the automotive industry found it necessary to implement effective and efficient training to ensure its skilled laborers were successful in the final assembly of vehicles for distribution and sales while simultaneously reducing overhead costs.

The automotive manufacturing industry in Alabama was considered to be both robust and thriving, as there were several facilities in the state with more on the horizon. Despite the nature of the automotive industry in the state, there was no literature that aids in understanding how employees' attitudes of themselves (self-efficacy) affect job performance or how educational attainment played a role in that job performance. One of the driving questions in the present study asked if there were considerable or significant gaps in how individuals of varying educational backgrounds performed in their roles in automobile manufacturing final assembly plants? What role did self-efficacy, as a whole, play in job performance? How could future training address the needs of the industry to increase performance, productivity, and firms' bottom lines?

Theoretical Perspective

In its most basic definition, self-efficacy had been described as an individual's belief that he or she could effectuate tasks or behaviors that led to or produced specific outcomes (Bandura 1977; Carey & Forsyth, 2009). Self-efficacy was similarly defined as an individual believing they could deliver an expected level of performance or an outcome (Bandura, 1977, Judge et al., 2007). Researchers Stajkovic and Luthans suggested that there was a correlational relationship

between self-efficacy and job performance (1998). Other researchers, such as Martocchio and Judge, found that self-efficacy also informed the training outcomes of individuals (1997). Still, others were cited as equating a positive relationship with self-efficacy and job outcomes (Beattie et al., 2016). Having this background and knowledge, researchers could begin to understand the importance of building employees' self-efficacy to increase their job performance. Self-efficacy could potentially be the key to understanding how to best implement training that provided greater effectiveness on the job (Brennan et al., 2019; Zaki et al., 2019).

Perhaps one of the most significant challenges was a lack of understanding by industry leaders on the impacts of self-efficacy in outcomes and performance. Some programs had relative success with bringing about the workforce needed to fill positions within manufacturing jobs in the automotive industry (Stratos et al., 2016; BMW, 2021). Despite some studies on the effectiveness of a handful of training programs within automobile final assembly manufacturing facilities, none of the readily available research appeared to question the effects of self-efficacy and educational attainment on self-reported ratings of job performance measures.

In this study, the focus was to understand how workers' self-reported measurements of job performance correlated with their self-efficacy scores. In addition, there was a focus that was concerned with how educational attainment affected both job performance and self-efficacy. Ng and Feldman questioned the relevance and importance of educational attainment on job performance, as there had been very little research that sought to address the interaction between the two measures at the time of their study (2009). For this reason, I felt that it was essential to test for significant interactions between educational attainment, attitudes or beliefs about

individuals' abilities to do the work tasked to final assembly line workers, and self-reported ratings of job performance.

Data Analysis Plan and Overview

This study used a multivariate analysis of variance (MANOVA) to test for significant differences in job performance and self-efficacy based on the educational attainment of final assembly workers located in the Southeastern region of the United States. This study surveyed final assembly workers of automobile manufacturing plants located in the Southeastern part of the United States to understand if respondents' New General Self-Efficacy scores and their self-reported measures of job performance were significantly different based on respondents' levels of educational attainment. The New General Self-Efficacy (NGSE) instrument by Chen et al. (2001) and the Self-Reported Measure of Job Performance (SRMJP) scale (Carlos & Rodrigues, 2016) were used to understand participants' levels of self-efficacy and their beliefs about their job performance in automotive, general assembly. Participants for this study were chosen based on whether they were employed as final assembly workers at any of the region's automobile manufacturing facilities. In addition, each participant needed to be employed as a general assembly worker for a minimum of three months.

A Qualtrics survey was created and distributed to final assembly employees of plants in Alabama, Georgia, Kentucky, Mississippi, South Carolina, and Tennessee. These were the locations that housed one or more automobile final assembly manufacturing facilities. Those who were employed as managers, administrators, building support (custodial, grounds, building repair/maintenance), or other positions not involved in the literal final assembly process were not chosen to participate in this study. For the sake of this study, general and final assembly workers

were defined as those who were involved in the final stages of vehicle production and assembly using vehicle components that resulted in the total construction and preparedness of the vehicle for distribution and sale. The term general or final assembly line worker did not refer to any individual who worked at any number of suppliers that supplied parts or pre-built components such as engines, transmissions, electronic components, safety components, et cetera. Note that the terms final assembly worker and general assembly worker have been used interchangeably within this work.

Similarly, the phrases final assembly and general assembly were used interchangeably in this work. Final assembly facilities are where all components come together to complete the production of a vehicle before distribution and its retail sale. Participants were initially solicited through contacts who had close connections with friends and family at the locations that perform final vehicle assembly. Eventually, I sought to find study participants using social media posts, snowball sampling, word of mouth, and purposive sampling.

A historical literature review focusing on the automotive industry, manufacturing, and self-efficacy was conducted to understand, in greater detail, each of these areas of interest and to identify in what ways the literature failed to address the relationship between self-efficacy, job performance, and educational attainment within a sector of the manufacturing industry. As a whole, the literature focused on ways in which the automotive industry, from a historical perspective and the perspective that the industry would operate as it had, may seek to train individuals in a more effective yet more efficient way by implementing virtual training methods (Hermawati et al., 2015). Vocational education entities and training arms of manufacturing firms

should seek ways to encourage greater educational attainment, including certificates, licenses, and societal memberships focused on industry best practices.

Purpose of the Study

The purpose of this study was to investigate the relationship between final assembly workers' self-reported measures of job performance and their self-efficacy scores and whether there were relationships between those two measures. In addition, this study sought to determine whether there were significant differences in the two measures based on age, race and ethnicity, level of educational attainment, the manufacturing facility where respondents were employed, or respondents' job functions within the facility. As mentioned before, self-efficacy was the idea that individuals understood their capacities to execute or perform various tasks (Bandura, 1997). The self-efficacy score, then, would be used to assess whether employees felt they were capable of learning new tasks and responsibilities in their roles within final assembly plants. This study aimed to understand better the potential differences that race and ethnicity, educational background, and age had on employees within the automobile manufacturing industry.

By understanding these potential differences, training could be developed that ultimately led to greater confidence and abilities and increased workplace performance. This research could also be used to inform future human resources training programs that aim to increase employees' job performance. Organizations and bodies that play a role in the training of automobile manufacturing employees may be better equipped to prepare employees for their work while increasing individual job effectiveness, efficiency, and overall performance.

Significance of the Study

As the principal investigator, I sought to examine if correlations existed between final assembly workers' self-efficacy scores and their self-reported job performance ratings and the directions and strength of those correlations. The variables, self-efficacy and job performance, were chosen as part of this study not only because of my interest in the automotive industry, but also because of a hope that they would lead to increased understandings of the academic and technical education needs that would lead to increased efficiency, effectiveness, and success on the job. This goal is especially important as the industry continues its move toward increased technological innovations in design, construction, and vehicle functions that will ultimately rely on a workforce that is confident and competent enough to successfully get the job done. The basis of this body of work was centered around the effects of self-efficacy in workers' beliefs in their ability to perform well in their work environments. In addition to learning how the educational attainment levels of final assembly workers were associated with their self-efficacy and job performance, this study's tertiary goal was to understand how additional demographic markers such as age, race/ethnicity, manufacturing facility, and job function varied in final assembly workers' self-efficacy scores and their job-performance ratings.

This research and its findings may be used to inform how human resource professionals, plant managers, and other leaders within a specified manufacturing facility approach education and training. This study could also inform how practitioners concerned with the development of adult learners prepare for work in the labor market. This study may also be used in vocational education spaces to encourage greater participation and discovery in skilled labor so that employees who eventually work in capacities like those studied here have a developed self-

efficacy that encourages greater confidence in one's abilities that may positively affect job performance.

The findings in this research should also be used to encourage continued collaboration between the automotive industry and institutions that provide vocational education. As they seek employment within the firm and leadership within the firm, both employees will have a better idea of what type of education positively affects one's job performance.

Hypotheses

A set of hypotheses were developed for this study based on theoretical frameworks surrounding self-efficacy, job performance, and the effects of educational attainment on both measures. Those hypotheses are as follows:

Hypothesis 1: Self-reported measures of job performance and self-efficacy scores were not associated.

Hypothesis 2: Age explained none of the variance in final assembly workers' self-reported measures of job performance and their self-efficacy scores.

Hypothesis 3: There were no statistically significant differences in self-reported measures of job performance and self-efficacy scores based on respondents' race or ethnicity.

Hypothesis 4: Educational levels resulted in no statistically significant differences in respondents' self-reported measures of job performance and self-efficacy scores.

Hypothesis 5: Self-reported measures of job performance and self-efficacy scores were not significantly different from manufacturing facility to manufacturing facility.

Hypothesis 6: There were no significant differences in self-reported measures of job performance and self-efficacy scores based on respondents' job functions.

Research Terms and Definitions

Many fields and industries are filled with context-specific terms and jargon. This is true within the automotive industry as well as that of the academic settings. In this section, the most commonly used terms in this research have been listed and defined.

Educational attainment - is the level of education obtained by the final or general assembly employee. The term educational attainment encompasses any government-sanctioned education (Kindergarten through the 12th grade), post-secondary education (2-year community and junior colleges, 4-year institutions and higher). Educational attainment does not focus on certificates and certifications obtained by the general assembly employee.

Final assembly/general assembly - refers to the process by which all components come together for the overall completion of the vehicle for distribution to dealers for direct sales to consumers.

Final or General assembly employee - sometimes referred to as a final or general assembly worker, is any individual employed in a facility engaged in the resultant assembly of automobiles. This term does not include individuals who work in corporate leadership/ management, facilities upkeep and maintenance, or other employees who have job responsibilities at the final assembly facility, but not directly engaged in the final assembly.

Job Performance - is concerned with the way in which general assembly employees view their individual abilities to effectuate their job-specific tasks as assigned by the manufacturer.

Self-efficacy - is described as a belief in one's ability to effectuate a set of actions or behaviors in order to complete a task or meet expectations (Bandura, 1977, 1986)

Research Questions

The following research questions were used to guide this study:

Research Question 1: Was there an association between final assembly workers' self-reported measures of job performance and their self-efficacy scores?

Research Question 2: Was there an association between final assembly workers' age and self-reported measures of job performance, or between age and final assembly workers self-efficacy scores?

Research Question 3: Were there statistically significant differences in final assembly workers' self-reported measures of job performance and their self-efficacy scores based on race or ethnicity?

Research Question 4: Were there statistically significant differences in final assembly workers' self-reported measures of job performance and their self-efficacy scores based on educational attainment?

Research Question 5: Were there statistically significant differences in final assembly workers' self-reported measures of job performance and their self-efficacy scores based on the facilities where they were employed?

Research Question 6: Were there statistically significant differences in final assembly workers' self-reported measures of job performance and their self-efficacy scores based on job function?

In addition, there is also a desire to understand how roles with a greater perceived task complexity are compared to those where job complexities are not perceived to be as complex or labor-intensive. For instance, do those who work in welding report higher or lower self-efficacy scores and job performance scores versus those who work in interior assembly?

CHAPTER II

REVIEW OF RELEVANT RESEARCH

This chapter will focus on reviewing relevant literature to the larger body of work, starting with an introduction to and highlighting the popular theories surrounding adult education. Then there will be a shift toward literature focusing on workforce training and education that will be discussed. After discussing workforce training and education, this work will move toward manufacturing jobs and the economy before discussing automobile production and the automobile industry. This chapter will conclude with a look at the literature surrounding job performance, how it is measured, and how self-efficacy has been used in different fields.

The purpose of this study was to investigate the relationship between final assembly workers' self-reported measures of job performance and their self-efficacy scores and whether there were relationships between those two measures. In addition, this study sought to determine whether there were significant differences in the two measures based on race and ethnicity, age, level of educational attainment, the manufacturing facility where respondents were employed, and respondents' job functions within the facility.

There is considerable research investigating the effects of self-efficacy in the academic and healthcare contexts. However, there was not much work that focused on self-efficacy in other contexts, mainly manufacturing and technology-related work environments. Similarly, there was not much work that discussed job performance in automobile manufacturing or the assessment of employees' performance using self-reported measures of job performance in those settings.

This work seeks to provide a bridge — a path to understanding the potential relationships between educational attainment, self-reported measures of job performance, and self-efficacy. The ultimate goal is to understand not only how self-reported measures of job performance are affected or correlated with self-efficacy but also and eventually how formal and organizational measures of job performance are correlated with self-efficacy. These two variables, self-reported job performance, and self-efficacy were considered juxtapose one against the other. However, they were also considered in the contexts of a specific manufacturing facility, job function, race and ethnicity, age, and educational attainment level.

The Importance and Utility of Theory

Theories provide a basis from which phenomena or situations can be examined. They aid in an ability to implement practices more effectively that bring about the most positive change. Using theory results in less time being spent trying to understand a situation because there is already a body of knowledge or set of principles that inform our understanding. Malcolm Knowles talked about the importance of theory and how it could be used to analyze a group of facts in relation to others, highlight and explain general and abstract principles of a body of fact, is a plausible or scientifically acceptable general principle or body of principles that explain phenomena, while often serving as a hypothesis assumed for the sake of an argument or investigation, and most plainly, an abstract thought (1973). In their work *Theory Follows from Practice: Lessons from the Field*, Sommer and Strong (2016) stated that theory provided a way to get to useful generalizations. Goutrho (2019) stated that theory should be used to better help individuals make sense of a world that is complex and under constant transformation. In Gouthro's 2019 work, she argued that theory, regardless of the discipline, is convoluted, sloppy,

and messy while simultaneously acknowledging the utility of theory in practitioners' work lives and their abilities to understand contextual and societal challenges facing students more effectively.

In adult education, theory has been used to understand how and why adult learners participate in adult education. A few of the most salient theories in the discipline are andragogy, transformative learning, self-directed learning, experiential learning, and project-based learning. Many adult education students understand that Knowles' contribution to the field was considered instrumental to contemporary understandings of adult education (Knowles, 1973, Gouthro, 2019). There are varied beliefs among scholars in their quest to define adult education and how theories about the discipline should be defined and ultimately applied and put into practice. Boeren et al. (2020) described adult education as a first-floor discipline - that is to say that adult education draws its meaning from other social science disciplines like psychology, sociology, and philosophy (Goutrho, 2019). Of course, this analogy assumes that floors are labeled and numbered as they are in Europe (ground floor, 1st floor, 2nd floor, et cetera).

Wang et al. (2019) presented a paper that sought to reinvigorate the discussion about the two theories they argued were most used in adult education contexts - critical theory and transformative learning. Their work asserted that both theories needed further development while simultaneously acknowledging how reliant students and practitioners in the field were on these specific theories. Knowles' stated that early theories in adult education tended to focus on theories about children and how they learned (Knowles, 1973). These theories were "scaled" up or down to account for the mental and social development that took place due to the expected

growth of individuals from a child into an adult (Knowles, 1973). In the next section, the more popular theories in adult education are discussed.

Adult Education and Its Theories

It has been asserted that adult education suffers from "multiple origins" (Ross-Gordon, 2017, p. 27). That is, the field is vast and often exhibits multiple identities and conflicting definitions. In this work, adult education will be defined as "a process whereby persons whose major social roles are characteristic of adult status undertake systematic and sustained learned activities for the purpose of bringing about changes in knowledge, attitudes, values, or skills" (Darkenwald & Merriam, 1982, p. 9); or, to be more inclusive of those who may not be engaged in roles that place them in contemporary understandings of the word "adult" or those who may not actively engage in formal, structured, or organized learning, adult education should be extended to include "activities intentionally designed to bring about learning among those whose age, social roles, or self-perception, define them as adults" (Merriam & Brockett, 1997).

The rather popular or mainstream belief about adult education is that it is often limited to remedial and workforce education. However, adult education is an area that has found itself manifest in many forms and mediums. The obvious ones, those centered around remedial education and those centered around workforce training and development, tend to overshadow some of the more nuanced meanings and expressions of adult education. These often less-obvious meanings include new skills or projects that fall under self-directed learning (Merriam & Bierema, 2014), those that happen outside of formal settings like institutions of higher education that train and educate adults how to be experts in the field of adult education (Marsick et al., 2009), or those that encourage learning a new language for enjoyment. Nevertheless, groups like

the American Association for Adult and Continuing Education work to educate practitioners to be well-prepared to challenge and educate those who lack a complete understanding of the totality of adult education.

Theory of Andragogy

The term andragogy has been traced back to German educator Alexander Kapp, who was quoted as having asserted that andragogy was the education of the man (Loeng, 2017). The word *andragogy* is rooted in the Greek language with *andr-* meaning "man" and *-agōgos* meaning "leader" (Stevenson, 2010). As such, the word itself means "leader of man." However, Knowles' assertion that adults learned differently from children aided in the term andragogy being popularized in the 1970s despite its use being traced back to Europe almost 150 years earlier (Knowles, 1988; Merriam & Brockett, 1997; Loeng, 2017). Knowles himself was introduced to the term andragogy by the Yugoslavian educator, Dusan Savicevic, in 1967; Knowles went on to publish works that aided in popularizing the term a few years later (1970). Although Malcolm Knowles did not coin the term andragogy, no explanation of modern adult education should be considered complete without acknowledging his contributions to the contemporary field.

Adult education scholars Gordon G. Darkenwald and Sharan B. Merriam described andragogy as less of a theory and more of "a set of assumptions and methods pertaining to the process of helping adults learn" (1982, p. 14). However, in its most simple form, andragogy is consistently viewed as an art and a science that emphasizes helping adults learn (Knowles, 1980). Based on this definition, andragogy itself can encompass any intentional way in which an individual or an organization assists with the practice of learning by adults.

The six assumptions of the theory of andragogy list a) a need to know in which students are provided with an understanding of the importance and utility of their learning; b) experience that provides a basis or foundation from which adult learners can draw and aid in their learning; c) self-concept that gives adult learners the ability to be independent and make choices concerning their learning; d) orientation to learning in which learners are able to put into practice their new learning with immediacy; e) motivation to learn which is intrinsic and increasingly focused on life tasks, issues, and other challenges; f) readiness to learn in which learning is focused on the needs of solving everyday problems (Knowles, 1984; Roessger et al., 2020; Tight, 1996).

In automobile manufacturing and training, several of the assumptions of andragogy are met when one considers the training requirements of workers. For instance, the need to know assumption of andragogy presumes that workers need to understand the why of their new learning assignments. While the assumption of self-concept might be thought of as challenging in a role that requires a particular learned behavior or skill, when is is assessed more broadly — "adults have a self-concept of being responsible for their own lives…they develop a deep psychological need to be seen and treated by others as being capable of self-direction" — it is easy to see how workers' self-concept is considered in their roles as both learners and workers who need to be seen as sufficiently capable of self-direction (Knowles, 1989, p. 83).

Similarly, workers are likely to use their experiences in the learning process. They can rely on those experiences to provide them with how previous processes and practices worked, thus giving them a basis for learning the new ones. In addition, when workers learn new skills and processes, it is often because those new skills are almost immediately about to be put into

use as the result of a new model being introduced, or a new streamlined process that increases productivity and safety while minimizing risk and waste is being implemented. As such, this lends itself to workers' readiness to learn. Automobile final assembly workers can display orientation to learning new information or skills, as the new learning often helps overcome existing or newly emergent problems on the assembly line. And finally, workers in automobile assembly plants are encouraged by external factors but are likely motivated by their responsibilities as adults, who can often act as caregivers to parents and children while simultaneously being motivated by their desires to feel confident in their roles and in the quality of their work (Merriam & Brockett, 1997).

Transformative Learning Theory

In their work, *Adult Learning: Linking Theory and Practice*, Merriam and Bierma (2014) stated that transformative learning theory involves, at its core, a learning process of making meaning of one's experiences. Transformative learning, as initially defined by theorist Mezirow, listed ten steps that are involved in the process. The process begins when a rather life-altering event occurs that causes one to question fundamental assumptions of self and the world around them (Mezirow, 1991). This has been described as a "disorienting dilemma" and is considered the first step in Mezirow's transformative learning theory, or a "triggering (of) the process" that is transformative learning (Merriam & Bierma, 2014, p. 84). This eventually leads an individual to question or self-examine assumptions and norms surrounding the issue, followed by a critical assessment of the assumptions held before the disorientating dilemma occurred (Mezirow, 1991). There are competing thoughts on exactly what the steps and realizations are surrounding

transformative learning. However, the premise is universal: one's change in position or stance when viewing themselves or viewing themselves in the grand scheme of things.

Transformational learning theory might be considered a stretch in terms of its use in automobile production. However, in discussing the emergent trends in the automotive industry surrounding the shift from passenger cars to utility vehicles, and internal combustion engines to alternative-fuel and electrified vehicles, the production and maintenance practices are likely to change from the ways they have historically been implemented. For instance, it might come as a surprise to an automotive mechanic who is increasingly expected to engage in the processes generally expected of automotive technicians. The delineation between the two is that automobile mechanics have historically been more hands-on in repairing and maintaining automobiles and their systems. In contrast, an automobile technician has been increasingly expected to perform more diagnostic functions that most often deal with electronics and complex computer systems ("The Difference Between Auto Mechanics and Auto Technicians: Breaking It Down," 2021). Automobile mechanics who are faced with the expectation that they employ computers and other technical diagnostic software might find themselves in a position to increase their training in those areas, causing them to rethink their original assumptions about their jobs and question the traditional norms surrounding their work.

Many automotive manufacturing processes have persisted through significant shifts in the automotive tastes of consumers, with the manufacturing process remaining essentially unchanged since the introduction of the moving assembly line by Henry Ford in 1913 (Automobile History, 2010). However, innovations and efficiencies in manufacturing processes, precipitated by Japanese firms in the 1980s, was perhaps the most significant change in

automobile manufacturing since the moving assembly line; and, as the industry emerges with even greater demands in efficiency, resource management, and quality, disorienting dilemmas and moments for workers are likely to require transformative learning to guide workers to success.

Self-Directed Learning Theory

Self-directed learning theory involves a process of learning in which learners take the lead in planning, implementing, and ultimately assessing and evaluating the learning that has taken place. Self-directed learners take control over the entire process — what is to be learned, the resources needed to learn it, the timeline, the tactics, strategies for learning, and the evaluation process to assess how effective that learning has been (Knowles, 1975). One example of self-directed learning might be that of an individual who took up photography as a new hobby after finding increased levels of free time. In this example, the learner decided that photography was a new skill that they wanted to learn, they secured the resources (perhaps a camera and other gear), developed the timeline (a schedule of when they would study and practice the skill), developed strategies for learning (finding tutorials like how-to videos and guides), and determined on their own how effective their learning has been (perhaps assessed by how pleased they were with their progress, or if they were able to convince enough people that their new skill was worth compensation).

However, self-directed learning poses a challenge in contexts when time is money or when individuals have little free time in their workdays to engage in unsanctioned training. For example, a challenge to the use of self-directed learning in automobile manufacturing is that very specific skills are necessary at very specific times. Because of this, manufacturers have not

historically allowed for such autonomy on the production line when specific production targets have to be met. It is hard to imagine a space in any highly efficient work environment where self-directed learning might be possible while on the clock. Exceptions to this might be instances in which organizations allow for a certain number of professional development opportunities in which they give workers space and time to seek additional training outside of what is required.

Experiential Learning Theory

The theory of andragogy has been described as the practice and ways in which we help adults learn. Self-directed learning involves learning that is primarily initiated and sought after by the learner. Transformative learning involves reassessing previous assumptions and beliefs about one's self and how they fit in the grand scheme of things. The next theory, experiential learning theory, combines learning with considerations of how past experiences inform new ones and how new experiences ultimately influence future experiences (Bass, 2012). Experiential learning has been described as adult life experiences generating new learning and acting as resources for further learning (Merriam & Bierma, 2014). Experiential learning is learning from doing. It hinges on the reflective part of a concrete process. As Maiya Dernova (2015) put it, experiential learning involves action-reflection and experience-abstraction, ultimately leading to students' engagement to direct experiences tied to real-world problem-solving. Perhaps one of the most important aspects of experiential learning comes from the reflective process, a component that many argue is key to learned experiences (Kuk & Holst, 2018).

Perhaps most germane to the intersections of workforce training and education, the automobile industry, self-efficacy, and job performance is the experiential learning theory. Experiential learning is the adult education theory that best aligns with how final assembly

workers are assumed or expected to learn. In the automotive manufacturing industry, experiential learning has been boosted by federal and state programs that have aided in developing or injecting funding into their already existing manufacturing skills and training programs at local community colleges (Chen, 2019).

Several manufacturing firms have partnered with neighboring community colleges to develop and implement curriculum for skilled workers for the automobile manufacturing industry (Sledge, 2012). For example, Toyota in Kentucky developed a training curriculum for the Kentucky Community & Technical College System called Automotive Manufacturing Technical Education Collaborative (AMTEC), eventually adding General Motors and the former Chrysler (previously Fiat Chrysler Automobiles, now Stellantis) (Sledge, 2012).

In the AMTEC model, modules were employed that allowed workers to learn bits and pieces of new information and processes. Perhaps the most important part of experiential learning comes in the form of assessments that seeks to provide management with a baseline of knowledge for each employee. The knowledge is first put into practice in manufacturing simulators to allow the standard workflow on the assembly line to continue uninterrupted while preserving the quality of the products currently in production (Sledge, 2012).

Tying the Adult Learning Theories Together

In the last several pages, I have highlighted the complexities of several adult learning theories and how they might be of the most significant utility in automobile manufacturing contexts. While one, in particular, seems to be best suited for practice in automobile production, the truth is that several of these adult learning theories can be implemented to best provide the type of training and education workers need to be successful. To circle back to an earlier part of

this section that discussed the utility of theory, assessing the training needs of final assembly workers in automobile contexts through theory can assist human resource professionals and managers in their capacities to support the training and skills needs of workers, as there is no one theory that can be used to assess all situations.

Workforce Training and Education

Training in industry tends to pose challenges to firms. Maintaining productivity while simultaneously working to create the necessary space for training tends to be at odds with one another. One way around these competing needs might be addressed using remote and mobile training while keeping employees close at hand. In Colorado, Pueblo Community College developed mobile training units that provided the high-quality training needed to aid industry hopefuls in developing the necessary hands-on experience needed for employment (Vukich & Ackerman, 2010). According to Vukich and Ackerman (2010), employers' concerns for aging populations who retire and take their informational capital with them were being replaced by new, younger employees was the impetus for exploring newer, more accessible ways of providing training. The challenge which Vukich and Ackerman asserted was that providing this type of training was becoming increasingly more difficult as a result of cuts to budgets and the high cost of technical programs and education.

In 2019, the aerospace industry (The Boeing Company specifically) struggled due to the troubled rollout of the highly-anticipated, next-generation 737-Max aircraft. As the most popular aircraft type based on the number of units sold and by the number currently in operation, the airframe of the newest Boeing 737 needed to be an unqualified success to continue its legacy (Smith, 2018).

To counter some of the training difficulties faced by Boeing (the manufacturer of airframes) and airlines like Delta (carriers that buy and lease airframes for use), Boeing implemented technology and software that made the planes fly like earlier versions of the aircraft type. This similarity in flight was achieved despite the newer model having features and a new design that varied dramatically from all previous versions of the aircraft since its inception — a physical change that inherently affected the flight characteristics of the aircraft (Hawkins, 2019). By implementing that new software and technology, the new 737-Max versions of the aircraft required, in theory, no new training for airline pilots. However, according to Hawkins (2019), and as evidenced by the grounding of hundreds of these planes worldwide, pilots did, in fact, need new training to understand how the new flight software and a new wing and engine placement affected the flight characteristics of the new plane.

Some of the challenges and problems of failing to train individuals for their work adequately are exemplified here — there were two airplanes of the type described in this text that crashed within months of each other, killing 346 individuals (all of whom were onboard the two flights). This is an example of an attempt to avoid providing the necessary adult education (or workforce training) needed to help workers (in this case, the pilots) be successful in their roles.

Carruth's (2017) work for the Center of Advanced Vehicular Systems at the Bagley College of Engineering at Mississippi State University focused explicitly on how virtual reality could be leveraged to provide training in several contexts, but most importantly, the automotive context. The benefit of newer virtual reality training was that they provided the appropriate spatial contexts that were hard to achieve before the advent of these systems. These training

mediums also minimized the challenges of loss in productivity, damage to materials and products, and injury (Carruth, 2017). Carruth suggested that, while virtual reality training might have proven beneficial to many, older individuals might struggle to adapt to the technology. This was in direct contrast to Ordaz et al. (2015), who found that older populations, while prone to taking slightly longer on completing virtual training tasks, were just as successful at doing so as their younger counterparts.

Smith et al. (2010) similarly investigated ways in which aging populations might be considered during the formation and development of training programs within the manufacturing industry; and, their qualitative study largely centered on ways in which managers and professional staff could better integrate those aging populations into their training models for more effective and inclusive training. However, while this study provided insight into some aspect of training mature-aged workers for employment in the manufacturing industry, the study was somewhat limiting in that it centered around the Australian manufacturing industry; and, as is the case with qualitative work, generalizability is less possible as a result of the small, by quantitative standards, sample size, despite the rich information that is gleaned from the research.

In Midtsundstad's 2019 work about adult learning and employability in the contexts of increased life expectancy rates, the decline in birth rates, and other factors such as increased retirement ages, the current climate was considered to be prolonging employees' working lives and creating a need to understand how to engage older workers. Midtsundstad's work also found that many factors contributed to the aging population's need to stay in the workforce and that one's level of education dictated how long individuals were in the workplace when they retired

and the quality of that retirement. Based on his work, more educated individuals tended to stay in the workforce longer, mainly if they were the recipients of more formal education (Midtsundstad, 2019). Perhaps the most salient component of his work was to understand whether adult learning or lifelong education had a meaningful effect on an individual's ability to find and maintain employment or whether they affected older individuals' employability (Midtsundstad, 2019).

It might be evident that some firms tailor their training needs to meet their end goals. This is exactly what Smith and Dowling (2001) found during their qualitative inquiry into Australian firms' training practices in the mid-1990s. Smith and Dowling stated that all seven of the firms that participated in the study recognized that their training budgets had increased over previous years' budgets and that they all anticipated their training budgets would increase even more in the following years. Another finding of this work was that managers at each of the firms sought training opportunities that led to immediate and measurable effects, and those that required the least amount of time to design, implement, and incorporate into the on-going everyday work (Smith & Dowling, 2001).

Many of the works presented here have focused on training on the factory floors engaging in manufacturing. This training area is essential because much of the work at higher up levels would be for naught without those in the trenches. However, it is essential to understand how those who ultimately design and engineer products that ultimately need manufacturing are trained. O'Sullivan et al.'s work sought to understand how those tasked with manufacturing are trained and how young engineers are trained in their capacities. O'Sullivan et al. also found that most players within the industry, regardless of the levels at which they were in those industries,

were far behind the curve when it came to an understanding and implementing contemporary adult education and training practices (2011). Their work also found that much of the literature and the curricula were out of date. The industry as a whole found itself on its back foot and unprepared to meet the rapidly changing needs of the global manufacturing industry (O'Sullivan et al., 2011).

Understanding managerial attitudes toward training are vital in addressing the needs of firms' employees. Kucherov and Manokhina's (2017) work looked into the roles of training in Russian manufacturing companies. Their work found that most believed training was essential but lacked the desire to fully implement training outside of quick fixes. This work also found that companies' management and leadership were less than satisfied with the training outcomes of their employees (Kucherov and Manokhina, 2017) and that the number one goal of these trainings should always focus on creating greater efficiencies in employees' work.

One way the challenge of increased efficiency might be addressed is through the appropriate implementation of Lean Six Sigma certification processes. Lean Six Sigma certification is a process in which extraneous processes are eliminated, variations in production are minimized, and reduced waste is realized (Yadav & Desai, 2015). How could Lean Six Sigma certification play a role in manufacturing? There does appear to be a gap in the literature surrounding Lean Six Sigma certification and automobile manufacturing. It does stand to reason that automobile manufacturers could benefit from Lean Six Sigma in manufacturing, because some of the goals of automobile manufacturers are to produce products with fewer variations, to improve efficiency in the production process, and improved vehicle quality (Ikumapayi et al., 2020).

Some manufacturers have committed resources to develop apprenticeships and other training programs to aid in onboarding and retaining a skilled workforce. For instance, BMW Group has long-operated a training center focusing on professional and technical training since the mid-1990s, shortly after the Spartanburg, South Carolina factory commenced operation (BMW Group, 2021). Other examples include the Automotive Manufacturing and Technical Education Collaborative (AMTEC) developed by Toyota's Kentucky manufacturing group in partnership with the Kentucky Community & Technical College System (Sledge, 2012). The AMTEC collaborative was developed to better prepare individuals to meet the emerging needs of skilled laborers - needs that include flexibility in adapting to emerging technologies and processes (Sledge, 2012). One of the benefits to programs such as AMTEC is that they have been designed to provide specific enough training to the partnering manufacturers while simultaneously being broad enough to allow participants to be employable at other manufacturing facilities and in other job functions (Sledge, 2012).

Manufacturing, Jobs, and the Economy

The job market in the United States and globally saw considerable shrinkage since the onset of the COVID-19/Coronavirus pandemic. Since its start, the pandemic was said to have cost the job market a staggering 22.2 million jobs, of which just over half were recovered by late January 2021 (Mutikani, 2021). In his 2012 article, Goldstein asserted that manufacturing jobs were regularly touted as a key to bolstering the economy, which was predicated on the belief that there was a point in time in which individuals could work in manufacturing and earn a comfortable, middle-class living without the costs associated with obtaining a college education. However, the globalization of economies and the increase in technology were both cited as

reasons why manufacturing jobs were no longer the employment opportunity juggernaut they were at the end of the Second World War (Goldstein, 2012). According to Morris and Thomas, there were upwards of 19 million manufacturing positions at the end of the 1970s. Those numbers had been on the decline since bottoming out at 11 million manufacturing positions as 2010 rolled in (2020). Morris and Thomas (2020) later argued that while manufacturing jobs, on the surface, appeared to have declined dramatically, that the numbers did not tell the whole story because manufacturing entities often purchased products from other industries that significantly helped those industries while greatly contributing to the overall economy. One of the biggest takeaways from their work was the notion that supply chain management was critical to keeping the American economy going (Morris & Thomas, 2020). The challenges to supply chain disruption were witnessed in the automotive industry early in 2021, as semiconductor shortages caused many manufacturing facilities to cut vehicle production around the globe (Reuters Staff, 2021).

Early in 2021, governors of states where automobile manufacturing was one of the most vital job creators and contributors to their states' economies urged the federal government to step in and press chip and semiconductor producers to reallocate resources to build chips specifically for the automotive industry (Shepardson, 2021). At the writing of this body of work, the shortage had caused Ford Motor Company to cut profit projections by one billion dollars, down to 2.5 billion dollars, and General Motors cut their projections by two billion dollars. Ford Motor Company, General Motors Company, Volkswagen Auto Group, Nissan Motor Company, Toyota Motors Corporation, and Subaru Corporation had to cut vehicle production due to the shortage. All of these firms operated manufacturing facilities in the United States.

Automobile Production and Manufacturing Industry

In Alabama, manufacturing remained an industry that was seen as the key to economic growth. Alabama enjoyed a highly sought-after automotive manufacturing industry, with Honda, Mercedes-Benz, and Hyundai all functional final assembly factories in the state. A joint venture between Toyota and Mazda was slated to bring even more manufacturing jobs to the state when their new production facility opened in late 2021. The new Toyota-Mazda venture is in addition to an electric vehicle manufacturing facility by Mercedes-Benz that had already been producing vehicles in the state for over two decades (Moseley, 2021). According to an article written in the *Alabama Political Reporter*, nearly 6,000 jobs in the Alabama automobile manufacturing sector were expected to be added in 2021 (Moseley, 2021). In 2020, Alabama added nearly 2,000 jobs in the automobile manufacturing sector resulting from over a billion-dollar investment in the state (Azok, 2021). Automobile manufacturing jobs in the state of Alabama, according to an economic developer, Nicole Jones, were upwards of 40,000 when accounting for final assembly facilities and suppliers for the different firms in the state (Moseley, 2021).

Other states in the Southeast enjoyed similar economic benefits. However, no other state in the Southeast came close to the number of automotive production facilities in the south outside of Kentucky, which enjoys Toyota Motor Company and its luxury subsidiary, Lexus, Ford, and Chevrolet, where the world-famous Corvette was produced. According to a business source that focuses on Kentucky, automobile manufacturing facilities employ nearly 22,000 individuals who work directly for automobile manufacturing firms (Clinton, 2020). Moreover, while no other state in the Southeast had as many individual firms as Alabama and Kentucky,

states such as South Carolina, Mississippi, and Tennessee each have at least two factories that produce over one million vehicles combined annually.

A change in the automotive industry that may not necessarily affect how vehicles themselves are produced is the shift in American consumers' tastes from sedans to utility vehicles like traditional body-on-frame sports utility vehicles (SUVs). These types of vehicles which share similarities with traditional, body-on-frame trucks like Ford's F-Series trucks, GMs Silverado/Sierra, and Fiat/Chrysler's Ram on which the Expedition, Tahoe/Suburban/Yukon/ Escalade are built — and crossover utility vehicles (CUVs) like Honda's CR-V, Toyota's RAV-4, and Mazda's CX-5 which are modified versions of their smaller sedan chassis (Fiorelli et al., 2019). While this shift in preferences in consumers' tastes may not impact the production methods firms use to build their products, it is a change worth noting.

Like the aerospace industry and the challenges in training and education listed earlier, the automotive industry is at the mercy of governing bodies regarding safety standards, emission requirements, and even how cars are sold and serviced in the country. This makes it imperative that the automotive industry ensures it remains competitive by offering desirable, safe, efficient vehicles, all while remaining profitable. However, with several firms playing for market share, the automotive industry is constantly updating and replacing models, which means there is a need to ensure those on the final assembly lines are prepared to effectively and efficiently perform their job functions. As vehicle technology progresses and newer methods for manufacturing vehicles advance, firms have found it increasingly challenging to attract skilled and well-prepared individuals to manufacturing jobs at current compensation rates (Fiorelli, 2019). Perhaps, what is more, is that firms are constantly having to combat the idea that

automation and robots within the manufacturing process will all but eliminate the need for skilled laborers, which may be a detriment to firms' goals to attract, hire, and retain skilled workers in their manufacturing facilities (Fiorelli, 2019).

Mori and Kikuchi (1992) provided an excellent place to start when discussing the changes in the automotive industry on the heels of the Japanese firms' quest to automotive supremacy in production and manufacturing. Their work provided an undergirding for understanding how the automotive industry would later evolve into one that required a skilled labor force that quickly adapts to and implements increasing technological means of production and manufacturing within the field (Mori & Kikuchi, 1992). That need to evolve, precipitated by the Japanese firms (specifically Toyota), served as the basis for understanding how technology was only as valuable and effective as the individuals who use it.

Gaudart (2000) discussed the need for automotive firms to create ways to ensure older workers could still function in their roles while working on the final assembly line as they progressed in age. Gaudart's work also touched on the need to employ a diverse body of individually skilled laborers on final assembly lines in automotive manufacturing facilities. By doing so, he argued that manufacturers were in better positions to handle economic changes that precipitated a reduction in workforces by training individuals to be better prepared to work in various capacities within a final assembly line (Gaudart, 2000). Gaudart's work further described a need for flexibility to maintain competitiveness with other firms with which the company competed. This work's major theme was to understand how an aging population necessitated the changes and implementations listed above — to understand better how automotive final assembly plants incorporated aging populations into its regular rotation of skilled laborers.

However, an underlying theme of this work also focused on the idea that training was salient as a result of the organic nature of human resources with the demographic makeup of the workforce ever-changing; and the need to ensure that the firm was able to meet the needs of its ever-diversifying population of skilled laborers was just as important.

Dankbaar (1996) investigated the impending needs of automotive workforce training in the European Union. Dankbaar argued that automotive training would not be a one-time event but rather something that firms would have to continuously visit in an ever-evolving global economy and landscape to ensure its workers were adequately prepared to effectuate their tasks. His work also found that firms would be required to eliminate processes by which employees were trained solely on one task, ultimately moving toward increased job rotation for final assembly line workers. Dankbaar's work concluded that training would be necessary at all stages of employment. Training, according to Dankbaar, would not be something that one engaged in solely prior to employment with the firm, or even as an off-the-clock activity after beginning employment (examples include apprenticeships), but would also need to take place literally while working in one's capacity on the final assembly line. Dankbaar's work did not, however, provide insight into how training would be implemented on the final assembly lines. Neither did this work expressly state how knowledge gaps would be addressed between employees. Dankbaar's work sought to encourage more egalitarian practices on the final assembly line so that workers would feel empowered to make process changes, creating a more cooperative workplace that encouraged shared governance and increased productivity and efficiency, and safety.

In 1997, Cooney authored a piece that described the Australian government's efforts to reform training in its automotive industry. Cooney's (1997) work indicated that Australian final assembly line workers would need to undergo more effective training to better meet the needs to compete in a global automotive economy. Cooney's findings were that skills audits, access to training, time off to attend training, and provisions for entry-level training were areas in which the Australian government agreed to focus training reform in the industry. The argument that Cooney made was that workforce training was overwhelmingly responsible for workplace change. This work also found that skills-related training was not the only type of training that would aid in final assembly line workers' success, but that there also needed to be training that focused on cooperation and teamwork, occupational health, quality control, waste management, and other areas (Cooney, 1997).

Several years after his 1997 work, Cooney (2010) authored another piece centered around manufacturing practices and training in the Australian automotive industry, focusing on how the industry was not as well-regulated as other industries. Cooney's work highlighted some of the challenges of incorporating vocational education training (VET) at the national level. Of those challenges, Cooney found that firms like Toyota and Ford, for example, operated differently in the ways that they produced automobiles and the variety in which they produced vehicles for customers. For instance, Cooney (2010) found that Ford allowed more significant product variability within its Australian market than Toyota. As such, Ford allowed for more autonomy of its workers to ensure they were able to meet the needs of their customers. This increased autonomy created a training challenge if the goal was to implement national standards for VET

that aimed to increase the productivity of that industry and the competitiveness of the Australian automotive manufacturing industry.

Hermawati et al. (2015) examined how game-based training might be used to provide future implementations of virtual training in the automotive industry. They first sought to understand how history had informed the training practices within the automotive industry (Hermawati et al., 2015). Not limiting their inquiry to the automotive industry, Hermwati et al. sought knowledge from other manufacturing sectors that faced similar challenges. Citing the expensive nature of automotive training for final assembly line workers, Hermawati et al. found ways that would potentially reduce those expenses by effectively eliminating the need to build preproduction units that would regularly and continuously be torn down and rebuilt so that final assembly line workers could train for the final production run. Hermawati et al. indicated that this method of training was ineffective, as only a small number of employees were able to actively participate in the training as a result of the small number of preproduction practice vehicles (Hermawati et al., 2015). By introducing virtual training models, Hermawati et al. concluded that more final assembly line workers could access training without as much waste involved as would have been the case using physical preproduction units. Their work further laid claim to the idea that, while game-based virtual training would be an aid in training final assembly line workers, it would not be the sole source of training and that final assembly line workers would best be served by undergoing current training methods (using preproduction vehicles) in conjunction with game-based virtual training (Hermawati et al., 2015).

Similar to Hermawati et al. (2015), Gorecky et al. (2015) sought to highlight the usefulness of virtual training compared to traditional types of training that employ limited

numbers of preproduction units and traditional computer-simulated technologies. Their work largely centered on providing the audience with a brief history of how technological advancements had been introduced and implemented throughout the manufacturing industry while simultaneously speaking to the belief that the automotive industry viewed people as the most flexible component of the final assembly process of cars, even when coupled with automated processes (Gorecky et al., 2015). Unlike Hermawati et al. (2014), Gorecky et al., (2015) placed greater emphasis on understanding how previously used technological training methods had historically informed other industries within the larger manufacturing context, and not solely the automotive manufacturing industry. Like Hermawati et al. (2014), Gorecky et al. (2015) argued that training would need to be comprehensive in its approach by using both existing training methods and virtual training methods that aid in the production ramp-up and continuing production practice improvements.

While various sources describe the challenges and opportunities within the automotive manufacturing industry, most of these works centered around Asian, Australian, and European final assembly plants. Aside from some works in the latter part of the twentieth century, very little was found that focused on the automotive manufacturing industry within the United States of America. This was true despite having a significant automotive presence of both domestic and import brands alike. The Southeast alone is host to Bavarian Motor Works (BMW) and Volvo in South Carolina; Nissan and Volkswagen in Tennessee; Kia in Georgia; Honda, Hyundai, and Mercedes-Benz in Alabama; and Nissan and Toyota in Mississippi with plans and construction of other facilities in the south to be used by Toyota and Mazda. There is a noticeable gap in the

research and literature when it comes to fully understanding the scope and breadth of automotive manufacturing in the United States.

There appeared to be at least two significant changes set to affect the global automotive industry — a shift from internal combustion engine (ICE) to hybridization and electrification of cars, and the move from the expectation and historical practice of the car being in total control by a driver toward autonomy. Both of these precipitous shifts within the industry were ripe with contention as detractors of the change lodged complaints against the electrification of cars and autonomous cars (Manjoo, 2021, Madrigal, 2018). There is an additional change within the industry that has caused major marques like Ford Motor Company and General Motors to abandon passenger cars in the United States — focusing solely on passenger trucks like the best-selling F-Series line of trucks and utility vehicles like Explorer, Expedition, Escape, and others (Tully, 2020). Changes in who drives vehicles are also one of the most significant shifts in automobiles since Henry Ford's Model T.

As manufacturers rush to perfect their fully autonomous vehicles, they simultaneously run into roadblocks with different government agencies worldwide, as the views on who is considered a driver, who will be held responsible if a semiautonomous or autonomous car causes a crash. One such example of this disparate view in advancing autonomous and semiautonomous cars was Honda rolling out a level-3 autonomous car in its home market Japan in 2021 (Sugiura, 2021), while Volkswagen Group's Audi had a level-3 capable car in the global market beginning in 2017, but had yet to enable its level-3 semiautonomous features because of differing government hurdles across the globe (Hetzner, 2020) and has canceled plans to activate its level-3 functioning as a result of the widely varied policies governing semiautonomous cars. The

decade leading up to the 2020s saw several tech companies attempt to work toward autonomous vehicles, all with varying degrees of success. States like California, Nevada, and Arizona have been testing driverless cars for years. The joint venture between Hyundai Motor Company and Aptiv, AKA Motional, claims to have been the first successful driverless autonomous car without a backup pilot or human to be at the helm should things go awry (Iagnemma, 2021).

I recognize that many of the challenges related to mechanical issues with autonomous cars might be faced by the consumer rather than the manufacturer or the service departments that maintain and repair them; but, autonomous cars will dramatically shape how manufacturers do business. Perhaps the change within the industry that will require different types of training will shift toward alternatively fueled vehicles (electric cars, hydrogen-powered cars, et cetera). There tend to be many individuals and organizations that predicted the onset of significant shifts within the automotive industry. Many of these shifts focused on electric vehicles and autonomous/ semiautonomous vehicles (Toensmeier, 2020). Moreover, while manufacturers like Volkswagen Auto Group have committed to expanding their electric vehicle production, firms are still committed to producing internal combustion engines (ICE) so that they produce the power and performance that consumers demand while simultaneously meeting evermore strict government regulations on efficiency and emission production (Toensmeier, 2020).

Job Performance and Self-Efficacy

One of the hypotheses held in this study was that individuals who scored higher self-efficacy ratings would be assessed to have higher job performance ratings. This hypothesis was based on Stajkovic and Luthans (1998), which found that self-efficacy was positively correlated with job performance in lower-complexity tasks. This was also one of the findings of Cherian

and Jacob, which observed that individuals' self-efficacy scores positively correlated to their job performance and motivation (2013). The positive correlations between self-efficacy and job performance were also found in Chae and Park (2020).

Similar to my belief that self-efficacy would be positively correlated with job performance, I also believed that individuals who had experienced higher levels of educational attainment would also score higher on self-efficacy assessments. According to Robbins et al. (2004), academic self-efficacy was positively correlated with students' academic performance and Grade Point Average (GPA). Later, Artino (2012) similarly found that academic self-efficacy was an indicator that predicted students' academic performance — that is, as self-efficacy scores rose, so did a student's academic performance or GPA. Looking within a different domain outside of education, Judge et al. (2007) found that, by conducting a meta-analysis of relevant literature on self-efficacy, self-efficacy was positively correlated with job performance. The more complex the task, the less self-efficacy correlated with actual job performance. This was very similar to findings by Stajkovic and Luthans' 1998 study. While all of the studies discussed affirmed my original notion that self-efficacy positively correlated with job performance — and by extension and a plethora of well-documented research on the topic of self-efficacy in educational contexts — all of these studies looked at job performance as measures assessed externally to the individual. This work attempted to assess job performance as a self-rated measure in the context of automobile manufacturing.

Self-Efficacy

Albert Bandura's 1977 work surrounding self-efficacy, and by extension, social-cognitive theory has been instrumental in educators' abilities to promote success in the classroom. Self-

efficacy, loosely put, is the belief in one's ability to effectuate a set of actions or behaviors to complete a task or meet expectations (Bandura, 1977, 1986). Self-efficacy and other behavioral trends started to take shape in the late 1970s and early 1980s as organizational psychologists were looking to positively affect workers' motivation, productivity, and overall performance (Eden & Aviram, 1993). There have been arguments that self-efficacy is salient for individuals who exhibit higher ambitions because it "helps to increase the probability of performing a difficult action and increases the effort and persistence to pursue this action" (Speier and Frese, 1997, p. 174). It is important to note that self-efficacy is often considered domain-specific — that is self-efficacy is affected by the activity or the sphere in which it attempts to measure, although there are attempts to assess self-efficacy more generally (Artino, 2012). Another point critical to the understanding of self-efficacy is that self-report instruments often measure it; and, research suggests that individuals typically overestimate their abilities to effectuate or complete a new task based on their self-efficacy scores (Artino, 2012). In their 1993 piece, Eden and Aviram studied individuals who were chronically unemployed, as research suggested that unemployment is negatively correlated with self-efficacy. Eden and Aviram found that behavioral modeling workshops significantly impacted participants' general self-efficacy and the activities that led to increased performance.

According to Betz and Klein (1996), domain-specific measures of self-efficacy are likely to contribute to an individual's generalized self-efficacy. In their work, they discussed the different types of measurements of which Bandura's seminal works in the field provide a basis. For instance, self-efficacy is often mentioned with another construct such as self-esteem, which they described as an "affective evaluation of self-worth" (Bets & Klein, 1996, p. 286). Chen et

al. describe self-esteem as an affective construct, as had Betz and Klein's (1996) work. Judge et al. likened self-esteem to one's "self-acceptance, self-liking, and self-respect" (1998, p. 169). In Hajloo's (2014) findings from their work, *Relationships Between Self-Efficacy, Self-Esteem, and Procrastination in Undergraduate Psychology Students*, self-efficacy was said to predict self-esteem; and that self-esteem was a better predictor of problem-solving solutions versus self-efficacy. In essence, the difference in the two constructs comes down to one being task-oriented (self-efficacy) while the other is a generalized belief and confidence in one's self (self-esteem); one is motivational (self-efficacy), and one is affective (self-esteem) (Chen et al., 2004). In their 1998 study that looked at the ways in which self-efficacy and self-esteem were both the same while also being different, Gardner and Pierce argued that those who held the perceptions that they were "capable, significant, successful, and worthy" (a measurement of global self-esteem) were also likely to exhibit higher task success (high self-efficacy) (p. 2). Their findings go so far as to say that organizations should seek to employ individuals who have both high general self-efficacy and high global self-esteem (Garner & Pierce, 1998).

Özdemir et al. (2021) found that self-efficacy scores were positively correlated with students' abstract thinking skills, both of which positively correlated with their perceptions and attitudes toward mathematics. Their work looked at the attitudes and perceptions of 198 randomly-sampled eighth-grade Turkish students to determine whether their self-efficacy scores, as assessed by the Self-Efficacy Perception Scale Towards Mathematics, were correlated with their abstract thinking skills (assessed by the Abstract Thinking Test in Mathematics instrument) (Özdemir et al., 2021).

In 2021, Downes et al. found that social comparison in work settings where there were higher-performing workers caused the self-efficacy of observers (colleagues) to be reduced. Their argument, which was ultimately supported by their findings, was that job performance was affected by one's self-efficacy and the observation of higher and lower performers within their contexts. In addition, they stated that measures of job performance in isolation were less informative to the individuals receiving the evaluations than those in which performance was given in the context of others (Downes et al., 2021). However, another challenge in providing the feedback arose when providing contextual feedback to individuals who were lower performers were being compared to their higher-performing peers. In this situation, workers' observed self-efficacy was diminished (Downes et al., 2021).

Based on the literature, we can make assumptions about the ways in which self-efficacy is related to while simultaneously being different from other constructs such as job performance and self-esteem. The literature suggested that improving general self-efficacy could positively impact individuals' performance and attitudes concerning their work, academic abilities, and future successes. So much of the work surrounding self-efficacy has to do with self-efficacy in the academic sphere and self-efficacy in the health sphere (both practitioners and patients). While there had been work that looked at self-efficacy in other contexts, such as on the job, very little had been considered outside of these scopes. In this work, I was specifically concerned with how self-efficacy was potentially associated with self-reported measures of job performance in manufacturing and automobile manufacturing facilities. For instance, one study found that self-efficacy and job performance were positively correlated (Cherian & Jacob, 2013). Other studies, however, concluded that self-efficacy was able to predict job performance in low-complexity

tasks but failed to predict job performance in medium to high-complexity tasks (Speier & Frese, 1997; Judge et al., 2007).

Job Performance

The literature suggests that there are multiple ways in which job performance is measured and assessed and that there are multiple influences on job performance, regardless of how it is measured. "Job performance is a construct that comprises behaviors under workers' control that contribute to organizational goals" (Ramos-Villagrasa et al., 2019, p.197). Job performance measures and performance evaluations tend to be universally viewed as a consequence of employment akin to a normal function of one's job responsibilities. The question is whether there is sufficient buy-in regarding job performance and whether the players (both the assessed and assessors) understand the importance of conducting regular job performance reviews (Adler et al., 2016). In their work, Adler et al. argued that the performance management process needed overhauling, as managers were often viewed as finding little value in the process. At the same time, employers felt the spirit of the process was "frustrating, too bureaucratic, and often not relevant to their jobs" (2016, p. 221). Measuring workers' job performance is critical, as it theoretically leads to increased performance and productivity in situations where the performance evaluations are followed-up with meaningful training and education that lead to changed behaviors (Adler et al., 2016).

A study conducted in The Netherlands by van de Brake et al. (2020) found that membership in information-sharing networks had indirect effects on individual job performance. In that study, individual job performance was measured by the supervisors who were required to maintain relatively frequent data on performance metrics (van de Brake et al., 2020). The more

frequent and intense individuals' engagements with their information-sharing networks were, the lower their job performance as measured by their direct supervisors. The less frequent those interactions with their information-sharing networks, the more positive their job performance was (van de Brake et al., 2020).

Much like Carlos and Rodrigues, measurements of job performance have plagued organizations and social scientists who wish to affect workers in ways that increase their performance. Across the literature, one of the biggest challenges has been creating instruments that are specific enough to accurately assess individual job performance while also being general enough to encompass multiple job-related contexts. One of the other challenges with measuring job performance is the variability of raters or issues of inter-rater reliability (Ramos-Villagrasa et al., 2019).

One of the other challenges researchers who employ self-report instruments in research face is that of faking, whereas individuals do not want to rate themselves as poor performers or as having "poor work habits" (Judge et al., 1998). An example of faking is that respondents will rate themselves to appear more favorably to observers or their managers and supervisors despite anonymity in many cases. Similarly, Judge et al. found that the accuracy of individuals' self-concept might pose a challenge to the measurements taken by the self-report instruments. However, Ramos-Villagrasa et al. (2019) argued that self-report instruments are beneficial in contexts where measures are hard to obtain, citing high-complexity jobs as the prime example. Similarly, self-report instruments are beneficial, as the worker, in theory, is familiar with all of their actions and outcomes versus a supervisor, manager, or peer who might only observe part of workers' actions (Ramos-Villagrasa et al., 2019). In addition, Ramos-Villagrasa et al. also stated

that attitudes and perceptions of subordinates or colleagues often shape raters' perceptions about workers' job performance.

Some of the issues that have previously plagued researchers were how to measure job performance and even who measured job performance. Job performance was commonly a measure attributed to a worker after observation of that worker — that is, the score was given absent of feedback or input from the employee, as the employee's manager or supervisor provided the performance metric for the employee (Woehr, 2015). One of the challenges with rating job performance was the inconsistency (lack of consistency) between raters (Ramos-Villagrasa et al., 2019). One way this could be addressed would be to employ multi-rater performance metrics versus relying solely on one or another (Beausaert et al., 2013). Another challenge, according to Ramos-Villagrasa et al., was caused by jobs that required different abilities and outcomes from their workers. Some examples of who include the obvious supervisor or manager or colleagues and peers. Less obvious examples of those who measure performance include the workers themselves and those who answer directly to them (Cho et al., 2021).

Cho et al. (2021) have asserted that job performance has been a challenging topic to address because of how and who measures it. Cho et al. argued that job performance measured by leadership was often predicted by the humbleness of those leaders. In Ramos-Villagrasa et al's. study, they found a challenge with measures of job performance — current, off-the-shelf job performance scales were too job-specific and relied too much on leadership to be completed.

When discussing job performance metrics and how they were attributed to workers, other researchers stated that using specific job performance assessments was counterproductive when

attempting to assess general behavior (Judge and Kammeyer-Mueller, 2012). Deng et al. investigated the correlations between different types of stress and job performance, finding that higher levels of hindrance stress (stress that essentially got in the way of job growth, upward mobility) negatively affected self-reported measures of job performance (2019). On the other hand, challenge stress (stress that encourages growth and professional development) was positively correlated with job performance (Deng et al., 2019).

Downes et al.'s. work was cited earlier, as it focused on the constructs of job performance and self-efficacy. In that study, their hypothesis that individuals with higher performance prove goal orientation (PPGO) levels would actually have job performance measures that were less than their peers who had lower levels of PPGO after observing higher-performing peers. These studies have illustrated that job performance is a highly nuanced construct involving different attitudes, values, and beliefs while simultaneously integrating the organization and leadership goals where these measures are generally most salient. On the one hand, job performance has been used to influence and advance organizational goals while simultaneously being used to determine merit and compensation packages for those who receive the highest ratings. On the other hand, job performance has become a necessary part of the bureaucratic process that provides little benefit and support to those receiving the feedback, mainly when the evaluations come from managers who are not trained in observing behaviors or analyzing data meant to inform the evaluation process (Ramos-Villagrasa et al., 2019).

Job performance measures have plagued researchers for many of the reasons mentioned above (inter-rater reliability issues, varying job functions and industries, and whether assessments were self-administered or done by an external body other than the individual on

whom the assessment would have ultimately provided feedback), and one of the challenges was that inter-rater reliability caused concern about the overall instrument reliability (Woehr, 2015).

Summary

In this chapter, I sought to highlight the overall framework by which I would conduct this study and provide context to understand the space which this work attempted to occupy. The overall tenants of this research — to understand how self-efficacy and self-reported measures of job performance in automobile final assembly plants located in the Southeast — are missing from the literature. The automotive industry is a complex one on which so much of the American economy and job market rely; and, while there are manufacturers and government agencies that attempt to prepare their workforces for the skill required for manufacturing roles within the industry, there was not a lot, from what I had been able to ascertain in my review of the literature, of research that focused on these two areas: self-efficacy and self-reported measures of job performance in automobile manufacturing.

The sources in this chapter highlight the various areas that impact the interests that motivated an understanding of the automobile manufacturing industry, its impact on the national job market and overall economy, how individuals are trained within these spaces, how individuals perceive their job performance, and how individual self-efficacy can be used to predict outcomes. The individual manufacturers of automobiles are regularly assessed on their overall effectiveness based on market share, measures of reliability & dependability, costs of ownership, resale values, and safety ratings (J.D. Power, Consumer Reports, KBB, IIHS, NCAP/ NHTSA). However, the industry is tight-lipped about the performance of its workers. The gaps in the literature are significant, as there was no research discovered that mentions the effects of

self-efficacy on job performance in the automobile manufacturing industry. These omissions in the literature are what this project will seek to fill, with subsequent works expanding upon it.

CHAPTER III

METHODS

The purpose of this study was to investigate the relationship between Southeastern United States automobile final assembly workers' self-reported measures of job performance and their self-efficacy scores. In addition, I sought to determine whether there were significant differences in job performance and self-efficacy based on the facilities where respondents were employed, what respondents' job functions were, what respondents' levels of educational attainment were, and respondents' race and ethnicity. Next, I wanted to assess the relationship between participant age and the two dependent variables: job performance and self-efficacy.

In addition to using manufacturing facility and job function as pseudo-independent variables, I used education level as a pseudo-independent variable because research suggested that job performance was positively correlated with education (Wulandari, 2017). For self-efficacy, Hayat et al. (2020) suggested that individuals with higher self-efficacy were more motivated to persist through challenging problems in their academic endeavors, study longer, and exhaust other options and alternatives before giving up on an academic task. Their findings encouraged me to look at education level to assess whether there were significant relationships between the two dependent variables: job performance and self-efficacy. In addition, some researchers have found that race and ethnicity were associated with job performance measures (Hausdorf & Robie, 2018). Because of their findings, I used race and ethnicity as a pseudo-independent variable to investigate group differences in the dependent variables of job performance and self-efficacy.

Research Questions

I used the following research questions to guide me in this study:

Research Question 1: Was there an association between final assembly workers' self-reported measures of job performance and their self-efficacy scores?

Research Question 2: Was there an association between final assembly workers' age and self-reported measures of job performance, or between final assembly workers' age and self-efficacy scores?

Research Question 3: Were there statistically significant differences in final assembly workers' self-reported measures of job performance and their self-efficacy scores based on race or ethnicity?

Research Question 4: Were there statistically significant differences in final assembly workers' self-reported measures of job performance and their self-efficacy scores based on educational attainment?

Research Question 5: Were there statistically significant differences in final assembly workers' self-reported measures of job performance and their self-efficacy scores based on the facilities where they were employed?

Research Question 6: Were there statistically significant differences in final assembly workers' self-reported measures of job performance and their self-efficacy scores based on job function?

Participants

I recruited participants for this study from a sample of individuals who worked in final and general assembly roles in the Southeastern United States in automobile manufacturing facilities. The manufacturing facilities included in the Southeastern United States are those located in Alabama, Georgia, Kentucky, Mississippi, South Carolina, and Tennessee. To be eligible for participation in this study, individuals needed to be at least 18 years of age and

employed with one of the automobile manufacturing facilities located in one of the states listed above as final or general assembly workers. In addition, individuals had to be employed in their roles for at least three months at survey completion. I incentivized participation by allowing entry into a drawing for one of five $50.00 Amazon gift cards.

There were 1,117 participants who started the survey; however, one opted out of participation, and 52 did not complete the survey. I excluded individuals who worked for suppliers from participating in this research study. I excluded 11 individuals from participation due to their employment at a facility that did not perform final assembly or because they listed working at a facility outside of the Southeastern United States. Hyundai and Auburn SCA are examples of facilities that respondents listed as their employers that do not engage in the final assembly. There were also respondents who were employed at Ford facilities in Dearborn, Michigan, and Kansas City, Missouri, whom I excluded from the study. The respondents from the Michigan and Missouri facilities were previously counted in the 11 individuals that were excluded from the final sample.

Similarly, I excluded respondents who worked in other job functions not pursuant to the final assembly from participation in this research study. There were ten responses excluded due to not working in one of the included job functions (for example, parts director). Lastly, I excluded three additional responses from the final analysis due to the small sample size they represented (two responses from the Ford Kentucky Truck Plant and one response for Toyota Motor Manufacturing of Kentucky). As a result, 1,041 individuals were included in the final analyses.

To assess whether there were significant differences in job performance or self-efficacy, the age of each participant at the time of the study was collected. The average age of all

participants was 30.70 (*SD* = 5.94). The race and ethnicity groups here were selected to be uniform with how the U.S. Census Bureau collected data on race and ethnicity. I conducted a chi-square goodness-of-fit test to determine if participants in the study had the same racial and ethnic makeup as the general U.S. population as assessed by the U.S. Census Bureau (2021). The chi-square goodness-of-fit test indicated that the six racial and ethnic groups represented in the study were not similarly distributed as those within the general population or that they significantly deviated from the population distribution ($\chi^2_{(2)} = 26{,}880.16$, $p < .001$). The racial and ethnic breakdown of the study participants is represented in Table 1.

Table 1

Participants by Race and Ethnicity

Race and Ethnicity	Frequency	Percent	National Percentage of Population
American Indian/Alaska Native	211	20	1
Asian	71	7	6
Black or African American	119	11	13
Latino or Hispanic	55	5	19
Native Hawaiian or Other Pacific Islander	65	6	< 1
White	517	50	60
Total	1038	100	~100

Instruments

To determine the basic demographic information of participants, I created questions that asked respondents to type their age in years, to select the facility where they were employed, to type their employment start date, to select their job function, and to select the choice that

represented their highest level of education. All four levels of education were represented in this study, and distribution of participants by level of educational attainment can be found in Table 2.

Table 2

Participants by Education Level

Education Level	Frequency	Percent
Some High School/Less Than High School Diploma	74	7
High School Graduate/No College	390	37
Some College or Associate's Degree	393	38
Bachelor's Degree and Higher	184	18
Total	1041	100

I also sought to understand how final assembly workers rated their performance while on the job. To determine this, I searched the literature to identify instruments that had been previously developed for job performance measures. Specifically, I found it necessary to find a self-reported measure of job performance, as I sought to understand how individuals viewed their performance. This study then sought to understand how one's self-efficacy score, as determined by using the New General Self-Efficacy instrument developed by Chen et al. (2001), was associated with their job performance rating as determined by the Self-Reported Measure of Job Performance instrument developed by Carlos and Rodrigues (2016).

New General Self-Efficacy Instrument

To determine participants' self-efficacy scores, I used the New General Self-Efficacy assessment developed by Chen et al. (2001). The New General Self-Efficacy instrument is an 8-item assessment that allows test-takers the ability to self-select and self-score their self-efficacy

ratings. The New General Self-Efficacy instrument is considered different from other instruments that assess self-efficacy because it is unidimensional versus earlier instruments that focused on self-efficacy, self-confidence, and other constructs (Chen et al., 2001).

I assessed the New General Self-Efficacy instrument to be beneficial because it allowed final assembly workers to respond to statements on which they could select from a 7-point Likert-type scale from "strongly disagree" to "strongly agree." I should note that the New General Self-Efficacy instrument was originally scaled on a 5-point Likert-type scale but was changed to provide consistency in scoring for participants who were tasked with completing the survey that used two instruments as the second instrument (explained in the next section) employed a 7-point scale.

Chen et al. (2001) found that the New General Self-Efficacy instrument yielded internal consistency with an alpha level (α) of .86 during their validation of the assessment. The New General Self-Efficacy scores, across the three time periods within a single study conducted during its validation, remained internally consistent and yielded acceptable alpha levels ($\alpha = .87$, $\alpha = .88$, and $\alpha = .85$). Similarly, content validity was high as assessed during the validation of the measure by eight industrial and organizational psychology students and fourteen undergraduate psychology students. The graduate students assessed that 98% of the New General Self-Efficacy instrument items were measures of general self-efficacy, with the other 2% of items measures of self-esteem. The undergraduate students assessed that 87% of the New General Self-Efficacy items measures general self-efficacy, with 11% measuring self-esteem and 3% measuring some other construct. The New General Self-Efficacy was initially rated on a 5-point Likert-type scale (Chen et al., 2001). However, to allow consistency with the larger Self-Reported Measures of Job Performance instrument, I changed the scale to a 7-point Likert-type version. The eight-item self-

efficacy instrument displayed a Cronbach's alpha coefficient of .899 in the present study, indicating a high level of reliability.

Self-Reported Measure of Job Performance Instrument

To understand how participants viewed their performance on the job, I used the Self-Reported Measure of Job Performance instrument. The Self-Reported Measure of Job Performance instrument by Carlos and Rodrigues (2016) was designed to report performance measures of different domains or dimensions that one might face within a work context. The researchers' goals were to design a self-reported measure of job performance and develop an instrument that could be used across different domains and industries. The Self-Reported Measure of Job Performance instrument was also developed to be applicable in several global regions and across a number of cultures. Carlos and Rodrigues found that it exhibited good psychometric properties in the validation of the instrument. They reported a Cronbach's alpha of .749 for the 29-item scale.

There were seven domains in which the Self-Reported Measure of Job Performance instrument sought to assess participants' job performance. These included job knowledge, organizational skills, efficiency, persistent effort, cooperation, organizational conscientiousness, and interpersonal and relational skills (Carlos & Rodrigues, 2016). The Self-Reported Measure of Job Performance scores had an internal reliability that was deemed acceptable with a Cronbach's alpha reliability coefficient of .780 in the present study.

Procedures

I was granted approval from Auburn University's Institutional Review Board (IRB) on February 17, 2021. Upon receiving IRB approval, I began to engage existing social media connections on Facebook, LinkedIn, and Instagram to ask for participation in the study. In

addition, I sent emails to colleagues, family, and friends to explain the research goals, who was targeted for participation in the research, and to ask for assistance in administering the research to those interested in participating.

I employed additional recruitment methods, including sending recruitment items to Auburn University colleagues who had professional ties to the manufacturing facilities. I also emailed professional list-servers (LISTSERV), asking anyone who had associates, family, or friends who worked at any of the facilities to share recruitment materials and to share my contact information.

Other participant recruitment strategies included running a Facebook and Instagram advertisement for 10 days. Using the Facebook and Instagram advertising platforms, I targeted individuals located within 25-miles of the following areas: Montgomery, Alabama; Lincoln, Alabama; Vance, Alabama; Tuscaloosa, Alabama; Huntsville, Alabama; West Point, Georgia; Bowling Green, Kentucky, Georgetown, Kentucky; Louisville, Kentucky; Blue Springs, Mississippi; Canton, Mississippi; Charleston, South Carolina, Spartanburg, South Carolina; Chattanooga, Tennessee; and Smyrna, Tennessee. The advertisements were targeted to be visible on profiles of individuals who worked for one of the manufacturers that were included in this study. Through the Facebook and Instagram advertisement channels, I reached approximately 1,400 individuals, resulting in about 50 clicks.

Data Collection

I collected data using Qualtrics. Because a waiver of signed documentation of consent was granted by Auburn University's Institutional Review Board (IRB), the first part of the survey started with an information letter that described the research goals, provided participants with contact information, and explained how the information would be used and the impact (risk)

taking the survey might have on them. Before beginning the survey, participants were given the option to select into participation or select out of participation in the study.

Participants that agreed to continue with the study were then asked demographic questions about their age, race and ethnicity, level of educational attainment, the automobile manufacturing facility at which they were employed, their job function (engine/drivetrain assembly, paint and finish, internal installation, et cetera), and employment start date. Once that information was collected from the participant, they were then led through the rest of the Qualtrics survey that combined items from the New General Self Efficacy Instrument by Chen et al. (2001) and the Self-Reported Measure of Job Performance (SRMJP) by Carlos and Rodrigues (2016).

I made the Qualtrics survey so that all responses were required to avoid issues with missing or incomplete data. Data were collected through this medium over the course of 8 weeks (from February 11, 2021, through April 9, 2021). Ninety-eight percent of all participants represented six facilities located in Alabama, Georgia, and South Carolina. Together, these facilities were the employer of over 25,000 individuals at all levels of the organizations. Participants by their manufacturing facilities can be found in Table 3.

Table 3

Participants by Manufacturing Facility

Facility	Frequency	Percent
BMW (Spartanburg, South Carolina)	230	22
Honda (Lincoln, Alabama)	228	22
Hyundai (Montgomery, Alabama)	240	23
Kia (West Point, Georgia)	167	16
Mercedes-Benz (Vance, Alabama)	118	11
Volvo (Charleston, South Carolina)	58	6
Total	1041	100

Once data were collected, they were downloaded from my Qualtrics account and imported into IBM SPSS Statistics version 27. Data cleaning ensured that only individuals who completed the survey and who met the targeted audience requirements were included in the data analysis. I categorized participants based on their reported job functions. Job function breakdowns are listed in Table 4.

Table 4

Participants by Job Function

Job Function	Frequency	Percent
Body & Chassis	135	13
Engine & Drivetrain Assembly	195	19
Interior Assembly & Installation	209	20
Paint & Finish	193	19
Plastics Injection & Molding	109	10
Quality Control & Testing	119	11
Steel/Aluminum/Iron Stamping/Forging	44	4
Welding	37	4
Total	1041	100

Analytic Approach

In this study, I used multiple one-way Multivariate Analysis of Variance (MANOVA) tests to compare independent variable's pseudo-independent variable group means across multiple dependent variables and to assess whether both variables, together, were associated with the changes in a) the facilities where respondents were employed, b) respondents' job functions, c) respondent's levels of educational attainment or d) their race and ethnicity (Pituch & Stevens, 2016). The MANOVA requires that each pseudo-independent variable have multiple levels. To be the most consistent with other bodies of research that used demographic information such as educational attainment level and race and ethnicity, I categorized the educational attainment groups in the same way that they were previously categorized and used by the United States Bureau of Labor Statistics or US BLS (2020). I also categorized the race and ethnicity variable in

the same way that another federal agency previously categorized it. It included the following choices or responses available: a) American Indian or Alaska Native, b) Asian, c) Black, d) Hispanic, e) Native Hawaiian or other Pacific Islander, (f) white, or (g) more than one race. The independent variable age is interval; and, I conducted a Pearson correlation coefficient to identify any potential relationships between age and the dependent variables job performance and self-efficacy. I performed a second Pearson correlation coefficient to look for correlations between the dependent variables, job performance, and self-efficacy. Following the Pearson correlation coefficient analyses, I performed four multivariate analyses of variance procedures to look for significant differences in the dependent variables based on the pseudo-independent variables within the race and ethnicity, level of educational attainment, manufacturing facility, and job function.

I used SPSS to code and analyze participant responses. To do so, I downloaded and exported participant responses from my Qualtrics account, then imported the responses into the SPSS program. Once the import was complete, the process of coding responses and calculating both the self-efficacy scores and job performance ratings was done. This was done by using the original instrument and using the "compute" function under the "transform" dropdown menu in SPSS to calculate the Self-Reported Measure of Job Performance rating using the 29 items. I made careful consideration to ensure that the reverse-scored items in the job-performance instrument within the survey (of which there were 8) were appropriately and accurately accounted for in the scoring of responses. To do so, I used the "recode into different variables" function under the "transform" menu to reverse-code the 8-items that were reverse-scored.

Data Analysis

Data were analyzed in SPSS after initial checks for completeness of responses and appropriateness of participants (correct type of facility, length of time at employer, etc.) were completed within Microsoft Excel. Calculations of both participants' New General Self-Efficacy scores and their Self-Reported Measures of Job Performance ratings were completed within SPSS. Both instruments required taking the average of all items within (8 items for the New General Self-Efficacy instrument and all 29 across the seven domains in the Self-Reported Measures of Job Performance instrument) to calculate their respective scores. Part of the analysis also involved coding each variable in SPSS measured as nominal or ordinal, as SPSS requires that variables be coded into "dummy variables." In this research, the educational attainment level variables were coded as 1 = less than a high school diploma, 2 = high school graduate; no college, 3 = some college or associates degree, 4 = bachelor's degree or higher. The race/ethnicity variable was coded as 1 = American Indian or Alaska Native, 2 = Asian, 3 = Black or African American, 4 = Hispanic, 5 = Native Hawaiian or other Pacific Islander, 6 = white, 7 = More than one race. Age was collected as an interval variable and ultimately kept as such for reporting purposes. After coding, descriptive statistics were calculated for the sample size.

CHAPTER IV

RESULTS

The purpose of this study was to determine whether there were statistically significant differences in job performance and self-efficacy based on the the different manufacturing facilities where final assembly workers were employed. I was able to quantify respondents' feelings toward their job performance by collecting data using Carlos & Rodrigues' (2016) self-reported measure of job performance instrument. I was able to quantify respondents' beliefs in their abilities to learn new information and employ that information to effectuate new and more complex tasks by using Chen et al's., New General Self-Efficacy instrument (2001). I used IBM SPSS version 27 to analyze these collected data. SPSS allowed me to generate descriptive statistics, conduct one-way MANOVA analyses and one-way ANOVA analyses. It also allowed me to conduct a Pearson correlation coefficient to determine if age was associated with either job performance or self-efficacy.

Research Questions

The research questions and associated hypotheses for this study included:

Research Question 1: Was there an association between final assembly workers' self-reported measures of job performance and their self-efficacy scores?

H_0: There was no association between self-reported measures of job performance or self-efficacy scores.

H_1: Self-reported measures of job performance and self-efficacy scores were associated.

Research Question 2: Was there an association between final assembly workers' age and self-reported measures of job performance, or between final assembly workers' age and self-efficacy scores?

H_0: Age did not explain the variations in final assembly workers' self-reported measures of job performance or their self-efficacy scores.

H_1: Age explained the variations in final assembly workers' self-reported measures of job performance and their self-efficacy scores.

Research Question 3: Were there statistically significant differences in final assembly workers' self-reported measures of job performance and their self-efficacy scores based on race or ethnicity?

H_0: There were no statistically significant differences in the self-reported measures of job performance or self-efficacy scores based on respondents' race or ethnicity.

H_1: There were statistically significant differences in self-reported measures of job performance and self-efficacy scores based on respondents' race or ethnicity.

Research Question 4: Were there statistically significant differences in final assembly workers' self-reported measures of job performance and their self-efficacy scores based on educational attainment?

H_0: Educational levels showed no statistically significant differences in respondents' self-reported measures of job performance or self-efficacy scores.

H_1: Educational levels resulted in statistically significant differences in respondents' self-reported measures of job performance and self-efficacy scores.

Research Question 5: Were there statistically significant differences in final assembly workers' self-reported measures of job performance and their self-efficacy scores based on the facilities where they were employed?

H_0: Self-reported measures of job performance and self-efficacy scores were not significantly different from manufacturing facility to manufacturing facility.

H_1: Self-reported measures of job performance and self-efficacy scores were significantly different from manufacturing facility to manufacturing facility.

Research Question 6: Were there statistically significant differences in final assembly workers' self-reported measures of job performance and their self-efficacy scores based on job function?

H_0: There were no significant differences in self-reported measures of job performance or self-efficacy scores based on respondents' job functions.

H_1: There were significant differences in self-reported measures of job performance and self-efficacy scores based on respondents' job functions.

To test for univariate normality, I used SPSS to calculate both skewness and kurtosis for each dependent variable. Based on this initial test, univariate normality was not met on job performance (positive skew = .296, SE = .076, mesokurtosis = .130, SE = .151) nor self-efficacy (negative skew = -.171, SE = .076, platykurtosis = -.494, SE = .151). I ran both Kolmogorov-Smirnov and Shapiro-Wilk tests for normality. Both tests indicated that the data were not univariate normal. A Kolmogorov-Smirnov test indicated that job performance did not follow a normal distribution ($D(1041) = .045, p < .001$). A Kolmogorov-Smirnov test also indicated that self-efficacy did not follow a normal distribution ($D(1041) = .075, p < .001$). A Shapiro-Wilk test for normality indicated that self-reported measures of job performance did not follow a normal

distribution ($W(1041) = .988, p < .001$). Similarly a Shapiro-Wilk test for normality indicated that self-efficacy did not follow a normal distribution, ($W(1041) = .985, p < .001$). Despite these data not being normally distributed, the violation of the assumption of normality was not a cause for concern nor did it cause problems in these data because of the large sample size (Oppong & Agbedra, 2016; Ghasemi & Zahediasl, 2012). The assumption of homogeneity of covariance matrices was not met ($F_{18,858.743} = 2.717, p < .001$).

Research Question One

Research Question 1: *Was there an association between final assembly workers' self-reported measures of job performance and their self-efficacy scores?*

To determine if there was an association between job performance and self-efficacy, I calculated a Pearson product-moment correlation coefficient. The Pearson correlation coefficient helped me understand the strength and direction of the association between the two dependent variables. Based on the Pearson correlation coefficient, there was a strong and positive correlation between the self-reported measures of job performance and self-efficacy scores ($r = .818, r^2 = .668, p < .001$). This indicated that the self-reported measure of job performance shared about 67% of its variance with self-efficacy.

Research Question Two

Research question 2: *Was there an association between final assembly workers' age and self-reported measures of job performance, or between final assembly workers' age and self-efficacy scores?*

To investigate the research question that asked if there was an association between final assembly workers' ages and their self-reported measures of job performance and self-efficacy scores, I calculated two Pearson Correlation coefficient tests for the pair of dependent variables.

Both tests resulted in non-significant differences indicating that age was not strongly associated with either self-reported measures of job performance ($r = -.042, p = .172, r^2 = .002$) or self-efficacy scores ($r = -.049, p = .115, r^2 = .002$).

Research Question Three

Research Question 3: *Were there statistically significant differences in final assembly workers' self-reported measures of job performance and their self-efficacy scores based on race or ethnicity?*

I used a one-way MANOVA to determine if self-reported measures of job performance and self-efficacy were significantly different based on respondents' racial and ethnic identities. There was a significant difference in the self-reported job performance measure and self-efficacy based on respondents' race and ethnicity ($\Lambda = .939, F_{10,2062} = 6.54, p < .001$). Approximately 6% of the variance in self-reported job performance and self-efficacy was explained by respondents' race and ethnicity ($\omega^2 = .056$). To follow up on the significant multivariate test, I conducted two one-way ANOVAs. To control for familywise error, I used the Bonferroni adjustment setting studywise alpha at .025. The assumption of homogeneity of variance for self-reported job performance was not met, ($p = .012$). However, the assumption was met for self-efficacy, ($p = .053$). There was a significant difference in self-reported job performance based on respondents' race and ethnicity ($F_{5,1032} = 10.518, p < .001$) and in self-efficacy ($F_{5,1032} = 10.964, p < .001$). Approximately 4% of the variance in the self-reported job performance measurement was explained by respondents' race and ethnicity ($\omega^2 = .044$). Approximately 5% of the variance in self-efficacy was explained by respondents' race and ethnicity ($\omega^2 = .046$).

To follow up the significant one-way univariate tests, I used Tukey post-hoc tests. Respondents who identified as white had a mean self-reported measure of job performance that

was significantly lower than those who identified as American Indian or Alaska Native ($p <$ .001). Respondents who identified as white, however, had mean self-reported measures of job performance that were significantly higher than those who identified as Latino or Hispanic ($p =$ .018). For those who identified as Black or African American, the mean self-reported measure of job performance was significantly lower than those who identified as American Indian or Alaska native ($p = .001$). Mean self-reported measures of job performance were significantly higher for those who identified their race as American Indian or Alaska Native compared to those who identified as Native Hawaiian or Pacific Islander ($p = .001$). Similarly, those who identified as American Indian or Alaska Native had significantly higher mean self-reported measures of job performance ratings than their Latino or Hispanic counterparts ($p < .001$). Respondents who identified themselves as Asian had mean self-reported measures of job performance ratings that were significantly higher than those who identified themselves as Latino or Hispanic ($p = .018$).

Respondents who identified their race or ethnicity as white had self-efficacy scores that were significantly lower versus those who identified as American Indian or Alaska Native ($p <$ .001). However, white respondents had significantly higher mean self-efficacy scores versus Latino or Hispanic respondents ($p = .004$). Respondents identifying as Black or African American had significantly lower mean self-efficacy scores compared to those who identified as American Indian or Alaska Native ($p = .017$). The Black or African American group of respondents had significantly higher self-efficacy scores compared to respondents who identified as Latino or Hispanic ($p = .007$). Self-efficacy was statistically higher for those who identified as American Indian or Alaska Native compared to those who identified as Native Hawaiian or Pacific Islander ($p < .001$). The mean self-efficacy scores for the American Indian or Alaska Native group was significantly higher than those of the Latino or Hispanic respondents' mean

scores ($p < .001$). For respondents who identified as Asian, their self-efficacy scores were statistically higher from those who identified as Latino or Hispanic ($p < .001$). See Table 5 for descriptive statistics.

Table 5

Descriptive Statistics by Race/Identity and the Pair of Dependent Variables

Dependent Variable	Race or Ethnicity	*M*	*SD*	*N*
Job Performance	White	*4.592*	*.455*	*517*
	Black or African American	*4.591*	*.501*	*119*
	American Indian or Alaska Native	*4.818*	*.577*	*211*
	Asian	*4.651*	*.473*	*71*
	Native. Hawaiian or Pacific Islander	*4.535*	*.514*	*65*
	Latino or Hispanic	*4.370*	*.426*	*55*
	Total	*4.627*	*.502*	*1038*
Self-Efficacy	White	*5.212*	*.880*	*517*
	Black or African American	*5.252*	*.952*	*119*
	American Indian or Alaska Native	*5.578*	*.893*	*211*
	Asian	*5.412*	*.731*	*71*
	Native. Hawaiian or Pacific Islander	*4.990*	*.870*	*65*
	Latino or Hispanic	*4.752*	*.951*	*55*
	Total	*5.266*	*.906*	*1038*

The self-reported measures of job performance and self-efficacy appeared to be associated with respondents' race and ethnicity, as there was a significant difference in the pair of dependent variables (self-reported measures of job performance and self-efficacy scores) based

on respondents' race and ethnicity. In this study, the American Indian and Alaska Native sample was over-represented at 20% compared to the national population of American Indian or Alaska Native individuals which is 1%. Similarly, the underrepresentation Latino and Hispanic (5% in this study versus 19% nationally) population may not provide the best generalizability because the sample size was not representative of the larger national population (US Census Bureau, 2021).

Research Question Four

Research Question 4: *Were there statistically significant differences in final assembly workers' self-reported measures of job performance and their self-efficacy scores based on educational attainment?*

I used a one-way MANOVA to determine how educational attainment affected the outcome variables, and to determine if there was a significant difference in self-reported measures of job performance and self-efficacy scores based on respondents' levels of education. The MANOVA indicated there was a significant difference in job performance and self-efficacy based on respondents' levels of educational attainment ($\Lambda = .955, F_{6,2072} = 7.989, p < .001$). Approximately 9% of the variance in job performance and self-efficacy was explained by respondents' levels of educational attainment ($\omega^2 = .09$). To follow up on the significant multivariate test, I used one-way ANOVAs. To control for familywise error, I used the Bonferroni adjustment, setting studywise alpha at .025. There was a significant difference in job performance ($F_{3,1037} = 14.254, p < .001$) and in self-efficacy ($F_{3,1037} = 8.677, p < .001$) based on respondents' levels of educational attainment. Approximately 4% of the variance in self-reported measures of job performance was explained by respondents' levels of educational attainment (ω^2

= .037). Approximately 2% of the variance in self-efficacy was explained by respondents' levels of educational attainment ($\omega^2 = .022$).

I followed up the significant one-way univariate tests by using Tukey post-hoc tests. Self-reported measures of job performance was significantly lower for respondents who reported having less than a high school education than those who had a bachelor's degree ($p = .006$). Job performance was significantly lower for respondents who reported having a high school diploma versus those who reported having earned a bachelor's degree ($p < .001$). Job performance was significantly lower for respondents who reported having earned some college credit or having earned an associate's degree versus those with at least a bachelor's degree ($p < .001$).

High school graduates had self-efficacy scores that were significantly lower than respondents with a bachelor's degree or higher ($p < .001$). Similarly, self-efficacy was significantly lower for respondents who reported having earned some college credit or an associate's degree versus those with a bachelor's degree or higher ($p < .001$). See Table 6 for descriptive statistics.

Among the present sample, those with the highest and lowest levels of educational attainment reported both higher job performance ratings and self-efficacy scores. Those who had a high school diploma and those who had some college or an associate's degree had mean scores that were lower than both the bachelor's degree or higher group and the less than high school diploma group. The individuals who reported having less than a high school diploma had mean scores in both dependent variables that were lower than the mean score for all groups, but higher than the two middle groups.

Table 6

Dependent Variable	Education Level	*M*	*SD*	*N*
Job Performance	Some High School/Less Than High School Diploma	*4.618*	*.457*	*74*
	High School Graduate, No College	*4.566*	*.497*	*390*
	Some College or Associate's Degree	*4.588*	*.484*	*393*
	Bachelor's Degree or Higher	*4.840*	*.515*	*184*
	Total	*4.627*	*.502*	*1041*
Self-Efficacy	Some High School/Less Than High School Diploma	*5.382*	*.829*	*74*
	High School Graduate, No College	*5.183*	*.929*	*390*
	Some College or Associate's Degree	*5.192*	*.913*	*393*
	Bachelor's Degree or Higher	*5.552*	*.811*	*184*
	Total	*5.266*	*.906*	*1041*

Descriptive Statistics by Education Level and the Dependent Variables

Research Question Five

Research Question 5: *Were there statistically significant differences in final assembly workers' self-reported measures of job performance and their self-efficacy scores based on the facilities where they were employed?*

I used a one-way MANOVA to determine if self-reported job performance measures and self-efficacy scores significantly differed based on the manufacturing facility where respondents were employed. The one-way MANOVA indicated there was a significant difference in job performance and self-efficacy based on which manufacturing facility respondents were employed ($\Lambda = .982, F_{10, 2068} = 1.880, p = .043$). Slightly more than one-percent of the variance in job performance and self-efficacy was explained by the facility in which respondents were employed

($\omega^2 = .013$). To follow up on the significant multivariate test, I used one-way ANOVAs. To control for famislywise error, I used the Bonferonni adjustment, setting studywise alpha at .025. There was a significant difference in job performance ($F_{5,1035} = 2.754, p = .018$) and self-efficacy ($F_{5,1035} = 3.058, p = .010$). Less than 1% of the variance in job performance was explained by which manufacturing facility a respondent was employed (ω2 - .008). Approximately 1% of the variance in self-efficacy was explained by which manufacturing facility a respondent was employed ($\omega^2 = .008$).

To follow up on the significant univariate tests, I used Tukey post-hot tests. Self-efficacy was significantly different in employees working at Honda who had higher mean self-efficacy scores than those working at Hyundai ($p = .010$). While both the multivariate test (MANOVA) and the univariate test (ANOVA) indicated statistically significant differences in job performance between the manufacturing facilities, the differences appear to have been too small for the Tukey post-hoc tests to detect at the pairwise level. While self-efficacy was lower for those who worked at Hyundai compared to those who work at Honda, job performance was not statistically different for any of the facilities in this study based on the studywise alpha having been set at .025. See Table 7 for descriptive statistics.

Table 7

Descriptive Statistics by Manufacturing Facility and the Dependent Variables

Dependent Variable	Facility	*M*	*SD*	*N*
Job Performance	Honda Mfg of Alabama	*4.677*	*.480*	*228*
	Hyundai Motor Alabama	*4.537*	*.477*	*240*
	Kia Motor Mfg of Georgia	*4.593*	*.523*	*167*
	Mercedes-Benz US International	*4.690*	*.543*	*118*
	BMW Group Plant	*4.649*	*.498*	*230*
	Volvo - SC Factory	*4.680*	*.519*	*58*
	Total	*4.627*	*.502*	*1041*
Self-Efficacy	Honda Mfg of Alabama	*5.377*	*.833*	*228*
	Hyundai Motor Alabama	*5.096*	*.939*	*240*
	Kia Motor Mfg of Georgia	*5.196*	*.924*	*167*
	Mercedes-Benz US International	*5.317*	*.885*	*118*
	BMW Group Plant	*5.342*	*.949*	*230*
	Volvo - SC Factory	*5.328*	*.767*	*58*
	Total	*5.266*	*.906*	*1041*

Research Question Six

Research Question 6: *Were there statistically significant differences in final assembly workers' self-reported measures of job performance and their self-efficacy scores based on job function?*

I used a one-way MANOVA to determine whether there were significant differences in job performance ratings and self-efficacy scores based on job-related functions. The one-way

MANOVA indicated there was a significant difference on the set of dependent variables (job performance and self-efficacy) based on respondents' job functions ($\Lambda = .961, F_{14, 2064} = 2.928, p < .001$). About 3% of the variance in the dependent variables was explained by which job function respondents held ($\omega^2 = .032$). To follow up on the significant multivariate test, I used one-way ANOVAs. To control for familywise error, I used the Bonferroni adjustment, setting studywise alpha at .025. There was a significant difference in job performance ($F_{7,1033} = 5.556, p < .001$) and in self-efficacy ($F_{7,1033} = 4.303, p < .001$). About 3% of the variance in self-reported measures of job performance was explained by the facility where respondents were employed ($\omega^2 = .030$). Approximately 2% of the variance in self-efficacy was explained by the facility where respondents were employed ($\omega^2 = .022$).

I used Tukey post-hoc tests to follow up the significant univariate tests. Mean self-reported measures of job performance ratings were significantly different for respondents who worked in the body & chassis department versus those who worked in the plastic injection & molding department ($p = .005$). The mean self-reported job performance ratings were significantly different for respondents who worked in the paint & finish department and were lower than respondents who worked in quality & control testing ($p = .012$). The mean self-reported measures of job performance ratings were statistically significant for those who worked in the engine and drivetrain assembly department which were higher than those who worked in plastic injection & molding ($p = .004$). Job performance ratings were higher for those who worked in quality control and testing and were significantly different than those who worked in plastic injection & molding ($p = .001$). Respondents who worked in the plastic injection & molding department had significantly lower mean self-reported job performance ratings than those who in the welding department ($p = .015$).

Respondents who worked in the body and chassis department had significantly higher self-efficacy scores than those who worked in plastic injection & molding (p = .007). Respondents who worked in the engine & drivetrain assembly departments had significantly higher self-efficacy scores versus those who worked in plastic injection & molding (p = .015). Respondents who worked in quality control and testing had significantly higher self-efficacy scores than respondents who worked in the plastic injection and molding departments (p = .005). See Table 8 for descriptive statistics. Among the present sample, working in the welding department showed higher job performance ratings and self-efficacy scores compared to other job functions in final assembly facilities.

Table 8

Descriptive Statistics by Job Function and the Dependent Variables

Dependent Variable	Job Function	*M*	*SD*	*N*
Job Performance	Body & Chassis	*4.709*	*.575*	*135*
	Paint & Finish	*4.540*	*.485*	*193*
	Engine & Drivetrain Assembly	*4.695*	*.454*	*195*
	Interior Assembly & Installation	*4.608*	*.472*	*209*
	Quality Control & Testing	*4.741*	*.495*	*119*
	Plastic Injection & Molding	*4.470*	*.527*	*109*
	Steel, Aluminum, or Iron Machining & Stamping	*4.481*	*.434*	*44*
	Welding	*4.791*	*.519*	*37*
	Total	*4.627*	*.502*	*1041*
Self-Efficacy	Body & Chassis	*5.426*	*1.114*	*135*
	Paint & Finish	*5.117*	*.904*	*193*
	Engine & Drivetrain Assembly	*5.371*	*.836*	*195*
	Interior Assembly & Installation	*5.229*	*.879*	*209*
	Quality Control & Testing	*5.448*	*.821*	*119*
	Plastic Injection & Molding	*5.005*	*.887*	*109*
	Steel, Aluminum, or Iron Machining & Stamping	*5.119*	*.739*	*44*
	Welding	*5.480*	*.783*	*37*
	Total	*5.266*	*.906*	*1041*

Summary

The results of this study conclude that age had little association with job performance ratings or self-efficacy scores, and that any previously held assumptions about age's relationship

with the pair of dependent variables was unfounded. Race and ethnicity's association with either of the pair of dependent variables seemed to have greater associations, however, as 4% of job performance variance was explained by race and ethnicity, and 5% of self-efficacy variance was explained by race and ethnicity. These effect sizes were before performing Tukey post hoc tests to determine which mean scores were different from the other groups within the race/ethnicity predictor variable.

When investigating each group's mean scores, it should be noted that higher than expected occurrences in the American Indian or Alaska Native group might have caused these findings to be skewed. This was a concern I had, and I wanted to offer a possible explanation for the larger than expected American Indian or Alaska Native sample size. The American Indian or Alaska Native group was the first choice in a radio-style selection on the survey that respondents were tasked with completing. For respondents who may have been reluctant to share their actual race or ethnicity, it could have been the case that they simply selected the first option available to avoid selecting the one that most-accurately represented them. Another explanation could be that some respondents may have preferred not to provided a response to that particular question but were not given the option to opt out of providing said response. An additional point of concern I had about this area of the findings was that Black and African American respondents appeared to represent less of this study's sample size than they did in the actual national population. However, there is research that suggested that individuals who identify as Black or African American, Hispanic, and Asian or Pacific Islander skip the race/ethnicity question by 6.6%, 4.7%, and 4.7%, respectively (Dembosky et al., 2019).

Education had the biggest overall effect size for explaining variance in self-reported job performance ratings and self-efficacy scores at nearly 9%. However, education explained 4% and

2% respectively when following up the multivariate test. Education as a predictor of job performance and self-efficacy was not a surprise. However, those with some high school education/no high school diploma had the second-highest mean scores (behind the group with a bachelor's degree and higher) for both job performance ratings ($M = 4.618$, $SD = .457$) and self-efficacy scores ($M = 5.382$, $SD = .829$) compared to the sample mean of 4.623 and 5.266 ($SD = .502$ and .906 respectively). The group with some high school/no high school diploma had mean scores higher than both the group with high school education and the group with some college/associate's degree. Perhaps one of the reasons those within the sample with some high school/no high school diploma reported such higher job performance ratings and self-efficacy scores was out of a need to prove themselves and their beliefs in themselves that they were just as good at their jobs as those with higher levels of education. Another possible reason is that those who reported some high school, no high school diploma have been on the jobs longer than other samples; and, as a result of their tenure, they felt more confident in their abilities and in their job performance. I brought this up as a possible outcome, because I did not imagine that many firms would hire individuals without a high school education, and that the smaller sample size might be the result of those who were hired when the push toward more education was not as pervasive as it was at the time of this study.

Aside from age, the facility where employers worked appeared to have the smallest associations with self-reported measures of job performance and self-efficacy scores. Mercedes-Benz respondents had a mean score of 4.690 compared to Volvo respondents' 4.680 and Honda respondents' 4.677. The mean score for the entire sample was a 4.627, with Kia and Hyundai in job performance. Self-efficacy was similar in the bottom half, but respondents who worked for Honda had a mean score of 5.377 compared to the sample mean of 5.266. One thing that might

explain these numbers is better workplace pride and culture which has been a hallmark of Honda's ethos since its inception. Similarly, Mercedes-Benz' slogan, "The best or nothing" might shine light on its culture to build cars at the highest level which ultimately resulted in employees who had greater access to training and resources to ensure they were successful and produce the highest-quality automobiles. The manufacturers included in this study all had powerful reputations - both good and less than desirable. Honda, for example, was widely seen as one of the most reliable, efficient, and longest lasting cars on the road along with Toyota (not represented in this study). Mercedes-Benz and BMW were long-considered to be the standard for mainstream luxury and performance. Volvo was long associated with reliability and safety while Hyundai, and its subsidiary Kia, are just now being viewed as formidable competitors to the other brands listed here. Yet, the self-reported measures of job performance *and* self-efficacy scores were at the bottom for respondents from Hyundai and Kia. Perhaps this is explained by both brands having operated manufacturing facilities in their areas for the least amount of time while BMW has been building cars in the United States since 1994, Mercedes-Benz has been producing automobiles stateside since 1997, and Honda has been producing cars in the country since 1982.

Job function was, perhaps, the most interesting of the findings in this study, as those in welding had both job performance ratings ($M = 4.791$, $SD = .519$) and self-efficacy scores ($M = 5.480$, $SD = .783$) higher than those of any other groups in the job function category. In addition to this being a smaller sample of the overall sample size, I anticipated that training requirements played a role in these averages having been higher than the sample size's job performance ratings ($M = 4.627$, $SD = .502$) and self-efficacy scores ($M = 5.266$, $SD = .906$). The lowest mean scores for job performance ($M = 4.470$, $SD = .527$) and self-efficacy ($M = 5.005$, $SD = .887$) belonged

to those who worked in plastic injection/molding. The job performance mean score for all job classes was 4.791 with a standard deviation of .502. For self-efficacy, the mean score for all job classes was a 5.266 with a standard deviation of .906. Of all of the job functions listed here, only welding had certifications that were often encouraged or sought after by employers. Almost all other job functions were paired with some sort of automation on the assembly line; Those roles, while still technical and challenging, did not require the same type of training or skill that was required of welders. This education and certification process might explain why welders had both higher job performance and self efficacy than the rest of the sample size.

While I have made the delineation between job performance and self-efficacy, the strong correlation between the two dependent variables may have caused concern that the two instruments were not actually measuring two different constructs. When evaluating these findings, it was important to note that the robustness of the analyses might have been affected as a result of the two measures failing to meet the assumption of homogeneity of covariance matrices. In addition, failing to meet the assumption of homogeneity of variance might have also had an effect on the statistical significance of the findings (Tabachnick & Fidell, 1996).

CHAPTER V

DISCUSSION

The goals of this research were guided by research questions that were primarily focused on finding statistically significant differences in both job performance measures and self-efficacy measures. Here, I present the findings of this study, limitations of the study, and how future research surrounding workforce training and education in automobile manufacturing might be assessed, implemented, and made more effective in the future.

Summary of Key Findings

In this study, I wanted to know how final assembly workers assessed their job performance as workers in the context of automobile manufacturing and how they felt about their abilities to learn new information and skills and put those items into action. In the next several sections, I discuss the overall findings of the data analysis.

Job Performance and Self-Efficacy

There were several key findings of this research. First, the two constructs (self-reported job performance and self-efficacy) that were assessed in this research appeared to quantify or explain very similar concepts. This was discovered in Chapter Four when I discussed the findings of the research question that looked at the relationship between the pair of dependent variables. This was consistent with the findings in the work by Abosede and Adesanya (2017) and Chae and Park (2020) which saw task performance increased as respondents' general self-efficacy increased. While this was an anticipated result, it did cause me to question whether Carlos and Rodrigues' (2016) job performance instrument and Chen et al.'s (2001) self-efficacy instruments measured too similar of constructs, and if this research might be better suited using less subjective measures.

The self-reported job performance measure might have been more closely aligned to self-efficacy than desirable, which would support an argument for the use of a more objective job performance measurement that was assessed by managers, supervisors, or even peers. Another consideration of combining the two instruments used in this study was that their validity, particularly the New General Self-Efficacy instrument, was assessed to measure self-efficacy. Because of this, using either instrument from the present study in combination with an alternative instrument is recommended. Carlos and Rodrigues, in developing the self-reported measure of job performance instrument, used experts in the academy, human resources, psychology, work/organizational psychology, and organizational behavior to ensure that the instrument actually assessed job performance; however, because the instrument was a self-report one, concerns about whether respondents were as truthful or forthcoming arose.

Age

Age was the next construct that I wanted to test against self-reported measures of job performance and self-efficacy. I hypothesized that age would be associated with self-reported measures of job performance and self-efficacy. In the present study, the self-reported measure of job performance was not statistically different based on respondents' age. This was also true for self-efficacy. Age did not provide any prediction of respondents' job performance or self-efficacy measures.

Race and Ethnicity

While the differences in age on the two measures in this study were not significantly different, race and ethnicity were. I hypothesized that self-reported measures of job performance and self-efficacy would result in significant differences between groups. The findings found that job performance and self-efficacy were significantly different across race and ethnicity. In this

study, those who identified as American Indian or Alaska Native had the highest job performance and self-efficacy scores of all racial and ethnic groups in the study. This group also represented over 20% of the sample size, a number that is far greater than that of the general population (approximately 1%). Those who identified as Hispanic/Latino and Pacific Islander/Native Hawaiian had the lowest job performance and self-efficacy metrics. I would like to address and offer a possible explanation of why the American Indian or Alaska Native sample size might be over-estimated in this study: 1) "American Indian/Alaska Native" was the first choice on the survey under the question "Please make the selection that ***best*** describes your ethnicity," as items were listed in alphabetical order; 2) there was not an option that allowed respondents to opt-out of answering the question about their race/ethnicity. This might have caused respondents to be uncomfortable or may have caused other respondents who believe that race and ethnicity were not relevant or helpful measurements in this study to be frustrated.

Findings by the National Congress of American Indians suggested that the American Indian or Alaska Native population was underrepresented in government census data and other important counts by approximately five percent (2021). That research cited access to American Indian or Alaska Native populations as being limited, particularly on reservations and villages that were more remote, as one of the primary reasons the population was not believed to be accurately reflected in census data. The research also stated that several states, including Alaska, Arizona, New Mexico, Montana, and South Dakota, had large populations of its American Indian/Alaska Native residents that lived in "hard to count tracts" with 67%, 68%, 79%, 50%, and 52% of the American Indian or Alaska Native population respectively living in one of those areas. I recognize that this may explain some of the variation in the expected range versus the population of American Indian or Alaska Native respondents in the present study.

In this summary, I did not purport to say the national American Indian or Alaska Native population is or should be more closely aligned to the 20% sample in this study; I offered these explanations in an effort to explain some of the variances between their representation in this study and the national American Indian or Alaska Native population.

An additional finding that was not expected was the sample size of Black or African American and Latino or Hispanic-identifying individuals. Like the logic and rationale for the American Indian or Alaska Native respondents, it might have been the case that Black/African American and Latino or Hispanic-identifying respondents felt it unnecessary or immaterial to the present study, and thus opted out of providing a legitimate answer given there was no option to skip the question without providing an answer. In this study, the Black or African American sample was shy of the national population by 2% (11% versus 13% respectively). However, this study's Latino or Hispanic sample size was 14% points lower than the national population of 19%.

Educational Attainment Levels

I hypothesized that respondents' levels of education would bear out significant differences in job performance and self-efficacy measures. The findings found that respondents did have significantly different job performance and self-efficacy scores based on their education level. Respondents were given four options that quantified their education levels (some high school/no high school diploma, high school diploma/no college, some college/associate's degree, and bachelor's degree or higher). Of these listed, those with bachelor's degrees had both the highest mean scores for self-reported measures of job performance and self-efficacy scores. These two findings were consistent with most literature, as the belief that one who was more educated was

likely to perform better in a given job while also having greater confidence in an ability to learn new information and effectuate new tasks (Ng and Feldman, 2009).

However, those who indicated having some high school but no high school diploma had job performance and self-efficacy ratings higher than those with a high school diploma and those with some college or an associate's degree. This finding might be explained by an overcompensation attitude that respondents may have displayed to assert that their level of education was sufficient for being successful in their roles in final and general assembly. It may also be the case that administering a self-report instrument to assess job performance assumes that individuals are self-aware or have the insight to assess themselves without bias fully or that they will be truthful in assessing their performance (Heainisch & Jex, 1998).

Manufacturing Facility

I hypothesized that manufacturing facilities would have a strong relationship with self-reported job performance and self-efficacy scores. In this study, I found that the manufacturing facility where respondents were employed had one of the smallest relationships to either self-reported measures of job performance or self-efficacy. Despite this, the more established manufacturers, such as Honda, Mercedes-Benz, and BMW, still had respondents who had higher-assessed scores in both measures than the relative new players (Hyundai and its subsidiary, Kia) to the automotive industry. For instance, the Mercedes-Benz plant in Tuscaloosa, Alabama, had the highest mean score for self-reported job performance, followed by Volvo, Honda, BMW, Kia, and Hyundai. Respondents from Honda had the highest mean score for self-efficacy, followed by BMW, Volvo, Mercedes-Benz, Kia, and Hyundai. The top-scoring facilities in both measures have been in operation for over two decades (Mercedes-Benz in Alabama since 1997, Honda in Alabama since 2001).

Furthermore, Honda may have benefitted from practices learned from its two Ohio-based facilities that started production in 1982 (Marysville) and 1989 (East Liberty). The higher-scoring brands also had the longest established histories not only in the automotive industry, but also in manufacturing presence and duration in the Southeastern United States. The brands that were perceived to be relative newcomers to the field were lower in both metrics. It was also the case that the brands with the lowest job performance and self-efficacy metrics were also the brands that were historically perceived to be lower in brand prestige and lower in quality, reliability, and durability. While those perceptions, on either side, were still evolving, the attitudes toward the brands still appeared to carry historical importance.

Job Function

I hypothesized that job function would result in significantly different mean scores on self-reported job performance and self-efficacy scores. Job function's relationship with job performance and self-efficacy metrics was perhaps, the most important, as most of the job functions in this study did not require a specific education, certification, or training requirement. As far as this body of work is concerned, none of the brands had specific job requirements that listed specific qualifications aside from generic and universal qualifications. The welding department is the one job function that often encourages certification or additional education, and it had the highest job function and self-efficacy measures compared to all others. This indicated that both self-reported measures of job performance and self-efficacy might have been increased by additional education and training opportunities for respondents who held other job functions. However, this may not be the most productive way if associated training costs would be placed on employees versus the employers. Jobs with the lowest metrics - such as those dealing with plastic/plastic injection/molding and highly-automated machines that performed a significant

amount of the work - might prove to benefit both perceived job performance and self-efficacy of respondents.

Recommendations

Earlier in this study, I discussed how popular adult education theories might be implemented in workforce training within the automotive industry. Given the fast-paced, production-centered nature of automotive manufacturing, and the fact that this study found education levels to be statistically significant in both self-reported measures of job performance and self-efficacy scores, it is my recommendation that leadership and human resource personnel ensure training requirements and opportunities allow workers some autonomy and input in the planning of their training. In addition, efforts should be made to ensure that final assembly workers are given a variety of mediums by which to learn new information and skills. For instance, research suggested that pre-production units, while costly, were still necessary in manufacturing processes (Hermawati et al., 2015). Other researchers suggested that implementing virtual reality would be beneficial in filling the gap in watching new skills be implemented and actually performing new skills in limited numbers (Gorecky et al., 2015). This would allow final assembly workers to receive delivery of new information and skills through different mediums, potentially exposing them to one that is most beneficial to their learning styles.

I also recommend that managers and leaders who have the most contact with final assembly workers consider how to best re-engage workers who find themselves frustrated at the need to change long-standing processes that govern manufacturing processes — processes that have become less efficient or effective as a result of changes within the industry. This should be addressed by providing leadership and management with information about transformative

learning theory to assist them in how they approach responding to frustrated workers who express a desire to hold on to their values and beliefs about how to perform their jobs in an ever-evolving context. As a follow up, leadership should give final assembly workers greater access to training and education that helps them to better learn new information and skills versus being debilitated by the changing and evolving industry.

By considering self-directed learning theory, leadership within manufacturers facilities should also consider implementing increased opportunities for final assembly workers to seek out training that is related to automobile manufacturing but also focuses on increased knowledge and skills in areas that would promote increased responsibilities and opportunities to be promoted within the organization. This would allow final assembly workers to feel like they are being put in the best positions to be successful within the organization, even if it meant moving to another job function within it.

In the present study, I discussed how self-efficacy is positively associated with job performance and other performance measurements. Positive associations between self-efficacy and various measures of performance were found in several studies (Stajkovic & Luthans, 1998; Robbins et al., 2004; Artino, 2012; Cherian & Jacob, 2013; Chae & Park, 2020;). The last recommendation that I make is concerned with how self-efficacy might be manipulated in final assembly workers to increase efficiency and productivity. Zelanak (2020) found that increases in measurements of self-efficacy often occurred after individuals were engaged in repeated and successful efforts at challenging tasks. By implementing repeated efforts in training programs, leadership and management can employ experiential learning theory to encourage final assembly workers to reflect on the successes and shortcomings of their training and practice efforts, with greater emphasis being placed on the successes to encourage increases in self-efficacy.

Many of the recommendations for practice hinge on leaders within the automotive industry partnering with educators and leaders currently engaged in workforce training and education and other adult education practices. This would allow the two groups — educators and leadership within the automotive industry — to seek ways to best engage final assembly workers in the acquisition of new skills and knowledge. These two groups should work together to ensure that they stress to final assembly workers how new training and education will be applied immediately, how it will aid them in being more successful and efficient, and how the training and continuing education that takes place can be used to increase future on-the-job opportunities for promotion. Educators in the field of adult education are recommended to provide organizations like automobile manufacturers with layperson examples of theories so that expectations about training goals and outcomes can be managed and training better designed to reach the most individuals while providing the most significant impact.

Recommendations for Future Research

Given the results of this study, there are a few recommendations for future research. First, a more targeted research design that focuses on different predictor variables, potentially limiting them to education level and job function, should be considered, as those two variables were perhaps the most salient in this study. A future research design might also include job performance measures that are part of respondents' personnel files with their employers (such as annual reviews, disciplinary action, merit pay increases, promotions, et cetera). Similarly, a future research design might also be qualitative or mixed methods to provide greater detail and nuanced understandings of the values represented here. If a quantitative research design is attempted again, efforts should be made to ensure sample sizes are more representative of the larger populations one which the data findings will be ultimately used to generalize.

Other research that is recommended centers around job performance as measured objectively but also in the context of industry-wide vehicle standings in terms of quality, performance, defects, dependability, and reliability. This type of research might look at cross-examining the perception of high-quality work internally at participating manufacturing facilities against industry metrics that are assessed by organizations such as Consumer Reports, J.D. Power and Associates, Kelly Blue Book, and others. This could highlight differences in perceptions about job performance and reality.

Another recommendation for future research stems from the type of recruitment of employees, onboarding, training, and continuing education/professional development that is offered to employees. Future research should focus on comparing what were perceived to be the most engaging and effective onboarding and training practices by manufacturers in an effort to provide less-successful firms a framework for improving their training that increases objective measures of job performance, efficiency while simultaneously reducing associated costs and errors or defects. This would involve working with manufacturing firms such as Toyota's manufacturing facility in Kentucky and BMW's manufacturing facility in South Carolina. Because education level and job function appeared to have the greatest significant differences on job performance and self-efficacy, research surrounding the differences in training provided to different job functions and research surrounding the nature of attitudes about job performance within less formally educated individuals might also be considered.

A future research study should focus on providing control groups to compare job performance ratings with that of varying groups of self-efficacy ratings. This research might help to determine whether manufacturing facilities should invest efforts into helping potential employees feel confident in their abilities to engage in and learn new information and skills.

Limitations of the Present Study

While this study did shine a light on some of the variables that are associated with self-reported measures of job performance and self-efficacy, the two constructs, as measured by Carlos and Rodrigues' self-reported measure of job performance and Chen et al.'s New General Self-Efficacy instrument, were too similar in their assessments. By conducting of a Pearson correlation coefficient, I learned that it ultimately indicated a very strong relationship between the job performance and self-efficacy constructs which caused me to question if this research would be better-suited by using a more objective measure of job performance as previously discussed. This study may have been limited by using two self-report measures that share 2/3 of their variance; and, the present study would benefit from replication using a different job performance instrument or a different self-efficacy instrument.

A second limitation of this study involved the use of the self-reported measure of job performance. Research suggested that when given the opportunity to measure themselves, respondents often chose responses or answers they perceived to be more socially acceptable, even in anonymous surveys (Rosenman et al., 2011). Self-reported measures are also said to cause respondents to select responses that they are unfamiliar with or unsure of the actual meaning or implication. Another limitation of the job performance measure used in this study was that, as a self-reported measure, a greater understanding of oneself was necessary to be able to place oneself in a theoretical context in which they could predict their response or behavior (Haeffel & Howard, 2010).

Adding to that, some respondents expressed confusion by some of the questions or statements contained within the two instruments, particularly those they perceived had nothing to do with their day-to-day functions. I received feedback that indicated that some of the questions

or statements had little to no impact on the work and responsibilities of final assembly workers. This challenge might have been overcome by being able to engage respondents in an actual dialogue versus asking them to read the information letter and draw their own conclusions about items on which they showed confusion or had questions. This is likely to be overcome in a future study that uses objective measures of performance where participants are not tasked with assessing their performance, but rather leadership, managers, and other who observe their performance.

This study was administered solely through an online medium and made no room or space for those who may not have had access to a mobile telephone or tablet device or for those who were either uncomfortable or not trained on the use of computers for assessment. To that end, this study potentially missed out on an opportunity to include a greater number of participants that might have provided even greater insight into the attitudes and beliefs of final assembly workers. Similarly, the survey was relatively long and asked individuals who may have had rough or challenging days at work to "go home" and have to relive those experiences by thinking about work-related constructs while away from work, potentially causing would-be participants to forego an opportunity to participate in the research.

By using anonymous survey methods, the belief is that respondents are more likely to answer honestly, as they do not feel the pressure to answer in more socially accepted ways (Rosenman et al., 2011). However, there is research that suggested that anonymous survey methods might actually cause respondents to be less accountable for their responses, thereby providing data that is less accurate or honest (Lelkes et al., 2012).

Conclusions

In this study, I discovered that self-reported job performance and self-efficacy measurements were significantly different based on race and ethnicity, level of educational attainment, manufacturing facility, and job function, but that age did not result in significantly different measures on either construct. The two variables that appeared to have the most significant association on measures of job performance and self-efficacy were respondents' education levels and their job functions, thus my recommendation to focus on research that examines these two variables.

The results of this study leave several questions to be answered. First, how can self-efficacy be better examined to ensure that it measures a different construct than job performance? This was already addressed by my recommendation that more objective job performance measures be used in a future study. In that future study that includes objective measures of job performance, an assessment of the relationship or correlation between job performance and self-efficacy can be conducted to increase confidence that the two scores measure different constructs. Next, why do different job functions have significantly different job performance and self-efficacy measurements? This study did not provide insight into this, as it was not a focus of the research.

This study leaves room for additional studies that look at collaborative efforts between two-year institutions that engage in workforce training geared toward the manufacturing industry. Additionally, examination of the type of training that automobile manufacturers offer to final assembly workers should also be studied to assess how workers' performance is associated with the types of on-the-job training offered.

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Appendix A

Tajuan Sellars

From:	IRB Administration
Sent:	Tuesday, February 16, 2021 10:25 AM
To:	Tajuan Sellars
Cc:	Maria Witte; James Satterfield
Subject:	Sellars Approval Exempt Protocol #21-076 EX 2102, "Job Performance and Self-Efficacy of Final Assembly Workers in Southeastern Automobile Manufacturing Facilities"
Attachments:	Investigators Responsibilities rev 1-2011.docx; Sellars 21-076 EX 2102 revisions 1.pdf

Use IRBsubmit@auburn.edu for protocol related submissions and IRBadmin@auburn.edu for questions and information.
The IRB only accepts forms posted at https://cws.auburn.edu/vpr/compliance/humansubjects/?Forms and submitted electronically.

Dear Tajuan,

Your protocol titled "Job Performance and Self-Efficacy of Final Assembly Workers in Southeastern Automobile Manufacturing Facilities" was approved by the AU IRB as "Exempt" under federal regulation 45 CFR 46.101(b)(2).

Official notice:
This e-mail serves as notice the protocol has been approved. By accepting this approval, you also accept your responsibilities associated with this approval. Details of your responsibilities are attached. Please print and retain.

Information Letter:
A copy of your approved protocol is attached. However you still need *to add the following IRB approval information to your information letter(s):* "**The Auburn University Institutional Review Board has approved this document for use from February 11, 2021 to --------- Protocol #21-076 EX 2102, Sellars"**

You must use the updated document(s) to consent participants.

Expiration:
Continuing review of this Exempt protocol is not required; however, all modification/revisions to the approved protocol must be reviewed and approved by the IRB.

When you have completed all research activities, have no plans to collect additional data and have destroyed all identifiable information as approved by the IRB, notify Office of the IRB via e-mail. A final report is **not** required for Exempt protocols.

****Please Note:** With future submissions in item1.c of the EXEMPT application describe the role (recruitment? consent? data analysis? oversight? of all key personnel listed in item 1.c, the line for role.

Best wishes for success with your research!

IRB Admin
Office of Research Compliance
Auburn University
115 Ramsay Hall
Auburn, AL 36849

Appendix B

Self-Reported Measure of Job Performance Instrument
Carlos and Rodrigues, 2016

Instructions

Please indicate the best answer to each of the following statements, given that '1' means 'strongly disagree' ,'2' means 'disagree' ,'3' means 'somewhat disagree' ,'4' means 'neither agree nor disagree' ,'5' means 'somewhat agree' ,'6' means 'agree' and '7' means 'strongly agree'".'

Task Performance
Job Knowledge

1. If I need to perform a task that I'm not familiar with, I seek for information that allows me to perform it better
2. I don't think I could execute my tasks effectively if I didn't have a certain amount of experience
3. The way I perform the basic tasks required in my job is not always in agreement with what I'm capable of doing (R)
4. The way I perform the basic tasks required in my job corresponds completely to the performance that the organization where I work asks from me

Organizational Skills

5. It is not always easy for me to perform tasks on time (R)
6. When I have a deadline to perform a certain task, I always finish it on time
7. If I had to perform a task in conjunction with other workers, I would probably be responsible for the planning, organizing and monitoring of the work to be done
8. I always leave my tasks to the last minute (R)
9. I am always aware when there is a lack of the resources (material or human) needed for the efficient performance of the organization

Efficiency

10. Sometimes, I feel disappointed with my performance at work, because I know I could have done better
11. I consider myself a fundamental worker to the organization I work for, due to the high quality of my performance
12. Receiving feedback (from my subordinates, my colleagues, my supervisor or from the organization) is fundamental in order for me to continue performing my duties with dedication (R)

Contextual performance
Persistent effort

13. When something is not right at work, I don't complain because I am afraid that others won't agree with me (R)
14. Usually, I take the initiative to give constructive feedback in order to improve the performance of other workers (subordinates, colleagues, supervisor or workgroups)

15. In the event the organization did not provide the training that I consider necessary to perform my duties effectively, I would seek information from other sources
16. I'm still able to perform my duties effectively when I'm working under pressure
17. As soon as I arrive at work, I set aside all my personal problems, so that my performance is not harmed

Cooperation

18. Usually, I dedicate less effort to work when performing a task in conjunction with other people (R)
19. I am always willing to assist other workers from the organization, even when I don't have much time available
20. Usually, I also perform tasks that are not related to my specific duties

Organizational Conscientiousness

21. Frequently, I arrive late at work (R)
22. It's really difficult for me to miss work, even when I'm feeling sick
23. I would never adopt actions that could harm the well-being of the other workers
24. When I think that the goals of the organization conflict with my personal goals, my dedication to work decreases (R)
25. I take my job really seriously, so I always comply with the rules and procedures imposed (by my supervisor or by the organization), even when no one is around

Interpersonal and Relational Skills

26. My communication skills are so good that I'm always able to capture everyone's attention
27. Communication inside organizations, even in workgroups, is fundamental so that people can perform their tasks effectively
28. When I write a message to others (other workers or students) I feel a certain difficulty in expressing what I'm thinking
29. When someone has a different opinion from mine, I usually convince them that my opinion is the best

Appendix C

New General Self-Efficacy Scale
Chen et al., 2001

Instructions
Using a *seven-point* rating scale please respond using the scale under each item. To calculate a score, take the average of all of the responses. A higher score indicates a greater self-efficacy.

Response Format
Please indicate the best answer to each of the following statements, given that ‘1’ means ‘strongly disagree‘ ,’2’ means ‘disagree‘ ,’3’ means ‘somewhat disagree‘ ,’4’ means ‘neither agree nor disagree‘ ,’5’ means ‘somewhat agree‘ ,’6’ means ‘agree’ and ‘7’ means ‘strongly agree”.’

New General Self-Efficacy Scale

1. I will be able to achieve most of the goals that I have set for myself.
2. When facing difficult tasks, I am certain that I will accomplish them.
3. In general, I think that I can obtain outcomes that are important to me.
4. I believe I can succeed at almost any endeavor to which I set my mind.
5. I will be able to successfully overcome many challenges.
6. I am confident that I can perform effectively on many different tasks.
7. Compared to other people, I can do most tasks very well.
8. Even when things are tough, I can perform quite well.

CITI PROGRAM

Completion Date 19-Jul-2018
Expiration Date 18-Jul-2021
Record ID 27895260

This is to certify that:

Tajuan Sellars

Has completed the following CITI Program course:

Not valid for renewal of certification through CME.

IRB # 2 Social and Behavioral Emphasis - AU Personnel - Basic/Refresher
(Curriculum Group)
IRB # 2 Social and Behavioral Emphasis - AU Personnel
(Course Learner Group)
1 - Basic Course
(Stage)

Under requirements set by:

Auburn University

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