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Supporting Employers in Apprentice Training: Outcomes of a Training and Mentoring Program for Electrical and Plumbing Employers

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We want to recognize and thank the stakeholders, employers and industry partners who have provided their support in making this project and report possible.

We would also like to thank the apprentices and team of the Ontario Electrical League (OEL). Your willingness and openness in participating in our surveys and interviews have allowed us to understand the barriers you face. Your participation has contributed to our goal of addressing and devising a solution to the gaps commonly faced in the skilled trades.

We wish to acknowledge this land on which the University of Toronto operates. For thousands of years, it has been the traditional land of the Huron-Wendat, the Seneca, and the Mississaugas of the Credit. Today, this meeting place is still the home to many Indigenous people from across Turtle Island and we are grateful to have the opportunity to work on this land.

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Executive Summary

The Ontario Electrical League (OEL) is a non-profit, member-based organization that represents the electrical industry in Ontario. OEL was originally established as the Electric Home League on January 11, 1922. The organization has over 38,000 industry partners province-wide including electrical contractors, inspectors, utilities, distributors, manufacturers, agents, engineers, educators and more. The OEL is aimed to promote, strengthen, and represent the electrical industry in Ontario.

This report examines the outcomes of a training and mentorship program that supports electrical and plumbing employers' need to train apprentices. Increasing the engagement in developing and delivering a solution to close these gaps in these trades. Active participation and involvement among employers in apprentice training in electrical and plumbing sectors will increase the capacity to train and certify enough workers in the skilled trades to meet the current and future needs of the labour market.

Research staff from the University of Toronto carried out the consent and data collection with all stakeholders and participants. A convergent parallel mixed methods approach was employed with a three-month follow-up period, using concurrent qualitative and quantitative data collection to meet project objectives. During the quantitative phase, all participants were invited to complete self-administered questionnaires online on REDCap and provide saliva samples for genetic and epigenetic analysis. During the qualitative phase, all participants were invited to participate in individual interviews to explore their experiences in apprentice recruitment, training and retention.

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Introduction

The following sections comprise this report:

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Section 2 Outlines the literature relevant to this report and project. This section provides detail to the common demographic visible within this population, the barriers faced in this field, the impact of mental health, the recent Covid-19 impact, and the epigenetics of occupational burnout.

Section 3 Highlights the methodology of this project, providing details about its purpose, the research questions, and how the quantitative and qualitative phases were carried out and interpreted.

Section 4 Presents the findings of the qualitative and quantitative results.

Section 5 Provides a discussion and overview of the significant results and the importance of this study.

Section 6 Addresses and offers recommendations based on the results of the findings.

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Section 1: Overview

1.1 Terminology

Table 1.

Apprentice	A qualified trainee who has signed a written agreement with their employer to receive the opportunity to learn and work in a designated trade and is registered with the Apprenticeship and Trade Certification Commission.
Apprenticeship training	A pathway that combines technical learning and supervised workplace training. The two components will aid in the apprentice to gain knowledge, understanding and skills aligned with their designated trade.
Certificate of Completion of Apprenticeship	A certificate issued to the apprentice upon completion of the final level of training for their designed trade.
Certificate of Qualification	This certificate is obtained when the apprentice completes the written exam that examines the individual's knowledge and proficiency in their designated trade.
Compulsory Trades	Requires a registered apprentice or journeyperson to work in the trade.
Designated Trade	Trade occupations under The Apprenticeship and Trade Certification Act, 1999.
Journeyperson	A recognized and qualified skilled professional who has completed their Apprenticeship certification and has received their certificate of qualification. They are able to train and mentor other apprentices.
Red Seal Program	An endorsement used to enhance a journeyperson's certificate of qualification. Indicates that a tradesperson has achieved the competency required the national standard in

	their designated trade. They are licensed to practice their trade in any Canadian province and territory.
Skilled Trades	Refers to an occupation that requires skilled labor and knowledge of the subject.
Small and Medium Sized Businesses	A small enterprise is defined as one with fewer than 100 employees. Medium enterprises have 100-499 employees.
Voluntary Trades	An individual is not required to obtain a certificate or license to practice their trade legally.

1.2 List of Abbreviations

CBI	Copenhagen Burnout Inventory
NIOSH	National Institute for Occupational Safety and Health
OEL	Ontario Electrical League
OS&OT	Occupational Science and Occupational Therapy
PTSD	Post-Traumatic Stress Disorder
REB	Research Ethics Board
SMB	Small to Medium Sized Businesses
UofT	University of Toronto
EDI	Equity, Diversity and Inclusion
CAMH	Centre for Addiction and Mental Health

1.3 About the Ontario Electrical League

The Ontario Electrical League (OEL) is a non-profit members-based organization that represents the electrical industry in Ontario[1]. Their goal is to promote, strengthen and represent the electrical industry in Ontario as they bring current issues in the industry (e.g., labour laws) to the attention of various government authorities through chapter meetings, conference's seminars, trade shows, training programs and government relations initiatives. Additionally, the OEL helps with the hiring process for companies seeking apprentices. This includes providing a hiring tool to find qualified apprentices and training to assist employers with the required paperwork and information. The OEL membership includes more than 12,000 individuals that span across Ontario and is supported by a provincial office. As an employer-based organization established 100 years ago, OEL is a staunch supporter of apprenticeship, one of the oldest, most respected forms of education and training.

1.4 About the University of Toronto

The University of Toronto (UofT) was founded in 1827 and is Canada's top university. The UofT is one of the world's top research-intensive universities, bringing together top minds from different backgrounds and disciplines to collaborate. Their goal is to prioritize city building, international partnerships, and transformative education to strengthen their standing as a globally ranked research powerhouse and leader in research-intensive education.

1.5 The Department of Occupational Science and Occupational Therapy

The Department of Occupational Science and Occupational Therapy at the UofT is a place to learn the knowledge and skills of occupational therapy that will lead to a Master of Science in Occupational Therapy degree. The department provides excellence in research and teaching in occupational science and occupational therapy and contributes to the well-being of the population by advancing knowledge regarding engagement in life's occupations. Furthermore, the Department of OS&OT provides graduate and continuing education programs that enable occupational therapists to be leaders in research, clinical practice and the promotion of health and well-being.

1.6 Temerty Faculty of Medicine

The Temerty Faculty of Medicine at the UofT overlooks the medical education and rehabilitation sciences departments and programs, including the Department of OS&OT.

1.7 About the ReSTORE Lab

The ReSTORE (Rehabilitation Sciences Through Occupational Research and Engagement) Lab was established in 2021 and is led by the Principal Investigator of this study, Dr. Behdin Nowrouzi-Kia. The ReSTORE lab is a multidisciplinary research group with backgrounds in occupational therapy, occupational health and safety, public health, psychology, work disability prevention, work ability and stroke rehabilitation. The mission of the ReSTORE lab is to identify and assess risk and to develop occupation-based interventions to improve mental and physical health in the workplace. Using a biopsychosocial lens, the ReSTORE lab seeks to understand how work disability extends towards personal characteristics (e.g., psychosocial) and environmental (e.g., healthcare system, workplace, workers' compensation system) factors to improve health outcomes.

1.8 ReSTORE Lab Members

Dr. Behdin Nowrouzi-Kia is an occupational therapist and assistant professor at the Department of OS&OT at the UofT, where he also holds the inaugural Emily Geldsaler Grant Early Career Professorship in Workplace Mental Health. Through an occupational lens, his research program is a systematic study of occupations in the areas of work disability prevention, return to work, and disability management. This approach is designed to produce results directly applicable to identifying and assessing risk and developing interventions for preventing or improving high-risk behaviours in the workplace. Dr. Nowrouzi-Kia's work is motivated by efforts

in the field of work disability prevention that extends beyond the efforts to prevent or cure diseases from a purely physical perspective, toward more holistic approaches.

Dr. Ali Bani-Fatemi is a Research Associate at the Department of OS&OT at the UofT. His research focuses on evaluating the influences of genetic and epigenetic alterations as potential risk factors for mental disorders. Using a biopsychosocial approach, he investigates the socio-cultural and clinical variables that may be related to mental illnesses. He has expertise in conducting rigorous research and has strong methodological experience in review studies, quantitative methods, and analyses.

Aaron Howe is a graduate student at Columbia University, where he is completing his studies in Clinical Psychology. He has previously worked at the Centre of Addiction and Mental Health (CAMH) on various projects related to investigating epigenetic and genetic mechanisms of suicidal behaviour in adult schizophrenia spectrum patients. Aaron has a passion for studying the intersection between psych neuroendocrinology and evidence-based mental health treatments for children and adolescents. He has joined the ReSTORE Lab in March 2022 to contribute to mental health-related projects.

Maryam Shahzad is an occupational therapist and a Doctoral student in Rehabilitation Sciences at the UofT, with a focus on studying workplace disability, return to work, and occupational health and safety. She has experience in qualitative and knowledge synthesis studies in the areas of resiliency and brain injury and analyzing health behaviours of Indigenous and immigrant populations.

Vijay Kumar Chattu is a Postdoctoral Fellow at the Department of OS&OT. He is a medical doctor and holds an MD in Community Medicine, MPH in Health Policy from Belgium, MPhil in Global Health Governance from Stellenbosch University. Besides, he specialized in Global Mental Health from Harvard University and in Refugee Mental Health from UofT and CAMH. He completed a 2-year Research Fellowship in Occupational Medicine from UofT based at St. Michael's Hospital. His current PhD research focuses on global health diplomacy and health security. Dr. Chattu has published over 300 research articles to his credit.

Nadia Nega is a fourth-year student at the UofT Mississauga campus, majoring in Biology for Health Sciences and doing a double minor in psychology and chemistry. She is greatly passionate about the intersection between biology and psychology, specifically the field of mental health. Thus, she joined the Restore Lab in September 2022 through an internship placement to enhance her passion for research and gain knowledge about the field of occupational sciences.

Beatrice Yuen is a fourth-year student at the UofT's St George campus and is completing her undergraduate degree specializing in Global Health. Beatrice is passionate about global health and hopes to combine her research interest in occupational science and mental health to improve the quality of life within the community. Beatrice joined the ReSTORE Lab as a research trainee to learn more about occupational science and gain research skills.

Bushra Alam is a fourth-year co-op student at the UofT Scarborough campus completing her Bachelor of Sciences (BSc) in Human Biology and Health Studies. Her research interests lie in OS&OT, public health, clinical research and mental health research. Bushra joined the ReSTORE lab as a Research Assistant in September of 2022 and is currently supporting/working on a variety of research projects at the ReSTORE lab.

Eunjae Youn is a fourth year bachelor of science student the UofT and joined the ReSTORE lab as a research student from September 2022-November 2022.

Section 2: Background Information

2.1 Demographics

2.1.1 Apprentices

In 2015, the National Apprenticeship Survey revealed that the majority of apprentices in Canada are men (86.3%) and Canadian-born (91.3%). A small portion of apprentices are composed of underrepresented groups such as women (13.7%), immigrants (9%), and aboriginals (6%). In 2016, the Canadian Apprenticeship Forum reported that there are 67,026 apprentices (64,833 males and 2,193 females) working as an electrician, 45,771 apprentices (44,760 males and 1,011 females) working as a plumber and 3,675 construction workers (3,363 males and 312 females). The National Apprenticeship Survey also found that female apprentices are more likely to work in trades that are not male dominated, and there are fewer women (59.2%) than men (81.2%) who are working in the Red Seal Trades. 1 in 10 Canadian apprentices are women and mostly worked in female-dominated sectors.

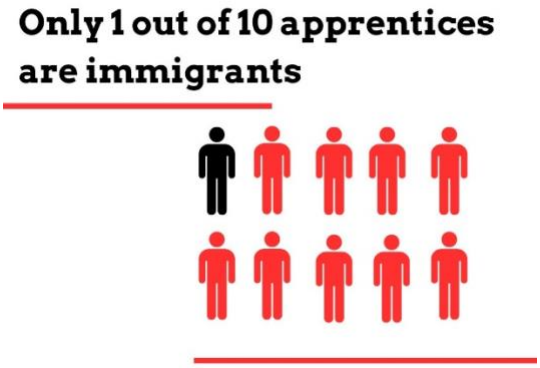


Figure 1: The design shows the lack of immigrants of entering the apprenticeship careers.

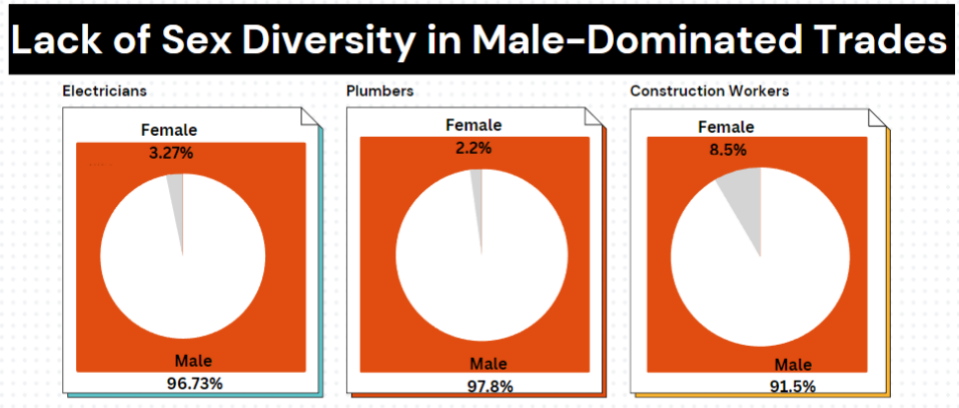


Figure 2*:* The pie charts exhibit the male domination in multiple sectors of skilled trades such as electrical, plumbing and construction industry.

The average age for entering an apprenticeship program in Canada and in Ontario is 27 years old and 29 years old respectively (1). With apprentices starting the program at a young age,

the highest level of education attained by most apprentices (55.7%) was a high school diploma (1).

2.1.2 Small to Medium Sized Businesses

Small to medium sized businesses (SMB), defined as a business with 1 to 499 employees, are essential to increasing apprenticeship opportunities as they represent approximately 95% of the employment in the construction industry (9). Despite this, many SMB employers have identified challenges with hiring and retaining apprentices, including a lack of adequate pre-apprenticeship training, low workplace cohesion, limitations in soft skills (10), a negative image of the trades, and difficulty competing in a demand-based market (11). National and international research has focused on understanding retention rates through apprentices' perspectives and dropout considerations. In these studies, it was determined that a loss in interest and reduced workplace resources (e.g., defined as occupational expertise, job security, and apprentice perception of technical ability) during the apprenticeship training was a strong predictor of increased dropout and good role models/strong pre-apprenticeship interest was associated with retention (12,13). This research reinforces the importance of supporting SMB employers to ensure the quality of apprenticeship training and inclusivity of the workplace environment (14).

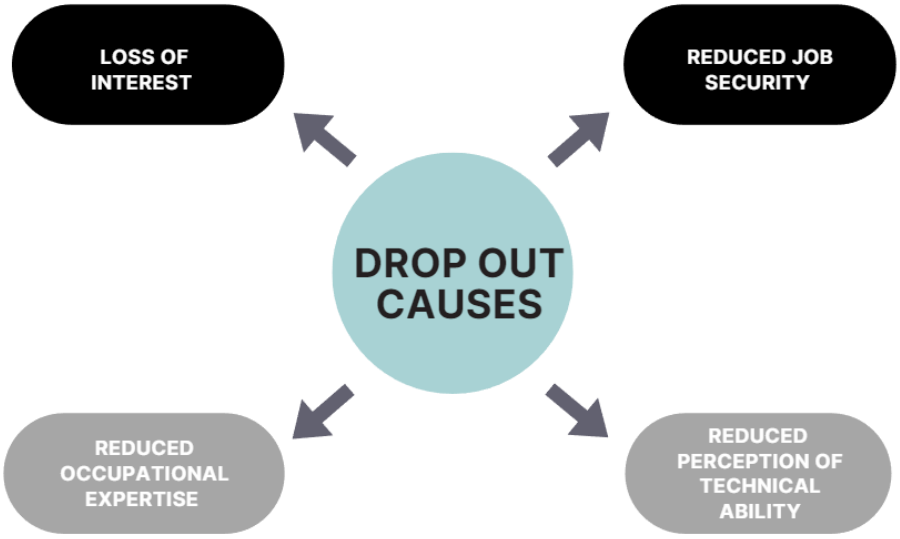


Figure 3: Predictors of increased apprentice dropout in the skilled trades.

2.1.3 Industry

In Canada, the skilled trades are primarily comprised of the following five sectors: construction, transportation, manufacturing and industrial, services and information and digital technology (2). The current in-demand skilled trades across Canada are carpenter, cook, hairstylist, auto service technician, and welder (2).

Approximately about 20% of Canadians working in the skilled trades (3). In 2021, data from BuildForce Canada revealed that out of 1.1 million workers in the construction industry only

140,000 workers are women. Furthermore, in the Canadian construction industry, roughly around 9.4% and 16% of Indigenous people and new immigrants respectively are in the workforce (4). Due to COVID-19 impact, the skilled trades economy and market recovery have been slow (4). Compared to other provinces in Canada, Ontario's skilled trade growth and employment rate have been relatively low (4). In 2021, the employment rate in Canada's construction industry had a 7% increase from 2020 and a 1% increase from 2019 (4). A total of 1,125,850 construction workers were employed in 2021. In the long term, construction employment is expected to grow at a moderate rate. In addition, the employment rate for both the plumbing and electrical industries has increased from 5% to 36% and 15% to 38% respectively from 2020 to 2021.

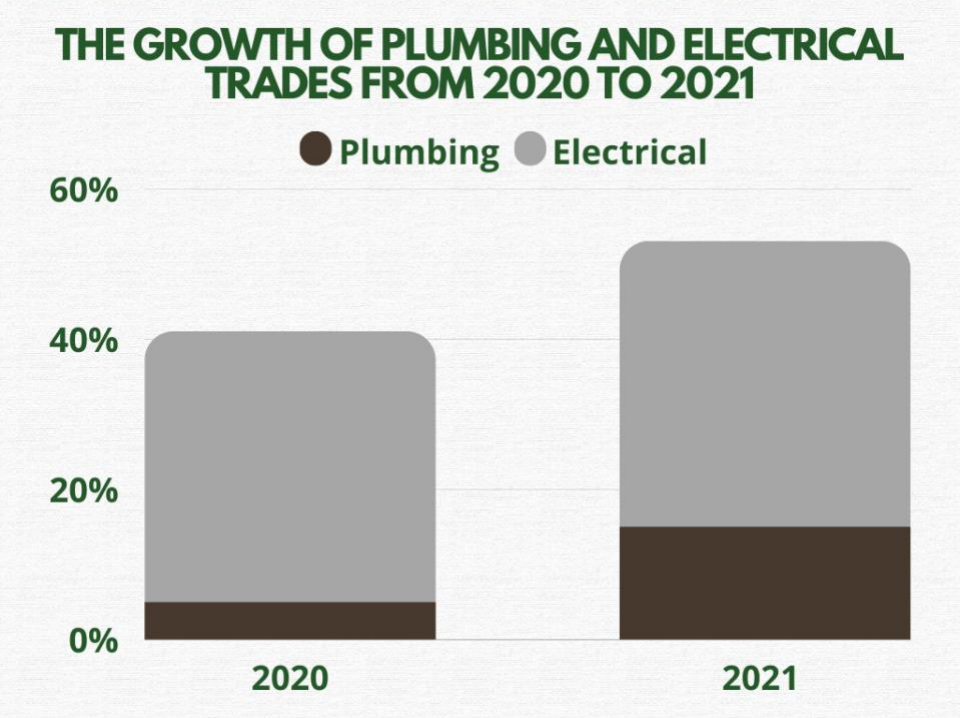


Figure 4: Employment rate growth in the plumbing and electrical industries.

With the skilled trades being a male-dominated career, only 2% of the skilled trades workforce in Canada are women (5). Along with masculine stereotypes, gender biases, sexual harassment and other barriers make skilled trades less desirable for women to work in (5). The lack of mentoring at work and opportunities in leadership roles are one of the key factors that may influence women to continue working in the construction industry (5,6).

2.2 Apprentice Training

2.2.1 Labour shortage in the skilled trades

Before the COVID-19 pandemic, labour shortage in the skilled trades was already a concern (7). Between 2016 and 2020, the number of young people entering the apprenticeship program in Canada dropped to 28.5% (8). Moreover, roughly around 700,000 workers from the skilled trades are planning to retire from 2019 to 2028 (8). A report by the Canadian House of

Commons in 2019, also highlighted the labour shortages in the construction Industry within the Greater Toronto and Hamilton area. The report identified that although COVID-19 has interrupted employment growth, in 2021, the construction sector rebounded and is expecting to hire 15,900 workers and train 142,850 apprentices (4). As it is predicted that 156,000 construction workers will be retiring in 2027 and there is a need to meet the rising demand of the construction industry (4).

The Canadian House of Commons also indicated the factors that affect the labour supply of the skilled trades. The factors include a lack of awareness and economic barriers. Many youths in Ontario lack awareness and knowledge of careers in the skilled trades (9,10). Even though there are Ontario Youth Apprenticeship Programs, few high schools implement and introduce these programs to help navigate students' career options (9). This results in a lack of exposure to the different types of jobs in the skilled trades, salary, training expectations, and work-life balance (9). Additionally, industry employers and apprentices are uninformed about the federal and provincial funds that are eligible for them to apply (9). On the other hand, labour mobility has a positive impact on industry employers when facing economic challenges, however, the high cost of living and transportation in the Greater Toronto and Hamilton area could be a burden to employees (9). Workers living in the Greater Toronto and Hamilton area may not be able to travel to other regions for work in a short time (9)

Apart from labour shortage, the phenomenon of an aging workforce is also seen within Canadian skilled trades. With more older workers retiring and leaving the skilled trades, fewer apprentices would be able to gain the knowledge and experience required to sustain a competitive and adequately trained workforce (9). However, the aging phenomenon does not affect all sectors of the skilled trades equally. The occupations greatly affected by the aging workforce are machine-related and the use of heavy equipment (9).

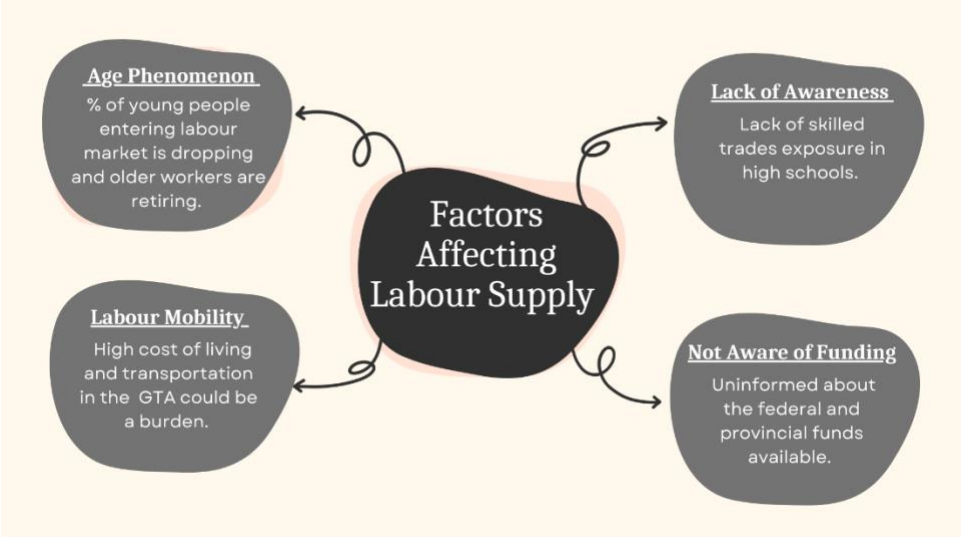


***Figure 5*:** Factors affecting labour supply in the skilled trades.

2.2.2 Apprenticeship system in Canada

The apprenticeship program is the only pathway in Canada to become a certified skilled trade worker. An apprentice will receive on-the-job training with a journeyman and complete technical training in colleges or in vocational schools (11). Most of the apprenticeship programs are governed by the Red Seal trades (11). Once apprentices pass an examination, they can then practice in any province in Canada (11). Despite the existence of this apprenticeship system in Canada, the completion rate of the program remains low (7,12).

2.2.3 Issues with the apprenticeship system in Canada

A negative image has been imposed on the apprenticeship programs. Besides the lack of awareness of apprenticeship programs, reasons such as the lack of training from Canadian employers, low participation in programs, low wages and variations in training requirements could result in a lack of interest in a career in the skilled trades for youth and high school students (10). Apprenticeship training varies among companies, as training can be costly and time consuming for employers. In addition, a high ratio of journeyperson is required for certain apprenticeship programs. Small businesses might not be able to arrange that many journeypersons to supervise the training for one apprentice (10). Many employers treat their apprentices as an investment, and many of them are afraid that the apprentices they have spent money to train would leave for another competing firm (e.g., a poaching risk) (Meredith et al. 2011). Therefore, employers are reluctant to pay apprentices a higher wage or provide them with training (10). Moreover, the length of the apprenticeship program can also hinder employers from sustaining the training and finding journeyperson to provide the training. Although the apprenticeship program registration remains high, the completion rates of apprenticeship programs are still low (Coe, 2013). With the skilled trades corresponding to the changes in the economy and the labour market, the apprenticeship programs in Canada cannot meet the demands stated above (14).

2.2.4 Completion of apprenticeship

In Canada, the apprenticeship program takes two to five years to complete and become certified as a journeyperson (15). There are other restrictions such as rigid testing with low passing rates, a narrow range of skilled trades sectors to practice in, and intensive coursework training which might require a high school diploma to fulfill the requirements (10). These restrictions could diminish the number of apprentices entering the skilled trades and wanting to complete the program. Financial conditions and the age of apprentices are closely related to the completion rate of the programs (16). The predominant age group registering for the program tends to be older than those who are undergraduates (10,16). Older apprentices who already have experience in the skilled trades are less likely to complete an apprenticeship and may leave the program due to family and financial obligations (10,16). The skilled trades are comprised of different skill sets and responsibilities, which can determine apprentices' success and their income (16). It is harder to retain apprentices in trades with job instability, as many of the apprentices who enter the skilled trades are looking for a stable income (10,16).

2.3 Mental Health in the Skilled Trades

With apprentices entering the industry early in their career, their well-being and mental health challenges are rarely looked upon. A study by Duc and Lamamra (2022) highlighted the mental health issues among apprentices. Factors such as the workplace hierarchy system, the uncertainty of the future, and work conditions (e.g., abuse, violence, exploitation), apprentices may suffer from sadness, depression, or post-traumatic stress related symptoms (17). In addition, the study also revealed mental health issues are a possible factor for the discontinuation of apprenticeship programs, however, it does not end their suffering. Moreover, psychosocial factors such as substance abuse, relationship issues, workplace bullying, and traditional masculine beliefs (e.g., self-reliance) could also increase vulnerability to mental health issues and suicidal thoughts in construction apprentices (17).

Suicide rates in the construction sector are disproportionately high (20). Ross et al. (2020) demonstrated that male construction apprentices who are younger and less skilled have a higher suicide rate than other young males (20). In addition, data from Statistics Canada showed that the age group between 40 and 59 males have the highest risk of suicide in the general population (18). Due to workplace bullying, construction apprentices are more likely to use substances as a coping strategy as well as discontinue their apprenticeship programs (19–21). Tyler et al. (2022) identified 25 potential factors that are associated with the risk of suicidal thoughts and suicide rates in the construction industry. Examples of factors identified included education, relationship status, socioeconomic status, psychosocial factors, and masculine stereotypes could play a role in suicidal thoughts (22). Furthermore, the workplace culture of the construction industry could stigmatize mental health and suicide, preventing construction workers from seeking help when needed (21). Demographic factors such as age, gender identity, apprentice status, year of apprenticeship, and the level of education could also influence the risk of suicide and suicidal thoughts in construction workers and apprentices (20)

Among these factors, age could be an important factor as young apprentices might have a difficult time transitioning from school to work (19). Being affected by mental health problems at a young age in the workplace, apprentices are less likely to complete the apprenticeship program (19). Unfavorable workplace conditions, low wages, and long working hours are the other factors that may reduce the desirability of working in the skilled trades for a long time (19).

The COVID-19 pandemic has also greatly affected apprentices' mental health (23). The government restrictions of COVID-19 severely impacted apprentices' learning experiences which could affect their future career opportunities and prospect in the skilled trades (23). The lack of opportunities could lead to an increase in psychological distress due to the unforeseeable future ahead and the risk of unemployment (23).

2.4 Impacts of the COVID-19 Pandemic

The coronavirus, or Covid-19, first emerged in 2019. This pandemic required mandated stay-at-home orders and caused global panic. There have been over 46 000 deaths due to Covid-19 in Canada with over 4 million cases recorded nationwide (24). Due to the infectious nature of

the coronavirus, many occupations maximized social distancing and moved to remote work options where possible (25). This led to implications for businesses due to the pandemic where job responsibilities are required to be performed on-site.

Particularly in the skilled trades, both remote working potential and social distancing potential are found to be low (25). For example, the construction industry paused apprenticeship, training, and placements for the safety of workers and students, with projected deterioration of the industry until 2028 (26). The government of Canada provided financial support through the Canada Emergency Response Benefit (CERB) and Statistics Canada found overall 38% of journeypersons collected this benefit, with 56% of female journeypersons having collected the benefit compared to the 36% of their male counterpart (27).

2.5 Equity, Diversity and Inclusion (EDI) in the Skilled Trades Workforce

Equity is the promotion of justice and fairness for everyone, with consideration of people's unique social positions. Diversity is the representation of a range of different backgrounds, culture, and identities within a community or population. Inclusion involves creating an environment that allows the active and intentional participation of everyone. There has been a spotlight on EDI in the skilled trades in recent years, with attention being paid to historically underrepresented groups in the industry such as youth, racialized individuals, Indigenous persons, women, immigrants and newcomers. The increased recruitment of these groups has been proposed to meet the social and economic demands for skilled trades workers and create more equitable employment opportunities.

The skilled trades have historically been viewed as a "man's job" and still hold barriers for women which result in a disproportionate male-dominated field. A systematic review faulted the lack of change in the masculine culture in the field to be a main cause of why it is so unwelcoming for women students (28). Apprenticeship experience have been found to be a vital factor in improving gender diversity in male-dominated fields (29). This is supported by the findings of Lopata et al. (2015) where women were found to be 1.5 times more likely to stop or prolong apprenticeships compared to the average (30). For women to thrive in the skilled trades, a positive and inclusive working environment is required. This includes mentoring, support in personal development, inclusive recruitment, and strengthening formal rules (31). Putting women in leadership roles or having an all-women's team can inspire other women working in the skilled trades (28,31). Having role models in the industry can demonstrate that women can have the same opportunities as men and prevent gender segregation among the skilled trades. In addition, support and encouragement from co-workers or male instructors in a male-dominated industry can help them to feel more relieved (28). Moreover, support in personal development can help build characteristics such as self-confidence, self-efficacy and resilience (28). These attributes are essential to assist women in feeling more satisfied and acknowledge that specific feminine characteristics (e.g., creativity and attention to detail) are favorable when working in the skilled trades (28). Policies in companies and organizations can play a crucial role in recruiting and retaining women in the skilled trades. However, the policies must be relevant

to cultural and company values to ensure gender diversity is maintained in recruitment and the workplace environment (28).

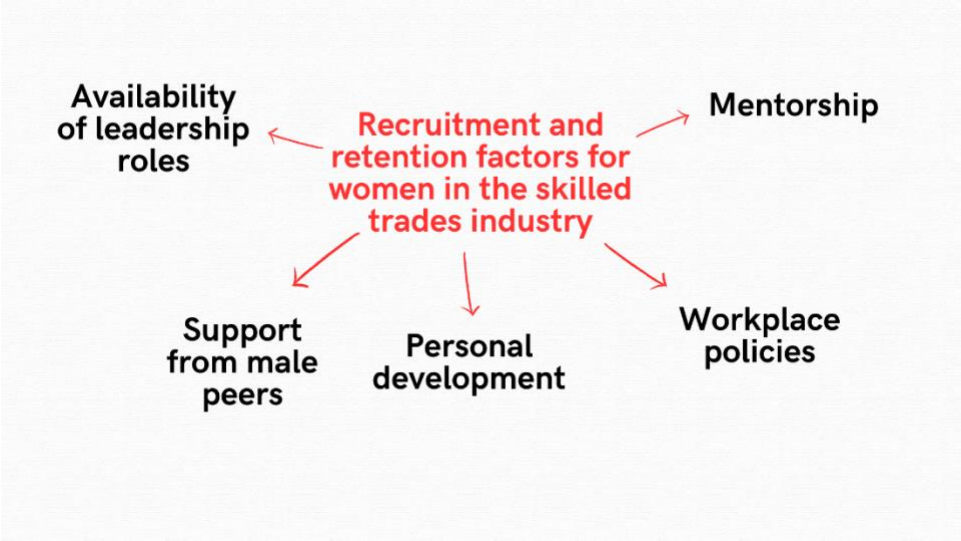


Figure 6: Factors to support women in the skilled trades.

2.6 Genetics and Epigenetics Study of Occupational Stressors

Research has shown that work-related values and abilities such as job satisfaction, leadership abilities, stress and mental health may be related to genetic and epigenetic factors. Genes are inherited from biological parents and contain information that determine biological and physical traits. Epigenetics is the study of how behavioural and environmental influences (e.g., diet and stress) can change genetic activity without changes to the genetic code itself. Epigenetic changes because of biological mechanisms can turn genes on or off and alter the expression of genes.

Most commonly, gene expression can be affected by epigenetic changes in three primary ways: DNA methylation, histone modification and non-coding RNA. Intergenerational epigenetic inheritance has been hypothesized; whereby epigenetic markers may be transmitted from parent to offspring without changes in the genetic sequence. Epigenetic changes have been linked to neurological and psychiatric disorders such as depression, substance use, and schizophrenia (32). Several workplace stressors with epigenetic effects such as bullying, sexism, racism, and expectations of long hours have been found and studied in different settings. Lam et al (2012) found that perceived stress and cortisol output were associated with epigenetic mechanisms. The effects of genetics and epigenetic mechanisms in the workplace are not well established and it is not clear how an organization can consider and deal with genetic variations and/or epigenetic alterations (33).

Section 3: Methodology

3.1 Research Design

A mixed method convergent parallel design was used to meet the following study objectives (A) examine mental health outcomes among skilled trades workers (e.g., electricians and plumbers) in Ontario through surveys (34), interviews and whole-genome genotyping for genetic and epigenetic analyses and (B) increase the number of employers in the apprenticeship mentoring and training program which aims to certify more workers in the skilled trades to meet the current and future trades in the labour market. The convergent parallel design involved simultaneous collection and analysis of quantitative and qualitative data, and complementary interpretation to enhance the depth of understanding. The quantitative phase of the study involved longitudinal data collection using a survey tool to measure sociodemographic data and mental health-related factors, and saliva collection for genetic and epigenetic analyses. Participants were invited to complete the survey and saliva collection at an initial visit and a three-month follow-up to evaluate the mental health and well-being of the participants and to detect changes in short-term stress, burnout, and work-related factors and epigenetic modifications over time (Objective A). The qualitative phase of the study involved phenomenological design involving data collection using individual semi-structured interviews to explore apprentice and contractor experiences in apprentice recruitment, training and retention (Objective B).

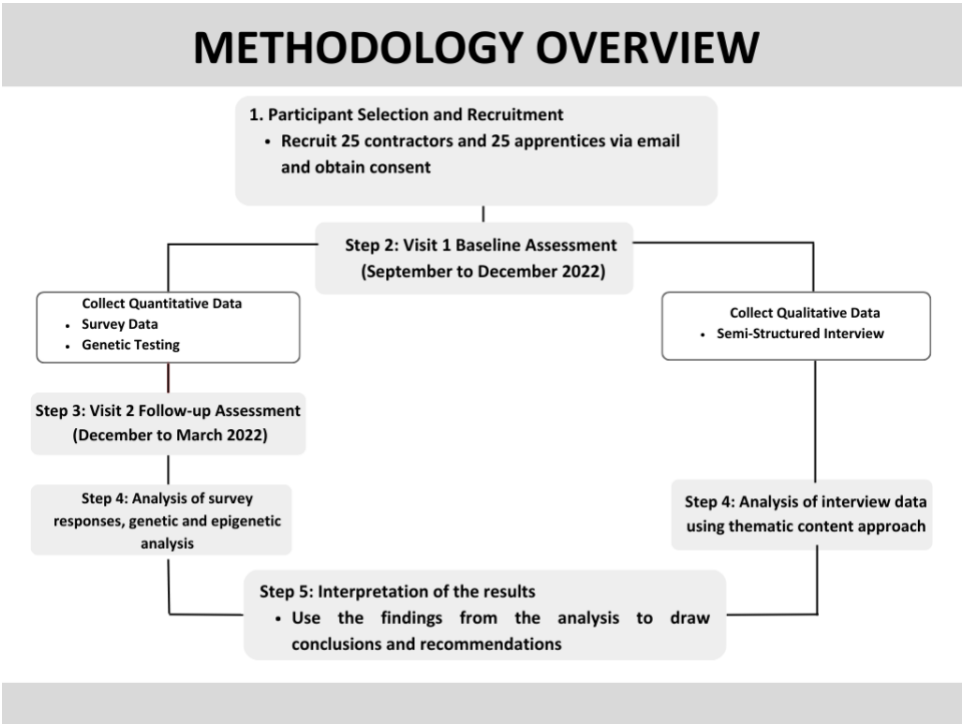


***Figure 7*:** Methodology at a glance.

3.2 Preparatory Phase

This 12-month study commenced on April 1, 2022. The first three months were considered the preparatory period wherein the Research Ethics Board (REB) approval was obtained from UofT, and participants were recruited. Recruitment of participants began on September 1, 2022. During the remaining nine months, quantitative and qualitative data collection and analysis were completed. An identical sampling strategy was used for this mixed methods project, with the same individuals participating in the quantitative and qualitative phases of the study. Participants were recruited using convenience sampling, a non-probability sampling strategy involving recruitment based on accessibility and pragmatic considerations. To be eligible to participate, inclusion criteria included: employers of small to medium businesses (SMB) in the electrical and/or plumbing industry or electrical or plumbing apprentices. Fifty-two participants were included in the final study with 20 apprentices, 17 employees and 15 employers. All participants, including contractors and apprentices, were recruited using an email script created by the research team at UofT and sent by the OEL.

3.3 Data Collection

3.3.1 Quantitative Data Collection

Survey

Informed written consent was obtained from each participant in both baseline and follow-up visits. The survey measure was developed using validated questionnaires to measure demographic information, burnout, work-related factors and mental health. Trained research staff administered the 37-item cross-sectional survey online using REDcap, an UofT secure online platform. Demographic data collected included gender, marital status, age, educational attainment, language, ethnicity, Indigenous status, height, weight, health issues, smoking status, work experience, and current employment (sector, hours, position, overtime, shift length). The questionnaire also included an inventory of factors that participants believed keep them working at their current position in their current workplace, and the availability of and satisfaction with factors in the current workplace.

The survey included an inventory of factors experienced as occupational stressors and burnout based on the Copenhagen Burnout Inventory (CBI) (35), the modified National Institute for Occupational Safety and Health (NIOSH) Generic Job Stress Questionnaire(36) and the Holmes and Rahe Stress Scale (HR). The CBI is a tool to measure burnout in three different domains: personal burnout, work-related burnout and client-related burnout. Personal burnout is defined as physical and psychological exhaustion experienced by a person. Work-related burnout is physical and psychological exhaustion related to the person's work. Client-related burnout is defined as physical and psychological exhaustion related to interpersonal relations with clients. The NIOSH Generic Job Stress Questionnaire is a tool used to measure job stress across 21 dimensions. For the present study, the survey included the following dimensions: job satisfaction, mental demands, physical environment, work hazards, and social support. Participants were invited to complete the survey during the initial visit, and a three-month follow-up visit. The

Holmes and Rahe Stress Scale is an assessment tool used to measure total stress experienced in the past three months or expected to occur in the next three months. The Holmes and Rahe Stress Scale was included to cover the occurrence of stressful events during the three-month observation period. Participants were invited to complete the scale at an initial visit, and three-month follow-up visit. HR is a 43-item self-report scale that assesses a series of financial, health, family and legal stressors in the past three months (37). The short time period covering only the last three months can be advantageous because of the falloff in reporting of events due to forgetfulness (37). HR measures the sum of life changes that occurred during the 3-month observation. As the emphasis of the scale is on stress due to readjustment rather than negative events, life change items may or may not be socially desirable.

Genetic Testing

Non-invasive oral DNA self-collection methods were used for genetic testing. Participants were invited to provide saliva samples for the purpose of analysis of genetic and epigenetic biomarkers' influence on mental health. The saliva samples for genomic DNA extraction were collected according to the guidelines of the manufacturer, DNA Genotek. A saliva sample consisting of 2 mL of spittle cells were collected using saliva collection tubes by trained researchers. Extraction and purification of DNA samples was carried out according to manufacturer protocol by the Neurogenetics lab at CAMH. The DNA samples were genotyped by The Centre for Applied Genomics (TCAG affiliated with The Hospital for Sick Kids) in Toronto. The genotyping was performed using the Illumina Omni2.5 (San Diego, CA, USA). This chip includes more than 2,300,000 Single Nucleotide Polymorphisms (SNPs). Specifically, the Chip incorporates the unbiased selection of 22 autosomal, X, Y and mitochondrial SNPs. The Omni2.5 offers optimal and comprehensive set of both common and rare SNP content from the 1kGP (MAF>2.5%) for diverse world populations. This BeadChip has the advantage of including optimized tag SNP content from recently released 1000 Genomes Project pilot data. Standard quality control filtering was applied. Subjects with missing data rates ≥5% were dropped from the analysis, and SNPs were dropped from the analysis if they had minor allele frequencies <1%, missing data rates ≥5% or Hardy–Weinberg equilibrium P-values $<10^{-5}$.

Three-month follow-up

Similar to the baseline visit, quantitative data collection includes completion of the survey, Holmes and Rahe Stress Scale, and saliva sample collection for genetic testing was completed at the three-month follow-up visit.

3.3.2 Qualitative Data Collection

Semi-Structured Interview

Participants were invited by the OEL to take part in individual semi-structured interviews using an email script created by the research team from the UofT. Informed written consent was obtained from each participant. The individual interviews were conducted for 45 minutes to 60 minutes and took place in person in a private room or via an online secure platform. Participants

were provided with an overview of the study and education regarding privacy, confidentiality and secure storage of their information. Permission was requested to audio record the interview for data accuracy purposes. A semi-structured interview guide was developed by the research team prior to the initiation of data collection outlining predetermined questions relevant to the study objectives. Although an interview guide was used, semi-structured interviews allow flexibility to explore particular themes and responses further on an individual basis. The session began by making participants comfortable through conversation including an introduction of the interviewer and participant, and confirmation of the participant's name and brief work history. Participants were invited to provide their contact information if they wished to receive a one-page summary of the study findings upon completion of the project. Participants were reminded that they could skip or choose not to answer any of the questions. The interview questions focused on aspects of the OEL mentorship program, apprenticeship hiring, apprenticeship retention, diversity and underrepresented groups in the skilled trades, and the apprenticeship model in Ontario. The interview protocol has been appended at the end of this report (Appendix E).

3.4 Data Analysis

3.4.1 Quantitative Data Analysis

The quantitative data were analyzed in IBM SPSS Statistics for Windows (Version 29.0.) (reference). Descriptive analyses were conducted using means, standard deviations, and percentages. Continuous variables were summarized as means and SD, and categorical variables were presented as frequencies. Categorical variables and proportions of participants with the variables were investigated using the chi-square test. Significance level was set at $P<0.05$.

We tested the effect of short-term stress on level of burnout in the study participants by analyzing the effect of the 3-month HR total score in a logistic regression model. The presence of burnout at 3-month was the dependent variable in the model. We also examined the effect of specific stressful events (family, medical, financial, legal, and work problems) on burnout. The effect size was described as OR and 95% CI. The logistic regression model was performed using SPSS Ver. 29.

Genetics analysis

Whole-genome genotyping was conducted to investigate genetic susceptibility to burnout in the study participants. Logistic regression analyses were performed, coding the genotype for an additive effect using PLINK (38).

3.4.2 Qualitative Data Analysis

The semi-structured interviews were analyzed using thematic content analysis. The purpose of thematic analysis is to derive the themes—that is, significant patterns of meaning in the data set. Braun and Clarke's six-stage thematic analysis was used in this study to provide guidance on analysis approaches. Interview recordings were first transcribed using a professional transcription agency and imported onto the NVivo 12 software (39), which is used for organization, coding and analysis of qualitative data. Four researchers engaged in the qualitative

analysis process. Each team member first familiarized themselves with the transcribed data by reading all 52 participant interview transcripts, taking notes on items of interest, and amending any errors in transcription. Researchers then completed the coding process, which involved applying short words or phrases to segments of text that would allow the organization of data in a meaningful way. Each researcher coded one interview, and then met as a group to merge transcripts and compare codes to ensure consistency in the coding process and minimize errors with merging data. Next, researchers coded the same seven interview transcripts independently, and the results were merged and discussed in detail. A code book was developed on this basis, outlining the full list of codes and definitions for each code on NVivo12. Next, the 52 transcripts were divided evenly amongst the four researchers, and each researcher completed coding on their assigned 13 transcripts. The results from the independent coding process were merged and reviewed by the researchers to ensure consensus on coding for all 52 transcripts. The codes were then sorted, interpreted, merged, and condensed into potential themes by the research team. Codes were examined based on factors such as the relevance to the research question and frequency count (e.g., the number of times each code appeared) to determine how they would be used to generate broader themes. The final themes were named using direct interview transcript data to best represent participant experiences.

Section 4: Results

4.1 Quantitative findings

4.1.1 Overview

The authors of this report used SPSS Statistics, version 29 to conduct statistical analysis and examine the participants' demographic characteristics, work and industry related characteristics, the importance and availability of work-related factors that contribute to the decision to stay in their current position as well as on burnout and stress levels. The total study sample (*n*=53) consisted of employers and employees or apprentices. *One participant did not complete the interview and the survey in follow-up visit and was excluded from both the qualitative and quantitative analyses.*

4.1.2 Demographic characteristics of study participants

The sociodemographic and work/industry related characteristics of the participants are shown in Table 1 and Table 2. The average age of the participants in this study was 39 years old. The majority of participants (49, 93%) were male, and the remaining four participants were female. Thirty-eight percent of participants received a college diploma (n=20) as their highest level of education followed by approximately 24% of the sample who received a college certificate (n=13). 24% completed high school (n=13) and 4% did not complete high school (n=2). About 4% of the sample were university graduates (n=2). All but one participant in the study completed their training in the province of Ontario. About 72% of the participants did not belong to a union (n=38). Overall, 40 participants expressed their intent to remain in their current position for the next five years. Regarding income levels, 39% of respondents reported earning a gross annual income of more than $80,000 (n=15) while 50% indicated having a gross annual income of less than $80,000 (n=19).

4.1.3 Importance of Work-related factors

To determine the importance of work-related factors that increase the retainment of employees, a questionnaire consisting of 19 questions was administered to the participants. "Income and benefits," "full-time employment opportunities," "costs of living" and "career advancement possibilities" were deemed as the most critical factors for participants to remain in their current positions at their current workplace. In contrast, study participants identified "leave of absence for external training" and "opportunity/support to qualify as Master Electricians" as the least important factors for continuing to work in their current place of employment (Refer to Figure 8).

4.1.4 Availability and satisfaction with the work-related factors in current workplace

To identify the availability of work-related factors and the study participants' satisfaction with the factors, an 18-item questionnaire was conducted. Most study participants reported that "full-time employment opportunity" and "flexible scheduling for family commitments" are factors that are available to their satisfaction at their current place of employment. Conversely, participants remarked that "financial support for external training" and "career advancement possibilities" were unavailable in their current workplace (Refer to Figure 9).

4.1.5 Burnout

The results of this study revealed that some participants experienced a moderate level of burnout (scores of 50 to 74). More specifically, 14 participants experienced moderate levels of personal burnout, 13 participants experienced moderate levels of work-related burnout and seven participants experienced moderate levels of colleague-related burnout. Moreover, four participants indicated a high level of personal burnout and one participant expressed experiencing an elevated level of colleague-related burnout. A single participant reported experiencing a severe level of work-related burnout (Refer to Table 3).

4.1.6 Holmes and Rahe Scale or Social Readjustment Rating Scale (SRRS) Scores and Burnout

The association between the participants' SRRS scores and all three types of burnout including personal, colleague-related and work-related burnout was investigated. There was no association found between the participants' SRRS scores and work-related burnout or colleague-related burnout ($p<0.05$). However, a positive association was found between personal burnout and participant SRRS scores.

4.1.7 Follow-up Visit Results

Of the 52 participants who completed the initial phase of the study, 29 returned for the follow-up appointment. After analyzing each participants' stress scores, personal burnout responses, work-related burnout responses and colleague related burnout responses, no significant changes or differences were revealed between the initial and follow up visits. However, the results, did indicate that the mean stress scores, personal burnout, work-related burnout and colleague-related burnout was slightly higher amongst the participants during the follow-up visit in comparison to the baseline visit. Nonetheless, the results reported were not statistically significant.

When comparing the results of employers (n=7) and apprentices or employees (n=22), employers had a greater increase in stress scores, personal burnout and colleague related burnout during the follow-up visit. Different work-related burnout was slightly higher amongst employees/apprentices during the follow-up visit.

Table 1: Socio-demographic Characteristics of study participants (n=53).

Socio-demographic Variables		**Employer (n=15)**	**Employee (n=38)**	**Total (n=53)**	***P* value**
Age (years), mean (SD)		47.40 (12.05)	35.68 (13.97)	39.00 (14.36)	0.003
Gender, n (%)	Male	14 (93.3)	35 (92.1)	49 (92.5)	0.88
	Female	1 (6.7)	3 (7.9)	4 (7.5)	
Ontario born, n (%)	Yes	14 (93.3)	32 (84.2)	46 (86.8)	0.37
	No	1 (6.7)	6 (15.8)	7 (13.2)	
Canada born, n (%)	Yes	13 (86.7)	33 (86.8)	46 (86.8)	0.23
	No	1 (6.7)	5 (13.2)	6 (11.3)	
Marital status, n (%)	Single	0 (0)	16 (42.1)	16 (30.2)	0.007
	Married	15 (100)	21 (55.3)	36 (67.9)	
	Divorced	0 (0)	1 (2.6)	1 (1.9)	
Highest education level, n (%)	Incomplete high school	2 (13.3)	0 (0)	2 (3.8)	0.15
	Completed high school	2 (13.3)	11 (28.9)	13 (24.5)	
	College certificate	6 (40)	7 (18.4)	13 (24.5)	
	College diploma	4 (26.7)	16 (42.1)	20 (38.0)	
	University graduate degree	0 (0)	2 (5.3)	2 (3.8)	
Primary language, n (%)	English	14 (93.3)	35 (92.1)	49 (92.4)	0.44
	French	0 (0)	1 (2.6)	1 (1.9)	
	Spanish	1 (6.7)	0 (0)	1 (1.9)	
	Russian/Ukrainian	0 (0)	1 (2.6)	1 (1.9)	
	Arabic	0 (0)	1 (2.6)	1 (1.9)	
Ethnicity, n (%)	White European/North American	13 (86.7)	30 (79)	43 (81.0)	0.58
	Middle Eastern	0 (0)	2 (5.3)	2 (3.8)	
	Asian East	0 (0)	1 (2.6)	1 (1.9)	
	Indian Caribbean	0 (0)	1 (2.6)	1 (1.9)	
	Mixed Background	0 (0)	2 (5.3)	2 (3.8)	
	Other	2 (13.3)	1 (2.6)	3 (5.7)	
	Yes	0 (0)	1 (2.6)	1 (1.9)	0.23

Aboriginal/Metis/Inuit, n (%)	No	15 (100)	37 (97.4)	52 (98.1)	
Illness, n (%)	Bronchitis	0 (0)	1 (2.6)	1 (1.9)	
	Asthma	1 (6.7)	1 (2.6)	2 (3.8)	
	Lung or breathing problems	0 (0)	2 (5.3)	2 (3.8)	
	Electric shock	1 (6.7)	0 (0)	1 (1.9)	
	Knee problems/injury	0 (0)	5 (13.2)	5 (9.4)	
	Back problems/injuries	3 (20)	2 (5.3)	5 (9.4)	
	Eye injuries	0 (0)	1 (2.6)	1 (1.9)	
	Noise-induced hearing loss	0 (0)	1 (2.6)	1 (1.9)	
	Neck problems/injuries	0 (0)	1 (2.6)	1 (1.9)	
	High Blood Pressure	1 (6.7)	0 (0)	1 (1.9)	
	osteoarthritis	0 (0)	1 (2.6)	1 (1.9)	
Current smoker, n (%)	Yes	0 (0)	7 (18.4)	7 (13.2)	0.28
	No	15 (100)	31 (81.6)	46 (86.8)	
Income, n (%)	$20,000 -$29,999		0 (0)	2 (5.3)	
	$30,000 - $49,999		1 (6.7)	10 (26.4)	
	$50,000 - $79,999		4 (26.7)	7 (18.3)	
	$80,000 or more		8 (53.3)	15 (39.5)	
	Prefer not to answer		2 (13.3)	4 (10.5)	
Participants' Total SRRS Scores	Less than 150	11	22	33	
	Between 150-299	2	7	9	
	Greater than 300	1	7	8	

Table 2: Work and Industry Related Characteristics of study participants (n=53)

Work/Industry-Related Variables		**Employer (n=15)**	**Employee (n=38)**	**Total (n=53)**	***P* value**
Training in Ontario, n(%)	Yes	15 (100)	37 (97.4)	52 (98.1)	0.53
	No	0 (0)	1 (2.6)	1 (1.9)	
	Yes	13 (86.7)	27 (71.1)	40 (75.5)	0.07
	No	2 (13.3)*	11 (28.9)	13 (24.5)	

Union, n (%)	Yes	2 (13.3)	13 (34.2)	15 (28.3)	0.13
	No	13 (86.7)	25 (65.8)	38 (71.7)	
Work hours per week (hours), mean (SD)		47.79 (13.28)	43.53 (7.10)	44.58 (9.16)	0.18
Worked as electrician/plumber (years), mean (SD)		26.62 (10.73)	10.83 (11.00)	15.60 (13.24)	<0.001
Worked at current workplace (years), mean (SD)		17.09 (12.70)	7.58 (9.87)	10.20 (11.30)	0.002
Total years worked in Ontario (years), mean (SD)		31.66 (12.75)	16.41 (13.70)	20.99 (15.05)	0.003

Table 3: Copenhagen Burnout Inventory (n=52) - Study entry (first visit)

Type of Burnout	Mean [SD]	Minimum score	Maximum score	Median	Moderate burnout* (n)	High burnout * (n)	Severe burnout * (n)
Personal burnout	44.57[20.35]	4.16	87.5	45.83	14	4	0
Work-related burnout	36.81 [19.89]	3.57	100	32.14	13	0	1
Colleague-related burnout	27.11 [20.02]	0.00	75.00	25.00	7	1	0

*In the Copenhagen Burnout Inventory, scores of 50 to 74 are deemed to be 'moderate burnout', 75-99 is deemed to be high burnout, and a score of 100 is deemed to be severe burnout.

Figure 8

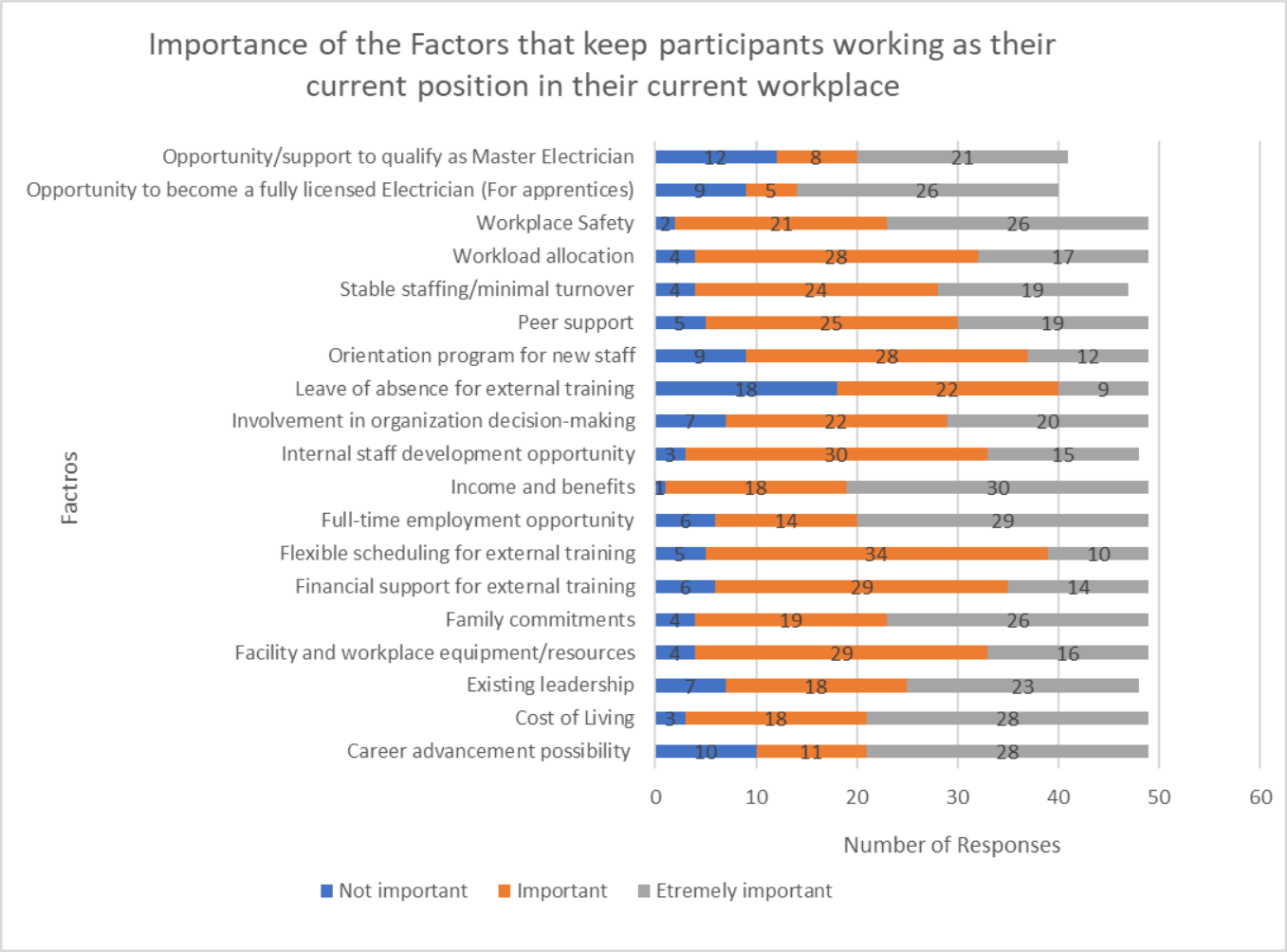
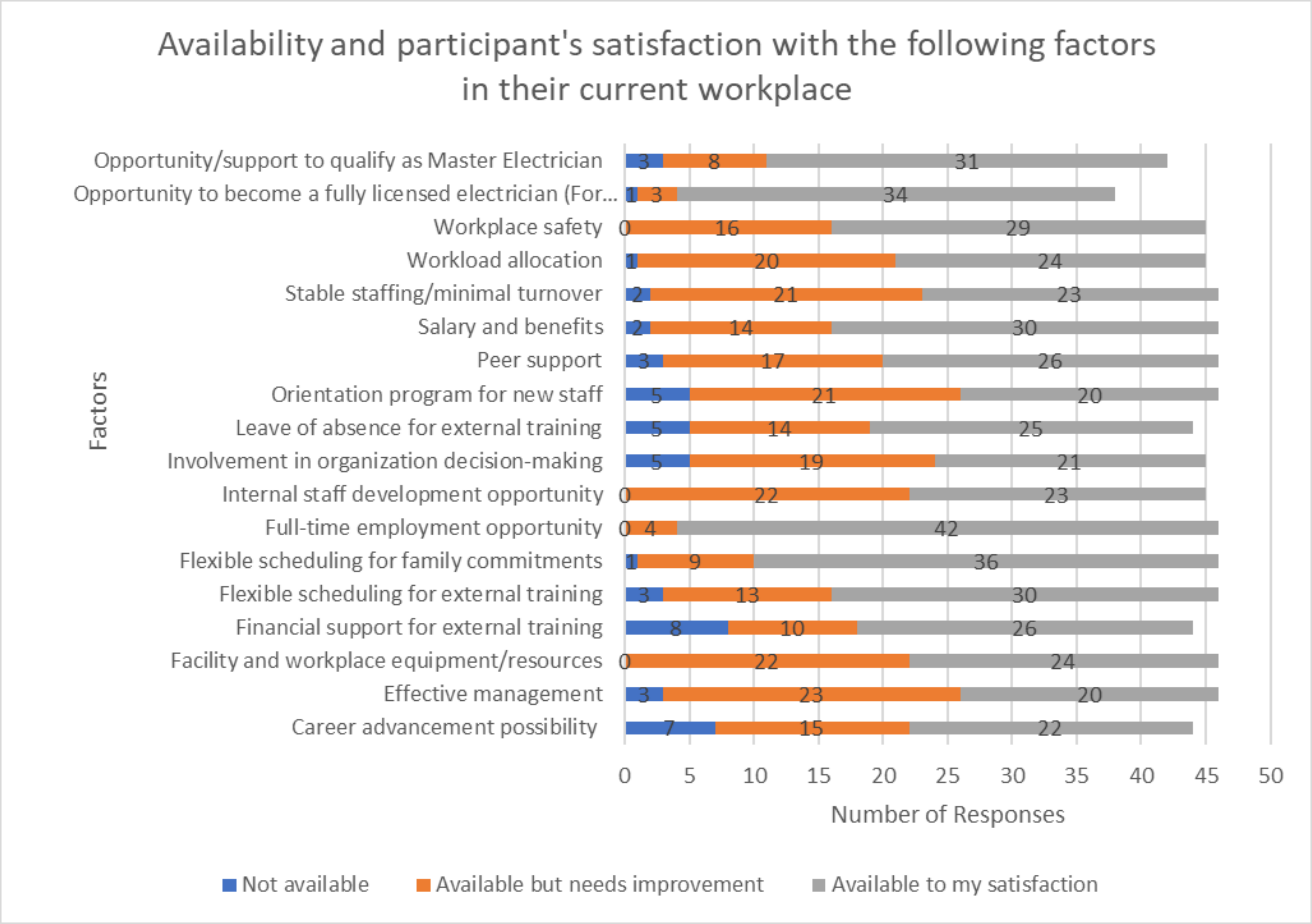

Importance of the Factors that keep participants working as their current position in their current workplace
Factros
Opportunity/support to qualify as Master Electrician 12 8 21
Opportunity to become a fully licensed Electrician (For apprentices) 9 5 26
Workplace Safety 2 21 26
Workload allocation 4 28 17
Stable staffing/minimal turnover 4 24 19
Peer support 5 25 19
Orientation program for new staff 9 28 12
Leave of absence for external training 18 22 9
Involvement in organization decision-making 7 22 20
Internal staff development opportunity 3 30 15
Income and benefits 1 18 30
Full-time employment opportunity 6 14 29
Flexible scheduling for external training 5 34 10
Financial support for external training 6 29 14
Family commitments 4 19 26
Facility and workplace equipment/resources 4 29 16
Existing leadership 7 18 23
Cost of Living 3 18 28
Career advancement possibility 10 11 28
0 10 20 30 40 50 60
Number of Responses
Not important
Important
Etremely important

Figure 9



4.2 Qualitative findings

4.2.1 Overview

Based on the thematic analysis, the following four themes have emerged: 1) Apprentice retention 2) Workplace environment 3) Equity, Diversity, and Inclusion and 4) Mental health and Covid-19. Corresponding subthemes were identified which exist underneath the umbrella of each theme to further expand on a notable element of the theme. The generated themes are summarized in Table 4, as a concept map in Figure 10 and described narratively.

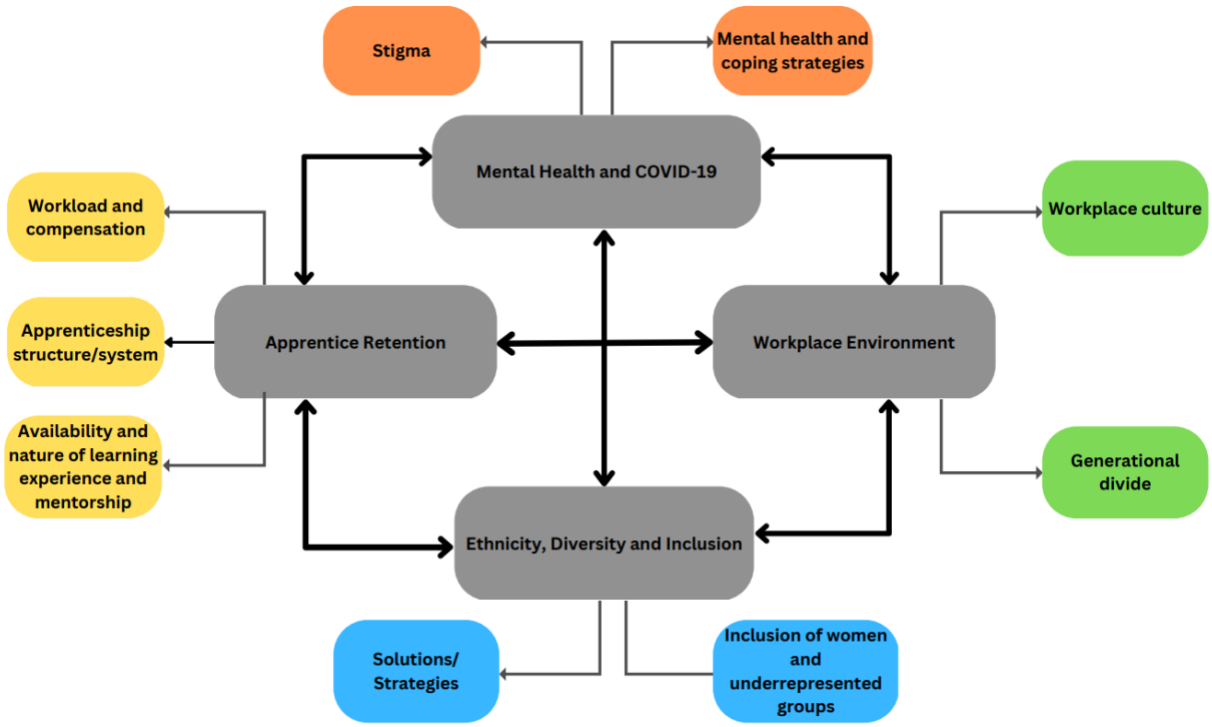
Table 4: Emergent themes and subthemes based on analysis of interviews.

Theme and subtheme	Quotations from participants
<u>Theme 1: Apprentice retention</u>	
1a. Workload and compensation	"The pay is like –things are expensive. Like, you know, you got to hire somebody with a family, and you pay him whatever you pay him, two

	three months down the road he cannot make it, so he has to go find another job with better pay, even if it's not a trade" (apprentice).
1b. Apprenticeship system	"But the-the apprenticeship model, I think, is fantastic. And I think it needs to be more systematized and kinder of rolled out across like saying, here's the standards. Here's a logbook, right, let's start with that, it's very simple" (employer).
1c. Availability and nature of learning experiences	"Companies specialize in one area. So that's the only thing they see for their apprenticeship. But we do a wide range of different jobs so that-so that it's more rounded and other companies we work with, we can have them work with that company to get exposed to the different areas without actually having them having to switch-switch jobs and move on to a different company" (employer).
<u>Theme 2: Workplace environment</u>	
2a. Generational divide	"The first thing that pops to mind is generational gaps. So, the way things were done previously compared to the way that societal expectations and tolerance is today, bridging that gap without offending either individuals. (In the past) the expectation was that you do all of the crap jobs, you are the one who is sweeping, you're picking up after the electrician, you're doing everything the electrician doesn't want to do. And that's not as widely accepted. And I also feel it's a little bit dehumanizing to have somebody basically be a slave for the beginning, you know, few years of their work experience. It's also not super supportive and encouraging" (employer).
2b. Workplace culture	"I worked for a company with obviously top-notch HR policies, but I can tell you once we hit a job site nobody gives a shit right…It did not matter, and apprentices can be subject to bullying, they can be subject to some kinds, some forms of threats depending on the jobsite and I think that as an industry as a whole it's our responsibility to change that" (employer).
<u>Theme 3: Equity, diversity and inclusion</u>	
3a. Inclusion of underrepresented groups	"The problem with that is every population is different. Whether it's the females, or the Natives, or Indigenous, any like minorities. Everyone is raised differently. So with each demographic there are different approaches" (apprentice).
3b. Inclusion of women	"There's still a lot of guys in the trades that think women shouldn't be in the trade…I guess my point is that in terms of seeing underrepresented people in the trades, I feel like there's still sometimes an old school stigma" (apprentice.
3c. Possible strategies and solutions	"So maybe have something where there's – like it all sounds silly – but sensitivity training" (apprentice).
<u>Theme 4: Mental health and COVID-19</u>	
4a. Stigma in the skilled trades	"But I feel, as a tradesman, I feel very looked down upon —on a day to day basis. You know? I'm walking down the street…I see people going to the other side of the street, or going to the other side of the sidewalk, or they're locking their door…In an elevator, people won't get in an elevator.

	And I'm like, I don't understand. What do you think, I'm going to murder you in the elevator?" (apprentice).
4b. Mental health concerns	"There's sometimes challenge, mental challenges, and we've had some apprentices that have taken extended time off, because of stress or whatever it is and they have a hard time handling the stress." (employer).
4c. Coping strategies and mental health supports	"My biggest thing would be, you know, as, as per any job having counselling or some sort of I don't want to use the word, either counselling or like, some sort of therapy or Outreach Programme" (apprentice).

***Figure 10**:* Concept map of generated themes.



4.2.2 Theme 1: Apprentice retention

Participants identified necessary factors to retain apprentices in the skilled trades industry broadly and more specifically reduce turnover rates within SMB. The following subthemes were identified: 1a) Workload and compensation 1b) Apprenticeship system 1c) Availability and nature of learning experiences and mentorship.

Subtheme 1a) Workload and compensation

Participants highlighted the importance of fair compensation and benefit packages to retain employees long-term. More specifically, wages, pensions, and benefits (e.g., health, dental, personal leave) were highlighted as significant factors to create sustainable employment. Some participants identified this as particularly important given the high rates of inflation in the

post-pandemic era. Particularly, employees with financial obligations to support their families stressed the importance of a living wage that could help secure basic needs and noted poor wage as a significant reason to seek employment elsewhere.

> "*But somebody, let's say, my age, married with a daughter, you got to hire me, for example, and you pay me, let's say, $18, $19 an hour. I'll only be there for a couple of months. I have to find something better, you know. You got to put – you have food on the table. So, I don't know if somehow they can make it work, but that's the most difficult thing for me.*" (R39, apprentice)

Subtheme 1b) Apprenticeship system

The apprenticeship system or model in Ontario was discussed in detail by apprentices, employees and employers, including the pathways to apprenticeship, apprenticeship funding, ratios of journeymen to apprentices, and formal trades school/education. Participants explored the process of mentorship and supervision under the current apprenticeship model compared to the older iterations of the model. Specifically, some participants preferred sponsorship by an individual journeyperson to ensure more direct responsibility and mentorship, rather than finding an employer to sponsor training. Additionally, most participants identified the apprentice-journeyperson ratio as a current problem in the apprenticeship system, and recommended an increase in the number of apprentices a journeyperson can train from one to two or three. This was proposed by participants to ensure sustainable employment and sufficient work opportunities for apprentices interested in engaging in the skilled trades, and to meet the demands for growth in the industry. Some participants suggested different ratios for different stages of apprenticeship as skill set and expertise are gained throughout the training process.

> "*I think one of the province's areas of improvement that needs to be looked at first and foremost, to encourage more people to come into the trade is the ratios. We have a one-to-one ratio for an entire five-year apprenticeship. The idea that a first-year apprentice is needed to be supervised at the same capacity that a fifth-year apprentice needs to be supervised is outrageous and it's not realistic*." (R07, employer)

Apprentices, employees and employers also discussed their challenges with formal trade school, reporting difficulty contacting administration, ambiguity regarding start dates and scheduling, and a lack of notice when a spot does become available. Participants suggested a public list or streamlined system for formal trade school, to allow apprentices to identify their spot on the waitlist, and plan for their in-school versus on-the-job training accordingly. Furthermore, some participants reported that the geographical availability of trade school options was limited, resulting in difficulties attending if they resided in rural or Northern Ontario.

> "*The trade school system is awful. Absolutely awful. I'm sure that causes so much stress and anxiety for people, myself included, because how is it that I'm getting ready to go get my license and I've been waiting a year and a half now to go back to advanced trade school and no one's even called me or emailed me. You want to go get your license, but then you*

can't because you haven't gone to school, because they haven't given you a seat." (R31, apprentice)

"*Now I'm sitting at five and I'm looking at, at least a seven-year apprenticeship and that's if I could even go to school for the next two years, but I, I know I won't because I'm so far down on the list...But you're still advertising to new kids getting into the trade, that it's a five-year apprenticeship. That's a load of *expletive*...The other thing too, is like you call and they just tell you, "You have to wait." Like show me the list. Where are all these people on the list? Where am I? Where – who's in control of this list.*" (R42, apprentice)

Employers also discussed the challenges of trade school, specifically having to make alternative arrangements for ongoing business projects and tasks, often under short notice. Employers also underscored the extra workload and burden on existing employees when apprentices were requested to attend trade school. Suggestions were made to mitigate the effects of apprentices being away for in-person trade school, including offering different options for scheduling or allowing a mix of on-the-job and in-school training.

"*Actually, just thought of another challenge and obstacle for apprenticeships. It's this schooling portion of-of the apprenticeship. So, getting them hired is one thing, but when they need to go do their schooling, um, it is very difficult to manage workload and have an apprentice gone for eight to 10 weeks.... And then if there were more options for that schooling as well, so that you didn't have to have all your apprentices gone on one day, that would be very helpful too. So, then you could support them learning at school part time and working part time rather than this all school, all nothing model.*" (R27, employer)

Subtheme 1c) Availability and nature of learning experiences and mentorship

The amount, frequency, diversity and quality of learning experiences and mentorship were discussed as significant factors in the apprenticeship training experience related to retention. Being paired with a journeyperson that was knowledgeable and engaged in the process of supporting apprentice growth and development was considered vital. Additionally, employers, employees and apprentices highlighted the need for well-rounded and diverse learning opportunities that exposed trainees to multiple types of work, tools and skills. However, it was acknowledged that this was highly dependent on the employer and employers that were able to provide a greater breadth of learning experiences were seen as more desirable for long term employment.

"*Getting a well-rounded experience is important. I don't know how companies can guarantee that. It just depends on what kind of work the company does.*" (R29, employer)

Mentorship both by a journeyperson and peers was recognized as an important aspect to apprenticeship training and retention. Particularly, job-related mentorship to help learn and perform industry-related skills safely within performance standards, and also personal mentorship to help navigate challenges and specific situations. The benefits of having mentorship

external to the direct employer were discussed, and participants voiced the challenges of openly disclosing their problems to an employer or senior colleague, particularly when employed with a small to medium sized business. Mentorship in the first couple of years of the apprenticeship process was considered most important to help navigate initial barriers and develop a sense of certainty and confidence.

> *"The thing that helped me the most was to be able to have a peer group to talk to. Um, which, I don't know who would set that up or how it would be done but just have kind of like a group that maybe is facilitated, maybe they meet once a week virtually. And there's somebody that runs the session. And it's open to all, let's say, first year apprentices, right. Because I think that's where the-the big problem is. I think if you can get past the first year and pass your first term of school, then you see the benefits longer term. But some sort of a group where they-they could go to deal with issues um, that maybe they don't want to address at work or they can't address at work because in a small to midsize shop, there's no HR department."* (R50, apprentice)

4.2.3 Theme 2: Workplace environment

The role of the workplace environment was a salient theme that emerged from participant interviews, with the following subthemes identified: 2a) Generational divide 2b) Workplace culture.

Subtheme 2a) Generational divide

Participants discussed the generational divide between the newer generation of skilled trades workers compared to earlier generations and noted differences in attitudes towards life and work. The need to bridge the gap between generations was identified as pertinent to the growth and advancement of the skilled trades. Managing generational clashes on the worksite were also highlighted to support appropriate mentorship and training of apprentices. Interviews underscored the need to value the expertise and knowledge of more experienced workers, while creating safe spaces for new generations of tradespeople. More experienced tradespeople spoke about the newer generation of workers lacking general hands-on skills and knowledge (e.g., using tools), and limited soft skills (e.g., work ethic, communication).

> *"So, with younger uh, apprentices, especially those um, just out of high school or just-just starting into the trades, a lot of them now do not have that experience with the tools that a lot of the older guys did when making it. Even 30 years ago, those that came through as*

a trade usually had a pretty good understanding of using even hand tools, power tools." (R11, employer)

"*I hate saying but this new generation come up is just – I hate, like I hate to use the word lazy but it's – there's just no drive you know. There's no good work ethic, it seems*." (R23, apprentice)

The newer generation of skilled trades workers identified potentially problematic patterns of behaviours and communications perpetuated historically within the skilled trades. Particularly, participants identified workplace harassment and perpetuation of hegemonic masculinity practices that explicitly associated the skilled trades with toughness, emotional stoicism, and self-sufficiency. The newer generation of workers identified the need to be emotionally resilient and take criticism easily.

"But then again, that's – that is the trade. If you walk onto any job site, if you walk onto any, um, if you walk onto any worksite, or whatever the case may be, um, you know, there's a lot of swearing, there's a lot of people talking smack to you, there's a lot of people smoking and drinking coffee. And, you know, there's a lot of old heads that are, you know, that they're very set in their ways, and they want to do it this way. And you know, your teachers have to go off the script - so that's stupid, we're going to do it this way instead. (R40, apprentice)

Facilitating conversations between and amongst different generations of tradespeople and supporting both parties were proposed as solutions to manage the generational gap.

Subtheme 2b) Workplace culture

Paying attention to the values, beliefs, attitudes and behaviours in the workplace was identified as important to create a safe and friendly workplace environment. Employers and employees both noted the responsibility for individuals to conduct themselves in a professional manner and interact with colleagues, clients and community members respectfully. Participants viewed workplace policies as integral to ensuring positive workplace culture, however, noted that there was often a gap between the policy and implementation on the worksite. The use of inappropriate language was identified by many participants as a concern in the workplace and reported to create a potentially hostile and unwelcoming culture. Apprentices and employees spoke about bullying and hazing in the workplace as a traditional practice that needed to be addressed to support better workplace culture.

"*But, you know, the trades are always – are just barbaric. It's an old way of – and an old way of learning, an old way of teaching. Apprentices are always known as, you know, the dummies, the new guys, new boots, you know, you're an idiot. It's not with every company, but you know? What company benefits from handing your apprentice a fake tool list and*

telling him to go and buy a bubble for a level, or a right-handed hammer? Like, you know what I mean? It's just silly stuff like that. It's hazing." (R40, apprentice)

Creating family-friendly work cultures and promoting work-life balance was deemed significant by both employers and apprentices. However, it was noted that this balance was often difficult to achieve, with long work hours, early mornings, and deadline driven work demands. Nurturing a culture of respect for personal demands and non-work-related activities was seen to enhance employee well-being and ultimately, retention.

"*Don't work the heck out of everybody. Too much work is not a good thing. And we seem to focus on just getting jobs done and not-not necessarily worrying about people's home lives and we just worried about the almighty dollar. There is more to life than money but unfortunately, with rising costs and everything, it's-it's a fine line. I try to tell all my employees, that family comes first*." (R08, employer)

4.2.4 Theme 3: Equity, diversity and inclusion

Participants expressed their opinions on inclusion of underrepresented groups in the skilled trades, including women, youth, persons with disabilities, racialized groups and Indigenous peoples. The following subthemes emerged: 3a) The inclusion of underrepresented groups 3b) The inclusion of women 3c) Strategies and solutions.

Subtheme 3a) The inclusion of underrepresented groups

Majority of participants acknowledged underrepresentation of certain groups in the skilled trades, while also reporting a visible increase in diversity on worksites in recent years including more women, Indigenous people, newcomers and racialized groups. Participants explored specific disadvantages and barriers for different groups, such as linguistic challenges for nonnative English speakers (e.g., with general workplace communication and written qualification exams), physical challenges for persons with physical disabilities (e.g., climbing a ladder), and gender-based challenges for women (e.g., lack of bathrooms for women on worksites). It was suggested that tailored approaches are needed to recruit and retain members of each underrepresented group. Some participants spoke about possible resistance to equity, diversity and inclusion efforts in the skilled trades.

"I guess my point is that in terms of seeing underrepresented people in the trades, I feel like there's still sometimes an old school stigma." (R34, apprentice)

Some participants questioned the fairness and benefit of incentives targeting underrepresented groups specifically (e.g., funding for women or Indigenous apprentices). It was believed that this created unequal opportunities and outcomes and may exclude or disadvantage individuals who do not belong to these underrepresented groups.

"*So incentivizing people to get into trades, um, equity, I think it's just an absolute catastrophe of an idea. I think the opportunity should be presented, there should be, what*

do they call it equality of opportunity and not equality of outcome is the way I see it." (R50, apprentice)

"*So, $5,000 for a white Anglo Saxon boy. And $10,000 if that boy is a woman. Well, we want equality. But we're making it incentive money-wise to hire a woman. That's not how that should happen.*" (R03, employer)

Additionally, the majority of employers indicated their hiring practices and criteria were based on qualifications of applicants, rather than consideration of sociodemographic traits such as ethnicity, age, and gender identity. Many participants stressed that work ethic, professionalism, and competence were the primary factors valued in the hiring process.

"*You* know what, again, like me, personally, I don't care if you're Black, White, Indian, Chinese, if I think you're qualified and you can-you can do the job, I will hire you." (R36, employer)

"If you're qualified for the job and you could do you[r] work, it doesn't matter your ethnicity, race, sex, whatever. It just depends on if you can do the job." (R37, employer)

Subtheme 3b) The inclusion of women

Participants explored the inclusion of women in the skilled trades, and identified specific barriers faced by employers and women. Some participants recognized the stigma that continues to exist regarding women working in the skilled trades, while others reported never noticing concerns with integration of women in the workplace. Employers discussed specific barriers to the inclusion of women, such as an inability to provide multiple bathrooms from a financial perspective, and having only one bathroom for staff use. Some employers felt a difference in physical abilities between men and women and reported that certain physical demands were more difficult for women to complete. Meanwhile, others questioned these heavy physical demands altogether, reporting that they should not be performed by any employee, irrespective of gender or sex (e.g., manual pipe bending). Additionally, employers highlighted business-related consequences of having an employee that is pregnant or has taken a parental leave.

"*And I'm sorry to say it. When they want to have a child, you got to help prepare both sides for that. So, I'm a construction guy, she's going to be carrying full term. When do I ask her to stop carrying that bundle of pipe up, and then what do I do with her?... Now, they're getting a year (off). How can I promise that person a job a year from now?*" (R03, employer)

Women and their colleagues identified specific barriers experienced by women such as inappropriate communication (e.g., use of unacceptable or derogatory language) and social exclusion in the workplace, often having no other women in the workplace. Participants also noted discrimination against women, particularly, questioning of their competence or ability to complete work tasks by colleagues and peers.

> *"I see a big challenge in the sense of, I've personally witnessed, like women discrimination in the trades. She kind of sat sort of near me (in trade school). And I see people like beside her, in front of her, behind her like, "What's your average? Like, there's no way you were top eight," right? Like people couldn't believe that, oh, you got outdone by like, by this woman."* (R31, apprentice)

Subtheme 3c) Strategies and solutions

Many participants offered specific strategies to promote the skilled trades to underrepresented groups and create sustainable employment opportunities including advertising, incentives for small to medium sized businesses, tailored programs, and inclusive approaches to mentorship. Specifically, a few participants suggested pairing apprentices belonging to underrepresented groups with mentors that shared similar life experiences. Participants also suggested hiring of women in pairs, to ensure another woman was present in the workplace and reduce possible social exclusion. Some participants also highlighted the need for sensitivity training in the workplace and more stringent monitoring of implementation of workplace policies to ensure a healthy and safe workplace. Other participants suggested providing shadowing or volunteer opportunities to individuals belonging to underrepresented groups in an effort to provide a transparent perspective of the industry and ensure that individuals who proceed with apprenticeships are committed to a long-term career.

> "*I think the biggest thing for recruitment is to be honest about the trades that they are looking to sign up in. Be honest about it. Have them sit with a house wiring company. Residential, industrial and commercial. Then they can get the feedback they require to make a decision.*" (R02, employer)

4.2.5 Theme 4: Mental health and Covid-19

Mental health in the skilled trades and the impact of Covid-19 on emotional, social and psychological well-being were discussed. The following subthemes were identified: 4a) Stigma 4b) Mental health concerns 4c) Supports and coping.

Subtheme 4a) Stigma

Stigma and misconceptions surrounding careers in the skilled trades were perceived to directly impact the mental health and well-being of workers in the skilled trades. Participants felt careers in the skilled trades were seen as low-paying, low-skill level jobs. Participants reported that newer generations were being encouraged to pursue careers requiring university degrees, and not being provided a realistic view of the skilled trades. Furthermore, participants felt that careers in the skilled trades were perceived by parents and schools as a second option for students, or targeted only to students that were not academically inclined. Addressing the stigmas, misconceptions and biases perpetuated by the public were considered important in addressing the mental health and well-being of trades workers, and to recruit and retain additional apprentices.

"But I feel, as a tradesman, I feel very looked down upon on a day-to-day basis. You know? I'm walking down the street. I'm like, I see people going to the other side of the street, or going to the other side of the sidewalk, or they're locking their door. If someone's sitting in the car, like you see them just do one of those and lock their door. Um, in an elevator, people won't get in an elevator. And I'm like, I don't understand. What do you think, I'm going to murder you in the elevator? Like, is that, is that what I'm here for?" (R34, apprentice)

Additionally, employers, employees and apprentices underscored the immense societal value of tradespeople. Some participants noted that their contributions as essential workers during the Covid-19 pandemic were often overlooked. For example, one participant indicated their work ensured that the necessary physical structures and infrastructures in our communities remained operational (e.g., hospitals, grocery stores and roads).

Subtheme 4b) Mental health concerns

Mental health concerns, problems and well-being in skilled tradespeople were discussed by participants. Sources of stress identified in interviews included toxic workplace environments, negative working relationships, challenges with the trade school process, lack of diverse work opportunities, travelling and being away from family and friends, deadline driven work and high work demands (e.g., early mornings, long workdays, physically demanding job tasks, and exposure to environmental conditions and hazards).

"*Working in construction, starting early. There are a lot of people and it doesn't work well for them having to be an hour from their home. Starting at 6:30AM, it's difficult for a lot of people, so their sleep is affected. And then, of course, the commute, anything in a big city, the-the commute is terrible, so that you're already stressed before you even get to site and open your toolbox. And then the demands on the job site seems like, you know, there's always time constraints nothing can ever be done quick enough on these job sites. For as long as I've worked, it was like, you start off and you're already behind*." (R51, contractor)

Many participants expressed the importance of cultivating resilience in the skilled trades and believed that emotional sensitivity had no place in that context. A lack of awareness of mental health concerns and hesitance to discuss mental health issues openly were highlighted. Drug and alcohol misuses were noted as concerns amongst tradespeople, and often seen as a coping mechanism for both physical and emotional issues.

"You know it's-it takes some time with a little bit tougher skin um, most times. Like you can't be a delicate or I'd say fragile type of person that's very sensitive to someone that you know, raises their voice often right." (R23, apprentice)

*"Fifty percent I think is a very fair number. Some companies more than others, but this company here, I would argue half of the apprentices have like drug issues" (*R31, apprentice).

Some participants reported direct mental health benefits from working in the skilled trades. Cited reasons included availability of diverse and new learning opportunities and physical activity being integral to the work.

"*I'd say it definitely improved my mental health. Because I'm, I'm doing a physical job I'm getting, I'm getting my physical activity that I wasn't getting. So definitely, that has, I've seen a change in my mental health in that regard. My stress level has gone down for the most part.*" (R52, apprentice)

Many participants discussed the impacts of Covid-19 on their mental health, highlighting challenges such as lack of certainty, lack of job security, exposure to health hazards (e.g., working during the pandemic), losing their jobs, and social isolation resulting in poor eating habits and lack of routine.

Subtheme 4c) Supports and coping

Participants identified strategies to promote improved mental health and well-being in the skilled trades such as access to support groups through the employer or an external agency, mentorship, and changing the perception of mental health in the skilled trades. Participants discussed breaking down stigma, negative attitudes, and barriers to address mental health and targeting harmful notions around toughness.

"*I think mental health is definitely one of the hardest topics um in all our industries like the skilled trade regardless of what trade it is. Like we, we're trying to change that attitude where it's OK if you don't feel good you know like it's OK if, if you're having a bad day, and that doesn't make you weak or a lessor than person right. It just means you're a human being and you're having a bad day... so I do think mental health is a huge topic for the skilled trades*" (R49, contractor)

Section 5: Discussion

In this 3-month follow up study, we examined workplace mental health and wellbeing of skilled trades workers in Ontario working in the skilled trades. The purpose of this study was to (a) identify existing stressors and examine their effects over time, and (b) to explore apprentice and contractor experiences on gaps and barriers influencing recruitment and retention. These objectives were constructed to support the OEL in increasing the number of apprenticeship opportunities within SMB employers. This initiative, in turn, aims to support the industry by increasing available apprenticeship opportunities to meet the current and future demands of a declining and aging labour market in the skilled trades. This future demand must also be met through sustainable retention rates. Factors maintaining retention of apprentices and

journeypersons within these small to medium sized electrical businesses was also explored based on our findings from the 2021-2022 report. Below, the findings of this study will be discussed sequentially based on the methodology employed.

We found that the majority of the participants (62%) in the sample reported experiencing moderate or high levels of personal and work-related burnout. Furthermore, in the 3-month follow-up, there was a marginal increase in work-related burnout. This is a noteworthy increase from the burnout levels reported in our study of a similar sample of electricians working in Ontario in 2021-2022 (23%). The observed difference in reported burnout may be due to multiple factors. The reduction of public health restrictions in the COVID-19 pandemic and the return to business activities has resulted in significant economic turbulence as supply chains and demands have shifted over time. Those in the skilled trades have experienced increased workloads due to a high demand for residential electricians to assist with home modifications due to a significant amount of the workforce continuing to work from home. The demand has also been associated with reduced material availability due to supply constraints causing delays and unfinished projects that may overlap with the start of other projects. Shifts in economic activity have also caused personal financial hardships as the cost of living for necessities has increased significantly over the last 2 years. These work and personal-related difficulties can influence and strain interpersonal relationships which may be a primary coping strategy to these stressors. This increased burnout rate may also be due to COVID-19 exacerbations of industry-specific stressors. There have been longer wait times and delays in apprentices being able to complete their in-person classroom training and the Certificate of Qualification exam. Therefore, 4th and 5th year apprentices may be delayed in their opportunity to secure better wages, greater opportunities, and further growth in their abilities as a journeyperson. This also consequentially creates reduced opportunity for small to medium sized business to acquire new apprentices due to the 1:1 ratio requirement for journeypersons and apprentices. Furthermore, some of the participants in this study continue to acknowledge the difficulties of the workplace environment including increased expectations and demands, health effects of commuting, and misconceptions/stigmatization. Governmental reforms and further study investigating interventions focused on addressing these areas of burnout and work-related stress exacerbations are indicated to maintain sustainable retention in the skilled trades.

Retention in the skilled trades has been difficult in recent years due to reduced apprenticeship availability, and internal and external industry pressures. The OEL mentorship program has initially targeted increasing apprenticeship availability by providing support and increasing awareness to small-to-medium business owners about the benefits of being involved in electrical apprenticeships in Ontario. This initiative has increased apprenticeship opportunities, however the effectiveness of the mentorship program in maintaining retention is currently unknown. In this study, we examined retention from survey data and interviews of employers, employees, and apprentices. In the survey data, it was observed that 77% of the participants had intention to remain in their current position for the next five years. This is a decrease from last year whereby 94% of the participants had intention to remain in their current

position. This decrease in retention may be due to the above-mentioned increase in burnout and work-related stress reported due to pre-existing stressors and/or COVID-19 exacerbations. An alternative explanation may also be age-related differences in the research study conducted in 2021-2022 compared to 2022-2023 related to the higher proportion of employees and apprentices included. In the interview data, the participants spoke about wages and workplace benefits as a primary motivator to remain with their employer. They cited the increased cost of living due to the COVID-19 pandemic as a primary motivator to seek opportunities outside of their current employer. The increased cost of living relative to earned wages could be one associative factor that has increased personal and work-related burnout year-over-year. We speculate that industry wide pressure creating prolonged apprenticeship programs and backlogged journeyperson certifications are also a contributing factor that are preventing employers from offering increased salaries to employees. Industry-wide stressors reported by employers and apprentices that also effect retention are inaccessibility to licensing exams and in-person classroom instruction (e.g., distance to facility, exam dates, and registration/waitlist difficulties) and reduced in-person peer-to-peer support networking opportunities. These external pressures on small-to-medium electrical employers result in less apprentice recruitment and additional costs related to having many uncertified 5th year apprentices that prevent further recruitment due to the 1:1 ratio requirement. As we transition out of the COVID-19 pandemic, greater apprenticeship resources for licensing exams and in-classroom instruction are essential to reduce the backlog of 5th year apprentices awaiting licensing and allowing for SMBs to be more effective in focusing their efforts on recruitment and retention initiatives.

In recent years, mental health and equity in the workplace has been a primary focus for individuals working in the skilled trades. The COVID-19 pandemic has exacerbated existing medical and psychosocial supports with increased rates of burnout of healthcare practitioners and system-wide reductions in healthcare worker availability. This strain on the healthcare system has also resulted in reduced focus in workplace physical and mental health. Participants in this study reported an increase in personal-related burnout that was associated with their total stress and their ability to cope with stressors. We speculate that this increase in personal-related burnout and total stress is likely an exacerbation of pre-existing stressors experienced by skilled trades apprentice and workers. The existing stressors of long work hours, physicality and demands of the work, psychosocial hazards, resource constraints, and the safety of the workplace environment are likely to have been exacerbated due to the COVID-19 pandemic. The increased job demands are likely to have contributed to greater exhaustion and mental fatigue that left these workers with no fortitude to withstand the stressors of their personal lives. Work-life balance and family conflict has also been associated with increased job-related burnout (40,41). In this study, we did not examine the coping strategies that these individuals have developed or their effectiveness over the years of the pandemic. Depletion of personal resources to withstand personal stressors is important to characterize as many of these SMBs do not have equal access to mental health benefits. A study by Grandi et al. described the importance of self-compassion, optimism, and humour in Italian workers during the COVID-19 pandemic (42). These

personal resources were found to have a protective effect on stress with self-compassion being a mediator between the relationship of optimism and exhaustion. Cestrand and colleagues (2022) examined the influence of an intervention aimed at improving psychosocial conditions in the workplace environment to target burnout and exhaustion in construction and trades workers (43). They found that structured round making (e.g., supervision with the aim of removing barriers) and duty clarification did not reduce overall stress but improved overall psychosocial working conditions through role clarity. Role clarity was suggested to be a predictor of health in these workers. In our study, it is unclear what the effects of role clarity would produce for the elevated rates of burnout seen. Earlier apprentices may be suffering from role conflict or ambiguity through qualitative reports of doing redundant and basic electrical tasks rather than getting exposure to more technical work opportunities (44). Fifth year apprentices may be suffering from role ambiguity as they are not progressing through their apprenticeship. Therefore, the development of adaptive coping strategies and improvements in role clarity should be supported with improved workplace policies and health interventions.

The literature on mental health interventions in the skilled trades is limited. The skilled trades and construction industry is male-dominated, and perpetuation of masculine norms has been previously associated with negative health outcomes (e.g., workplace injury, fatality, and suicide) (45). The qualitative findings of our study also support the literature as participants reported difficulties with psychosocial hazards and hegemonic workplace environments impacting their mental health. They reported increased stress, anxiety, and depression in the workplace that was mitigated mostly through avoidance or individual coping behaviours through personal support systems. The SMBs did not have effective interventions in place to manage these workplace stressors, however they acknowledged that workplace culture (e.g., family working environment, work-life balance was vital to long-term retention). Prior occupational research within this population has predominately been focused on workplace safety from a physical perspective examining prevention and injury rates of musculoskeletal conditions and physical ailments. Therefore, the impact of mental health and psychosocial working conditions in the construction trades industry remains elusive. A systematic review by Hulls et al. (2022) determined that organizational interventions rather than individual interventions can be more effective in targeting improvements in psychosocial working conditions in the construction trades industry (45). However, most of the studies included in this review had a follow up period of 1 year or less and therefore, the long-term impact of an organizational workplace intervention remains to be studied. The authors also acknowledged the importance of delivery (e.g., electronic or in-person) that would impact intervention effectiveness. A systematic review by Lee et al. (2014) reported that interventions to address mental health in male-dominated industries should focus on improving mental health literacy, increasing personal and work-related psychosocial support systems, increasing accessibility to treatment, and providing psychoeducation for employers and managerial staff on the impacts of workload management (46). Interestingly, a study by Schliemann and Woodside (2019) found evidence that mixed-gendered industries generally report positive outcomes in workplace intervention studies. Therefore, cultural shifts

away from hegemonic masculinity in the construction trades may support burnout interventions and long-term retention for employees and apprentices (47).

Recent governmental reform (e.g., Support Ontario Youth, Skilled Trades Ontario) and incentives (e.g., Apprenticeship Incentive Grant for Women) in the skilled trades has focused on improving recruitment by engaging underrepresented individuals and providing them equal opportunity (2). Qualitatively, we examined the experiences of employers, employees, and apprentices when engaging underrepresented persons in the skilled trades. Historically, the construction trades industry fostered an environment that was predominately male and therefore, risk-taking, and hegemonic behaviours were commonplace. Many of the participants in this study reported a visible increase in underrepresented people working on construction worksites. However, many of the participants were unable to articulate their involvement directly working with underrepresented persons and rather focused on generalities (e.g., hiring people based on qualifications irrespective of gender, disability, and culture). In terms of recruitment, many of the participants expressed concerns about the physicality of the work and how those with disabilities would have difficulty working well in a high-pressure and hazardous environment. Furthermore, inclusion of women in the skilled trades was discussed, but there were few ideas on how to support them through important life changes such as family planning/pregnancy and lack of availability of gendered resources support systems.

The participants in the study that identified as women provided some solutions to encourage further participation of women in the skilled trades by recruiting women in groups and having sensitivity training, so that they may provide extra support to one another. However, it is unclear how implementation of these solutions would exist without focusing on improving workplace culture and psychosocial hazards within individual employers. There is significant variability in experiences with underrepresented persons between these SMBs due to multiple reasons. First, many of these businesses are family-owned or operated and therefore limit the number of apprentices recruited to preserve the family culture of the business. Second, SMBs operate on smaller financial margins for profit and cost, and therefore may be worried about the additional financial risks of taking on apprentices that may require maternal leave to support their families. An example of this was the disproportionate effect of the COVID-19 pandemic on women as many women were forced out of their jobs due to public health restrictions or family dynamics requiring them stay at home with their children due to school closures or the expenses of childcare. Thirdly, education systems have not marketed the viability of a career in the skilled trades to impressionable girls that are career driven to hands-on learning experiences. Based on our qualitative research, these barriers continue to persist year-over-year with no targeted solution identified to date. We propose that additional awareness and engagement in high schools for women and other underrepresented persons will increase recruitment. However, we caution that increased recruitment will exacerbate the greater need for psychosocial support in the workplace to support with integration of these persons into these long-standing hegemonic workplace cultures.

There are some limitations to our research findings. First, the small sample size may not be representative of all employers, employees, and apprentices working in the skilled trades in Ontario. Moreover, we used a convenience sampling approach of active and engaged members of the Ontario Electrical League that are supportive of improving the industry, thus limiting the external validity of the study. Another limitation is that we didn't include participants from northern, rural and remote regions of Ontario. In addition, we included more apprentices in this report than the year prior to get additional perspectives from other stakeholders that experience the workplace environment reported by their employer. Lastly, the follow-up rates in this 3-month follow up study were lower than expected and therefore, it was difficult to track changes in burnout and wellbeing over time.

Future studies should use the data collected in this year and the previous year to develop an effective organizational mental health intervention (48). Co-creation of a workplace intervention in collaboration with the Ontario Electrical League and other key stakeholders may allow for a contextual fit to the unique workplace environments of the small-to-medium employers engaged with the OEL. Additional research should also be performed to have further measures of wellbeing and mental health that further examine the characteristics of personal-related burnout reported in this study. Further understanding of burnout will allow for further examination of retention barriers and outcomes measures for an intervention-based study.

In conclusion, the findings of this study have informed several barriers and gaps in retention exacerbated by the COVID-19 pandemic. These barriers are long-standing within the construction industry but are now more impactful due to the additional external economic pressures and changes to quality of life in Ontario. It is paramount that a workplace mental health intervention be constructed to provide psychosocial supports to the construction trades industry. Inclusion of underrepresented persons may be protective and beneficial to improving workplace environment and culture while also helping with development of future mental health interventions for a sustainable and stable skilled trades workforce.

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Section 7: Appendices

Appendix A: Research Ethics Board (REB) approval letter

Appendix B: Email scripts to invite participates to partake in study

Appendix C: Survey and genetic testing consent form

Appendix D: Interview consent form

Appendix E: Semi-structured interview guide

Ontario Electrical League

Appendix A

Research Ethics Board (REB) approval letter

UNIVERSITY OF TORONTO

OFFICE OF THE VICE-PRESIDENT, RESEARCH AND INNOVATION

RIS Protocol Number: 41519

Approval Date: 31-Jan-23

PI Name: Dr Behdin Nowrouzi-Kia

Division Name:

Dear Dr Behdin Nowrouzi-Kia:

Re: Your research protocol application entitled, "Supporting Employers in Apprentice Training: Outcomes of a Training and Mentoring Program for Electrical and Plumbing Employers"

The Health Sciences REB has conducted a Delegated review of your application and has granted approval to the attached protocol for the period 2023-01-31 to 2023-10-04.

This approval covers the ethical acceptability of the human research activity; please ensure that all other approvals required to conduct your research are obtained prior to commencing the activity.

Please be reminded of the following points:

- An **Amendment** must be submitted to the REB for any proposed changes to the approved protocol. The amended protocol must be reviewed and approved by the REB prior to implementation of the changes.
- An annual **Renewal** must be submitted for ongoing research. Renewals should be submitted between 15 and 30 days prior to the current expiry date.
- A **Protocol Deviation Report** (PDR) should be submitted when there is any departure from the REB-approved ethics review application form that has occurred without prior approval from the REB (e.g., changes to the study procedures, consent process, data protection measures). The submission of this form does not necessarily indicate wrong-doing; however follow-up procedures may be required.
- An **Adverse Events Report (AER)** must be submitted when adverse or unanticipated events occur to participants in the course of the research process.
- A **Protocol Completion Report** (PCR) is required when research using the protocol has been completed.
- If your research is funded by a third party, please contact the assigned Research Funding Officer in Research Services to ensure that your funds are released.

Best wishes for the successful completion of your research.

Ontario Electrical League

Appendix B

Email scripts to invite participants to partake in the study

Email Script: Objective 1

Email script to be sent by the Ontario Electrical League

Dear OEL member,

We are inviting you to participate in the study entitled “Supporting Canadian Apprentices in the Construction and Industrial Sectors: Genetic and Epigenetic Analyses of Mental Health”, evaluating the outcomes of a training and mentoring program that supports electrical and plumbing employers’ need to train apprentices. The study is being conducted as part of the OEL Increasing Employer Engagement in Apprenticeship Training project in order to meet the current and future needs of the labor market. To learn more about the study and participate, please *click here*

Study title: *Supporting Canadian Apprentices in the Construction and Industrial Sectors: Genetic and Epigenetic Analyses of Mental Health*

Principal Investigator: Dr. Behdin Nowrouzi-Kia is an occupational therapist and assistant professor in the Department of Occupational Science and Occupational Therapy in the Faculty of Medicine at the University of Toronto.

Sincerely,

The OEL

Email reminder script to be sent by the Ontario Electrical League

Dear OEL member,

Two weeks ago we invited you to participate in a study. If you have already participated in the study, thank you for your contribution. As a reminder, the study is entitled *Supporting Canadian Apprentices in the Construction and Industrial Sectors: Genetic and Epigenetic Analyses of Mental Health.* The study is being conducted as part of the OEL Increasing Employer Engagement in Apprenticeship Training project. To learn more about the study and participate, please *click here*

Study title: *Supporting Canadian Apprentices in the Construction and Industrial Sectors: Genetic and Epigenetic Analyses of Mental Health*

Principal Investigator: Dr. Behdin Nowrouzi-Kia is an occupational therapist and assistant professor in the Department of Occupational Science and Occupational

Therapy in the Faculty of Medicine at the University of Toronto

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Sincerely,

The OEL

Email Script: Objective 2

Email script to be sent by the Ontario Electrical League

Dear OEL member,

We are inviting you to participate in a semi-structured interview for the study entitled "Supporting Canadian Apprentices in the Construction and Industrial Sectors: Genetic and Epigenetic Analyses of Mental Health" evaluating the outcomes of a training and mentoring program that supports electrical and plumbing employers' need to train apprentices. The study is being conducted as part of the OEL Increasing Employer Engagement in Apprenticeship Training project in order to meet the current and future needs of the labor market. To learn more about the study and participate, please *click here*

Study title: *Supporting Canadian Apprentices in the Construction and Industrial Sectors: Genetic and Epigenetic Analyses of Mental Health*

Principal Investigator: Dr. Behdin Nowrouzi-Kia is an occupational therapist and assistant professor in the Department of Occupational Science and Occupational Therapy in the Faculty of Medicine at the University of Toronto.

Sincerely,

The OEL

Email reminder script to be sent by the Ontario Electrical League

Dear OEL member,

Two weeks ago we invited you to participate in a semi-structured interview related to a study entitled Supporting Canadian Apprentices in the Construction and Industrial Sectors: Genetic and Epigenetic Analyses of Mental Health. If you have already participated in the study, thank you for your contribution. The study is being conducted

as part of the OEL Increasing Employer Engagement in Apprenticeship Training project. To learn more about the study and participate, please *click here*

Study title: *Supporting Canadian Apprentices in the Construction and Industrial Sectors: Genetic and Epigenetic Analyses of Mental Health*

Principal Investigator: Dr. Behdin Nowrouzi-Kia is an occupational therapist and assistant professor in the Department of Occupational Science and Occupational Therapy in the Faculty of Medicine at the University of Toronto.

Sincerely,

The OEL

Ontario Electrical League

Appendix C

Survey and genetic testing consent form

Occupational Science
& Occupational Therapy
UNIVERSITY OF TORONTO

Letter of Information and Consent to Participate in a Research Study – Survey Consent

Study Title:	Supporting Employers in Apprentice Training: Outcomes of a Training and Mentoring Program for Electrical and Plumbing Employers
Principal Investigator:	*Behdin Nowrouzi-Kia, Ph.D., OT Reg. (Ont.)* *Assistant professor,* *Department of Occupational Therapy and Occupational Science, Temerty Faculty of Medicine, U of T* *E-mail: behdin.nowrouzi.kia@utoronto.ca* *Telephone: 416-946-3249*
Study Sponsor:	*The Ontario Electrical League (OEL)*

CONFLICT OF INTEREST STATEMENT

The principal investigator, co-investigators, and research staff do not have any conflicts of interest, financial or otherwise, related to this study or its outcome.

Principal Investigator

Dr. Behdin Nowrouzi-Kia is an occupational therapist and assistant professor in the Department of Occupational Science and Occupational Therapy in the Faculty of Medicine at the University of Toronto.

Study Sponsor:

The study is funded by the Ontario Electrical League (OEL).

Invitation to Participate

We are inviting you to participate in the study with the above title, evaluating the outcomes of a training and mentoring program that supports electrical and plumbing employers' need to train apprentices and thereby be more effectively engaged in developing and delivering a solution to close the skills gap in these trades.

Before agreeing to take part in this research study, it is important that you read the information in this research consent form. It includes details we think you need to know in order to decide if you wish to take part in the study. If you have any questions, you may ask the investigator (BNK) or research team members (ABF, VC, GJ, and MJ).

Study Purpose

The purpose of this study is to get more employers involved in apprenticeship training in order to have the capacity to train and certify enough workers in the skilled trades to meet the current and future needs of the labour market. Moreover, the study will evaluate the mental health challenges of

employers and apprentices using genetic and epigenetic analyses to capture hereditary factors that might influence risk for mental health concerns such as burnout and stress at workplace.

Eligibility

You are being asked to participate in this study because you are small to medium electrical and/or contractors in the plumbing and HVAC trades (with 0-50 employees) in Ontario.

Voluntary nature of the study

You will be asked to complete a questionnaire in visit 1 at the study entry (baseline visit). The questionnaire will take approximately 20-25 minutes to complete and available online at redcap.utoronto.ca

After three months of the first visit (baseline visit), you will be asked to complete another online questionnaire on REDcap (Visit 2) that includes all the questions in the baseline questionnaire except the demographics information.

Your experiences as an electrical/plumbing employer/apprentice are valuable and important to this study. Your participation is completely voluntary. You may withdraw at any time without penalty. You may skip any question that you are uncomfortable answering. Master lists and any identifying information are securely kept only on the University of Toronto server in Dr. Behdin Nowrouzi-Kia's lab and are electronically encrypted. All information will be securely kept for five years after study completion and will be properly cleared/purged following this time period.

Based on your responses, the data will be analyzed quantitatively using statistical software such as R and SPSS. The results of this study will be used to inform various stakeholders, and will be presented in academic conferences, and published in peer-reviewed journals.

Risks

There is a minimal risk that emotional distress may be created when answering some of the questions related to your mental health and working in the midst of COVID-19. Please feel free to discuss your reactions to the questionnaires with the research staff. Should you experience distress or discomfort when answering the questions, you can skip the questions or terminate your participation without providing a reason. You may also wish to contact the Employee & Family Assistance Program at your respective workplace location, or your mental health provider should you have one.

Benefits

There is no intended direct benefit to you for participation in this study. Information learned from this study will allow the researchers to understand and evaluate the demographic and work-related predictors of occupational stress and burnout of electricians and plumbers. The results of this study may be useful for identifying health, social, and economic impacts of electricians and plumbers psychosocial work environment due to the COVID-19 pandemic in Canada. If you are interested in the study's findings and would like to receive a copy of the study report, you must email the study investigators and request for that. A summary of the findings will be used to generate a report available to the public, where one can be sent to you. Only group information obtained from this study will be reported. Once completed, the findings will also be submitted for publication.

Participation and Withdrawal

Your participation in this research study is voluntary. If you decide to participate, you do not have to answer any questions that you don't want to. You may refuse to participate in or withdraw from the study at any time and this will have no effect on your employment. Your work within your company will not be altered or affected in any way by your decision to participate, abstain or withdraw from this study. If you would like to request the withdrawal of your data, please contact Dr. Behdin Nowrouzi-Kia. Information that was collected before you withdrew will be still used by the researchers for the purposes of the study, but no information will be collected or shared after you withdraw your permission.

Potential Costs and Reimbursement

In recognition of your time, you will receive a compensation of $50 for completion of survey, interview, and saliva sample collection in both visit 1 and visit 2 ($100 for both visits); $30 (each visit) if only survey and interview are performed during the visit (please also see the consent form for Interview).

Obligation

This study is not mandatory. There are no consequences if you choose not to participate. To reiterate the above-mentioned text, you may stop answering the questions and withdraw at any time.

Confidentiality

All information about you will be kept confidential to the extent of the law. Signing consent does not waive subject's legal rights nor relieve investigator/sponsor/ institution from legal responsibility. You will be identified only by a unique study ID number, not by identifiers. The investigator responsible for this study or the University of Toronto is not conducting this study to receive commercial benefit. The information that we collect will be kept secure on the University of Toronto server. The data will be summarized along with information obtained from other participants. If the results of the study are published or presented at a scientific meeting, you will not be identified. All individual information will be stored confidential on the University of Toronto server in Dr. Nowrouzi-kia's lab and will not be made available to the public. The data will be kept on encrypted, password-protected devices in Dr. Nowrouzi-kia's lab at 500 University Ave, Toronto, Ontario, Canada. The data will be kept for a period of five years to permit for analyses, preparation of manuscripts for publication and to determine the feasibility of the project.

Questions

For any questions about this study, please contact

Behdin Nowrouzi-Kia, Ph.D., OT Reg. (Ont.)
Assistant professor,
Department of Occupational Science and Occupational Therapy, Temerty Faculty of Medicine, U of T
E-mail: behdin.nowrouzi.kia@utoronto.ca
Telephone: 416-946-3249

I have read the information presented in the Information Consent regarding the research projected conducted by Dr. Nowrouzi-Kia. I voluntarily consent to participate in this study. I am also aware that I can choose to withdraw my information within one week upon receipt of the de-identified transcript or for a longer period upon my request.

Participant Name: _____ Participant signature _____

Date: _____

You may email this consent form. Please read the information in this research consent form carefully and if you agree, please sign the form, scan it, and email to ABF, VC, GJ, or MJ (see below for contact information).

Contact Information:

Behdin Nowrouzi-Kia, Ph.D., OT Reg. (Ont.)
Assistant professor,
Department of Occupational Science and Occupational Therapy, Temerty Faculty of Medicine, U of T
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Ontario Electrical League

Appendix D

Interview consent form

Occupational Science
& Occupational Therapy
UNIVERSITY OF TORONTO

Letter of Information and Consent to Participate in a Research Study – Interview

Study Title:	Supporting Employers in Apprentice Training: Outcomes of a Training and Mentoring Program for Electrical and Plumbing Employers
Principal Investigator:	*Behdin Nowrouzi-Kia, Ph.D., OT Reg. (Ont.)* *Assistant professor,* *Department of Occupational Therapy and Occupational Science, Temerty Faculty of Medicine, U of T* *E-mail: behdin.nowrouzi.kia@utoronto.ca* *Telephone: 416-946-3249*
Study Sponsor:	*The Ontario Electrical League (OEL)*

CONFLICT OF INTEREST STATEMENT

The principal investigator, co-investigators, and research staff do not have any conflicts of interest, financial or otherwise, related to this study or its outcome.

Principal Investigator

Dr. Behdin Nowrouzi-Kia is an occupational therapist and assistant professor in the Department of Occupational Science and Occupational Therapy in the Faculty of Medicine at the University of Toronto.

Study Sponsor:

This Employment Ontario project is funded in part by the Government of Canada and the Government of Ontario.

Invitation to Participate

We are inviting you to participate in the study with the above title, evaluating the outcomes of a training and mentoring program that supports electrical and plumbing employers' need to train apprentices and thereby be more effectively engaged in developing and delivering a solution to close the skills gap in these trades.

Before agreeing to take part in this research study, it is important that you read the information in this research consent form. It includes details we think you need to know in order to decide if you wish to take part in the study. If you have any questions, you may ask the investigator (BNK) or research team members (ABF, VC, GJ, and MJ).

Study Purpose

The purpose of this study is to get more employers involved in apprenticeship training in order to have the capacity to train and certify enough workers in the skilled trades to meet the current and future needs of the labour market. Moreover, the study will evaluate the mental health challenges of employers and apprentices using genetic and epigenetic analyses to capture hereditary factors that might influence risk for mental health concerns such as burnout and stress at workplace.

Eligibility

You are being asked to participate in this study because you are small to medium electrical and/or contractors in the plumbing and HVAC trades (with 0-50 employees) in Ontario.

Description of Study Visits

- **Visit 1 (Baseline Assessment):**

You will take part in a semi-structured interview held by the University of Toronto's research staff at the OEL office. It is anticipated that each semi-structured interview will take approximately 60 minutes. During this visit, we will also collect a saliva sample consisting of 2 mL of spittle cells using Saliva Collection Tubes. The saliva will be used to extract DNA for genetic and epigenetic analyses. Moreover, you will be invited to provide your contact information, including name, e-mail, address, and telephone number. You may also contact Dr. Nowrouzi-Kia & or research staff (AB, VC, GJ, and MJ) by telephone or e-mail to set up an interview time at a comfortable setting.

- Visit 2 (Follow-up Assessment):

There is an additional follow-up visits at 3 months after the baseline assessment. The procedure at this study visit will be the same as the baseline visit. The interview and sampling will take place at the OEL office.

Genetic testing of samples

The genetic analysis will be targeted genome-wide. We will first extract the DNA from saliva samples. Then, we will perform the process of determining DNA sequence in the whole genome. We will use these genetic data as a research tool to investigate the potential link between the genetic and epigenetic changes, occupational stressors, and burnout at workplace. The testing may take place up to five years after the study has been completed.

Voluntary nature of the study

Your experiences as an electrical/plumbing employer/apprentice are valuable and important to this study and will be audio-recorded and later transcribed. You will be asked to share your thoughts about what you consider to be important issues in the workplace. Moreover, you will be asked what aspects foster the workplace environment for apprentices and employees at your company. It is also your right as a participant in the study to refuse answering particular questions or to withdraw from the study at any time.

Please also note that while each transcript will be de-identified, it will be coded in such way that can be re-identified. Master lists and any identifying information are securely kept only on the University of

Toronto server in Dr. Behdin Nowrouzi-Kia's lab and are electronically encrypted. All information will be securely kept for five years after study completion and will be properly cleared/purged following this time period.

Based on your responses and the responses in the form of transcripts, a procedure called thematic analysis will be performed, which is a qualitative method used to help identify key themes and subthemes related to the study. The results of this study will be used to inform various stakeholders, and will be presented in academic conferences, and published in peer-reviewed journals.

Risks

There is a minimal risk that emotional distress may be created when discussing the current stressors related to working in the midst of COVID-19. Should you experience distress or discomfort during the focus group, you can terminate your participation without providing a reason. You may also wish to contact the Employee & Family Assistance Program at your respective workplace location, or your mental health provider should you have one. Furthermore, there is no major risk associated with the collection of the saliva samples.

Potential Risks of Genetic Testing

Due to the rapid pace of technological advances, there may be potential future risks associated with the use of genetic information that are presently unknown. Your participation in this study is confidential; however, there is a small chance that you genetic data (results from genomic sequencing) could identify you. This is because each person's genomic make up is unique, similar to a fingerprint. The potential re-identification or unintentional release of your genetic research data could lead to loss of privacy and to possible future discrimination against you or your biological relatives. In May 2017, the Genetic Non-Discrimination Act (GNA) was passed into law in Canada. GNA protects individuals from the disclosure of genetic test results for purposes such as insurance and employment. We will do everything to ensure that your identity is protected; but because of the uniqueness of your genetic data, we cannot guarantee confidentiality for you.

Benefits

There is no intended direct benefit to you for participation in this study. Information learned from this study will allow the researchers to understand and evaluate the effectiveness of the project and make recommendations for future supports that will lead to more completions of apprenticeship pathways. The results of this study may be useful for identifying health, social, and economic impacts of electricians and plumbers psychosocial work environment due to the COVID-19 pandemic in Canada. If you are interested in the study's findings and would like to receive a copy of the study report, you must email the study investigators and request for that. A summary of the findings will be used to generate a report available to the public, where one can be sent to you. Only group information obtained from this study will be reported. Once completed, the findings will also be submitted for publication.

We do not give general feedback but in the event that we detect an abnormal genetic factor or incidental findings (i.e., being carrier of a variant associated to a genetic disease) are noted in the saliva sample, you will be informed of the availability of this information and offered genetic counseling if that is what you desire.

Participation and Withdrawal

Your participation in this research study is voluntary. If you decide to participate, you do not have to answer any questions that you don't want to. You may refuse to participate in or withdraw from the study at any time and this will have no effect on your employment. You may use an alias during the focus group to protect your privacy and to avoid using directly identifiable information. The focus group will be conducted using Microsoft Teams. Your work within your company will not be altered or affected in any way by your decision to participate, abstain or withdraw from this study. If you would like to request the withdrawal of your data, please contact Dr. Behdin Nowrouzi-Kia. Information that was collected before you withdrew will be still used by the researchers for the purposes of the study, but no information will be collected or shared after you withdraw your permission.

Potential Costs and Reimbursement

In recognition of your time, you will receive a compensation of $50 for interview, survey, and saliva sample collection in both visit 1 and visit 2 ($100 for both visits); $30 (each visit) if only survey and interview are performed during the visit (please also see the Survey consent form).**Obligation**

This study is not mandatory. There are no consequences if you choose not to participate. To reiterate the above-mentioned text, you may withdraw at any time during the focus group, and can request to remove your data one week after the de-identified transcript has been shared with you (or longer as per your request).

STUDY BIOLOGIC SAMPLE STORAGE AND RETENTION

Collected biologic samples (i.e., DNA) will be stored in a secured lab (Dr. Vincenzo De Luca's lab located at Centre for Addiction and Mental Health-CAMH at 250 College St., Toronto, ON). DNA samples will be stored for five years. The principal investigator of this study (BNK) will control access to the samples. If you enroll in the study you will receive a study ID. The information you provide including your biological samples will be identified with this study ID. No identifiable information will be used.

Confidentiality

All information about you will be kept confidential to the extent of the law. Signing consent does not waive subject's legal rights nor relieve investigator/sponsor/ institution from legal responsibility. You will be identified only by a unique study ID number, not by identifiers. The investigator responsible for this study or the University of Toronto is not conducting this study to receive commercial benefit. As part of the current study, other laboratories may be involved in analyzing the genetic material, and if so, this will be confidential and your name will not be provided. We may collaborate with other research organizations in other locations, that may want to use your sample and already collected medical information for studying genetic material related to research on mental health. We will require that other collaborators keep your medical information confidential. The information that we collect will be kept secure on the University of Toronto server. The data will be summarized along with information obtained from other participants. If the results of the study are published or presented at a scientific meeting, you will not be identified. All individual information will be kept confidential on the University of Toronto server in Dr. Nowrouzi-kia's lab and will not be made available to the public. The de-identified data will be kept on encrypted, password-protected devices in Dr. Behdin Nowrouzi-Kia's lab at 500 University Ave, Toronto, Ontario, Canada. The data will be kept for a period of five years to permit for analyses, preparation of manuscripts for publication and to determine the feasibility of the project. The de-identified data will be kept for five years and then destroyed.

Questions

For any questions about this study, please contact

Behdin Nowrouzi-Kia, Ph.D., OT Reg. (Ont.)
Assistant professor,
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I have read the information presented in the Information Consent regarding the research projected conducted by Dr. Nowrouzi-Kia. I voluntarily consent to participate in this study. I am also aware that I can choose to withdraw my information within one week upon receipt of the de-identified transcript or for a longer period upon my request.

Participant Name: _____ Participant signature _____

Date: _____

You may email this consent form. Please read the information in this research consent form carefully and if you agree, please sign the form, scan it, and email to ABF, VC, GJ, or MJ (see below for contact information).

Contact Information

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Ontario Electrical League

Appendix E

Semi-structured interview guide

Interview Protocol and Questions

Before the interview with the participant:

The session begins by making the participant comfortable through information conversation that includes confirmation of their name and brief work history. Confidentiality issues are discussed, including informing participant that only the research team will have knowledge of what the participant discusses and that interview data will be combined with other data for analysis. The interviewer will request permission to audio record the interview and will explain the importance of recording for accuracy of data collection. The participant will also be invited to provide their contact information if they wish to receive a one-page summary of the study findings upon completion of the project.

1/ Share your work experience in the OEL mentorship training program.

2/ How would you describe the OEL's support in apprentice training?

3/ What do you like about OEL mentorship training program? What are aspects of the OEL mentoring training program that you would like to see changed?

4/ What are the biggest challenges you face at work when it comes to hiring an apprentice? Are there any differences in your experience pre-COVID and during COVID?

5/ Was the OEL mentorship training program successfully encouraging you to hire apprentices from underrepresented groups in the labour market or those disproportionately impacted by COVID-19, including women, youth, persons with disabilities, racialized groups, and Indigenous peoples?

6/ How do you think it would be best to recruit and integrate these underrepresented groups in the skilled trades? Do you foresee any challenges and if so, why?

7/ Tell me about some of the challenges facing employers in training an apprentice.

8/ Has working in the skilled trades [or involvement in the mentorship training program] influenced your mental health during COVID-19? If so, what coping strategies did you use [or currently use] to support your mental health?

9/ What type of supports do you need to provide apprenticeship training opportunities and ensure Ontarians have the skilled trades workforce they need?

10/ The OEL/OML provided resources in the form of employer outreach, mentoring, training and hiring tools to increase employer involvement in the project. Do you think they provided sufficient resources? If not, what other resources would you recommend for employer engagement?

11/ How likely are you to recommend the OEL mentorship training program?

12/ Is there anything further you want to share regarding the OEL mentorship training program, the apprenticeship model in Ontario, or recruitment of underrepresented individuals in the skilled trades?

Thank you for your participation.