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ACCESSIBLE SKILLED TRADES:
INCLUSIVE AND ACCESSIBLE SKILLED TRADES EMPLOYMENT FOR PEOPLE WITH DISABILITIES

Research Report | 2026

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This report was written by Drs. Katherine Bishop-Williams, Marcus Yung, and Amin Yazdani, and Nicki Islic. Individual chapter authorship is listed on the title page of each report section.

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Unlocking Untapped Talent: Inclusive Training Practices for Persons with Disabilities in Skilled Trades

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ABSTRACT

Accommodating persons with disabilities is an important step towards an inclusive skilled trades sector; lack of effective accommodation can introduce barriers to entry and retention for skilled trades. This research describes the prevalence of disability among apprentices, their perceptions of disability in apprenticeship, occupational health and safety (OHS) training knowledge, and recommendations for accommodations.

Data were collected through questionnaires with apprentices, gathering demographic information and measures such as OHS knowledge or skills. Analysis included descriptive statistics of disabilities and pain and injury profiles and Chi square tests comparing groups. Qualitative data was assessed via thematic analyses.

Of the 1,486 apprentices who completed the survey, 298 apprentices (20.1%) reported at least one disability. Apprentices with a disability reported significantly lower OHS knowledge or skills in 11 of 13 domains.

Apprentices with a disability were 2.01 (1.399, 2.871; $p<0.001$) times more likely to report a severe injury in the last 12 months. Apprentices with a disability were significantly more likely to report chronic and short-term pain.

Apprentices with and without a disability preferred hands-on-learning. Apprentices with a disability recommended accommodations that primarily fit into three themes: learning style, resources, and physical accommodations.

This paper provides an original analysis of the relationships between disability on skilled trades apprentices and their experience of OHS, including knowledge, pain, and injury.

OHS training accommodations should be implemented for apprentices with disabilities when needed, supporting educators and employers to provide inclusive OHS training, and promoting equitable and inclusive workforce entry.

KEYWORDS

Equitable apprenticeships, inclusive classrooms, learners with disabilities, occupational health and safety training

INTRODUCTION

The skilled trades sector in Canada faces a critical and ongoing workforce challenge. Attrition is increasingly evident as experienced workers retire, and others transition to new careers. Between July 2024 and July 2025, employment in Ontario's trades, transportation, and equipment operator sector decreased by 3.1%, representing nearly 35,000 vacated positions (Labour Market Report, 2025). The 2021 Census of the Canadian population demonstrated that the demand for skilled trades increased relative to the skilled trades workforce from 2016 to 2021 (Su et al., 2024). This shortage threatens productivity and economic stability (Skills Council of Canada, 2024).

Addressing this gap requires more than recruitment; it demands inclusive environments that attract and retain diverse talent. If eligible workers do not feel welcomed and included in the training or workplace settings, recruitment of valuable skilled trades workers may fall short (Skills Council of Canada, 2024), especially among workers from equity-deserving groups, such as females, gender-diverse individuals, newcomers to Canada, and persons with disabilities. Promoting equity and inclusion is essential across all sectors but especially in those facing workforce shortages. The Canadian Labour and Skills Survey identified labour and skills shortages as a major risk factor to industry growth in a globally competitive market (Canadian Manufacturers & Exporters, 2022). Among underrepresented groups, persons with disabilities remain particularly marginalized despite comprising 27% of the Canadian population (Statistics Canada, 2023) but only 13.8% of the Red Seal skilled trades workforce (CAF, 2023). This disparity reflects challenges such as inaccessible training environments, limited accommodations, and attitudinal biases. It is essential to prioritize inclusive training practices, accessible work environments, and targeted supports for equity-deserving groups, to stabilize and strengthen the skilled trades workforce. Previous research suggests that while these gaps have been identified for apprenticeship training for persons with disabilities, substantial work remains (Mitchell et al., 2023). These efforts will help unlock a broader talent pool and ensure that all workers can contribute safely and effectively to Canada's and the global economic future.

Despite ongoing efforts to improve workplace inclusion, persons with disabilities in Canada continue to experience significant disparities in employment outcomes. From 2023 to 2024, the employment rate for Canadians with disabilities was 46.4%, compared to 66.2% for those without disabilities (Hardy & Vergara, 2025). This disparity underscores the need for

targeted, systematic strategies to improve access to employment in skilled trades, where labour shortages are projected to continue. Data from the Canadian Apprenticeship Forum (CAF, 2023) show that individuals with disabilities made up only 13.8% of the Red Seal skilled trades workforce, while they represented 27.0% of the general Canadian population (Statistics Canada, 2023). Red Seal skilled trades refer to a nationally recognized certification program for approximately 50 skilled trades. Persons with disabilities remain particularly underrepresented and face unique barriers in the skilled trades. This underrepresentation reflects systemic barriers such as inaccessible training environments, limited accommodations, and attitudinal biases. Addressing these challenges requires coordinated efforts across government, industry, and educational institutions to ensure that apprenticeship pathways are inclusive and supportive of diverse learners.

Understanding disability is essential for creating safe, inclusive, and productive work environments. The International Classification of Functioning, Disability, and Health (WHO, 2001; Padkapayeva et al., 2017; Vornholt et al., 2017) defines disability as "impairment, activity limitations, and participation restrictions." This aligns with the National Standard of Canada (CSA Z1011, 2020), which describes disability as any impairment or functional limitation—permanent, temporary, or episodic—that, in interaction with barriers, hinders full and equal participation. Disability is often assessed through functional limitations, such as task performance (Vornholt et al., 2017), but this can emphasize deficits. Instead, disability should be understood contextually, where participation restrictions arise from environmental factors (Vornholt et al., 2017; CSA Z1011, 2020). Tuomi et al.'s (1991) widely applied definition (Lederer, 2014) focuses on a worker's ability to meet job demands relative to health and mental capacity, a concept easily extended to students and apprentices (Padkapayeva et al., 2017; Vornholt et al., 2017).

Accommodations, which are modifications enabling meaningful participation, improve safety and inclusion. Examples include adjusted schedules, assistive technology, and role adaptations (Nevala et al., 2015; Padkapayeva et al., 2017; Vornholt et al., 2017). In apprenticeships, accommodations may involve alternate material formats, extended test time, or supportive instruction. Canada's legislative framework supports these rights through the Accessible Canada Act (ACA, 2019), Canadian Human Rights Act (CHRA, 1985), Canadian Charter of Rights and Freedoms (2024), Employment Strategy for Canadians with Disabilities (2024), and CSA Z1011 (2020). The ACA emphasizes removing societal barriers, while the CHRA and Charter prohibit discrimination and mandate accommodation unless undue hardship occurs. The Employment Strategy promotes inclusive hiring and education, and CSA Z1011 outlines

organizational systems for early accommodation and return-to-work policies. For learners, the Ontario Education Act (Government of Ontario, 1990) and Accessibility for Ontarians with Disabilities Act (AODA, 2005) ensure accessible education. Apprenticeship programs allow exam accommodations such as extra time and assistive technology (Centre for Innovation in Campus Mental Health, 2025).

Inclusive access to apprenticeship training programs has been shown to support employment pathways for persons with disabilities (Cocks et al., 2015). Apprentices with impairments or disabilities often face additional challenges in completing their programs, particularly during the in-class training, where accommodations are critical (Brown et al., 2024). Recognizing the diverse abilities of persons with disabilities and proactively addressing their needs through accommodation is essential to improving employment outcomes in the skilled trades. Embedding inclusive practices into apprenticeship training and workplace safety programs is essential to closing employment gaps and fostering equity in the skilled trades workforce.

While inclusion in the skilled trades has been discussed, little attention has been paid to how these disparities intersect with occupational health and safety (OHS) training and outcomes. Research investigating the accommodation necessary for OHS training remains limited. OHS training is vital for preventing injuries and ensuring safe participation in skilled trades, yet little is known about how disability intersects with OHS learning and injury risk. This study addresses this gap by:

i. Estimating the prevalence of disability among skilled trades apprentice partiipants;
ii. Comparing OHS-related outcomes between apprentices with and without disability;
iii. Exploring associations between disability status, pain, and workplace injury; and
iv. Identifying learning preferences and recommended accommodation for OHS training.

By examining these dimensions, this research aims to inform inclusive practices that strengthen workforce sustainability and safety in Canada's skilled trades.

METHODS

Data Collection

This study engaged apprentices enrolled in skilled trades programs in Ontario. A purposive sampling strategy ensured representation across a range of trades, training levels (i.e., Years 1–3), and training formats (e.g., day-release and block-release; i.e., the classroom-to-workplace training schedule of apprenticeship training). Fourteen skilled trades apprenticeship classrooms were selected between September 2022 and June 2024. Surveys were administered in class using paper-based questionnaires to maximize participation and minimize disruption.

The questionnaire included multiple-choice, multi-select, and open-ended items, drawing on validated tools for program characteristics (International Labour Organization (ILO), 2021) and disability identification (CDC, 2025). Topics included demographics, training format, disability status, OHS training knowledge and values, workplace injury history, and pain profiles. Disability categories included learning, cognitive (i.e., memory-related), hearing, mobility, and vision impairments.

Apprentices were asked to reflect on their OHS training experiences, including how their disability may affect the type or amount of work they can perform. Injury-related questions used a 12-month recall period and captured severity (i.e., first aid, modified duties, or lost time). Pain-related questions, adapted from the Nordic Musculoskeletal Questionnaire (Crawford, 2007), assessed frequency and location of pain across body regions, including neck, shoulder, elbow/forearm, hand/wrist/fingers, lower back, and knee/leg. Pain was classified as short-term (≤30 days), long-term (>30 days), or chronic (ongoing). Open-ended questions invited apprentices with disabilities to recommend accommodations. Based on early survey responses, additional questions on workplace accommodations were added during the latter phase of data collection (n=729), allowing for deeper exploration of support needs across multiple training environments.

Data Analysis

Responses were transcribed into a secure spreadsheet (Microsoft Corporation, Redmond, WA, USA) and analyzed using Stata 13 (StataCorp LLC, College Station, TX, USA). Data cleaning removed incomplete or invalid entries.

Descriptive statistics summarized demographic characteristics, disability prevalence, and pain profiles. Group comparison between apprentices with and without disabilities used Chi-square tests; Fisher's Exact Tests were applied when assumptions were not met. Unadjusted odds ratios estimated associations between disability status and injury or pain. Statistical significance was set at $\alpha < 0.05$.

Qualitative data were analyzed using Braun and Clarke's (2006) thematic analysis framework. Thematic analysis began with a detailed review of responses to gain familiarity with the data. An inductive approach guided the coding, with themes emerging directly from the participant narratives. Codes were refined into broader themes capturing accommodation recommendations and accessibility strategies.

All study procedures were approved by the Research Ethics Board at Conestoga College Institute of Technology and Advanced Learning (REB #451).

FINDINGS

A total of 1,486 apprentices from 14 skilled trades programs completed the survey (range: 3-329 apprentices per program; median= 80 apprentices per program). Most participants were enrolled in block-release training (64.7%) and represented all three program levels (Level 1: 47.6%; Level 2: 21.5%; Level 3: 31.0%). The sample was predominantly male (92.2%), with smaller proportions identified as female (4.2%), transgender (0.9%), or non-binary (0.7%). Nearly half were aged 15-24 (45.9%); 13.3% identified as a visible minority and 2.1% identified as Indigenous.

Overall, 20.1% of apprentices reported at least one disability; 36.9% of those reported multiple disabilities (Figure 1). Cognitive and learning impairments were most common (learning: 14%; memory/concentration: 10.9%), followed by hearing (2.6%), mobility (1.1%), and vision (1.1%) (Table I).

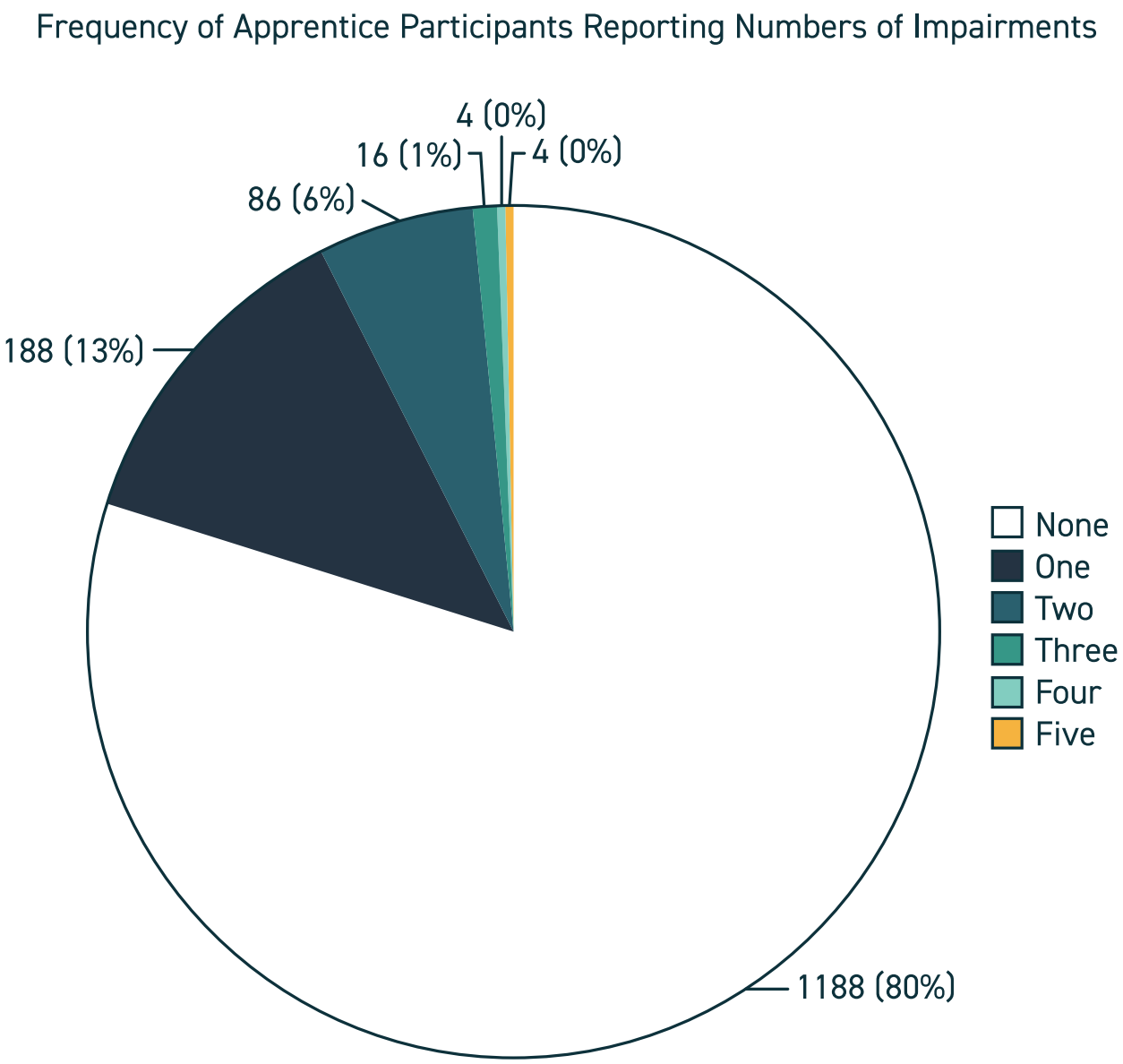

Figure 1. Demographics of survey questionnaire apprentice participants by their count of disability types within the five measured categories: learning impairment, cognitive impairments impacting memory, hearing, mobility, and vision.

Table I. Frequency and proportion of disability types by demographics and apprenticeship traits.

Disability Type - Frequency (% of Apprentices in the Program)							
Demographic and Apprenticeship Traits		**Any Disability[1]**	**Diagnosed Learning Disability (n=209 (14.0%))**	**Difficulty Concentrating and Remembering or Making Decisions (n=163 (10.9%))**	**Hearing Impairment (n=40 (2.6%))**	**Mobility Impairment (n=16 (1.1%))**	**Vision Impairment (n=16 (1.1%))**
Program	Automotive Service Technician (n=246)	65(26.4)	42(17.1)	34(13.8)	8(3.3)	2(0.8)	3(1.2)
	Brick And Stone Mason (n=83)	16(19.2)	13(15.7)	6(7.2)	2(2.4)	0	1(1.2)
	Cabinet Maker (n=41)	7(17.1)	6(14.6)	3(7.3)	0	0	0
	Electrician (n=329)	60(18.2)	35(10.6)	32(9.7)	11(3.3)	4(1.2)	4(1.2)
	General Carpenter (n=98)	19(19.4)	14(14.3)	8(8.2)	2(2.0)	1(1.0)	0
	General Machinist (n=71)	11(15.4)	8(11.3)	8(11.3)	1(1.4)	1(1.4)	0
	Metal Fabricator (Fitter) (n=75)	20(26.7)	19(25.3)	10(13.3)	0(0)	1(1.3)	1(1.3)
	Millwright (n=74)	11(14.9)	8(10.8)	7(9.5)	2(2.7)	2(2.7)	1(1.4)
	MTBI (n=3)	0	0	0	0	0	0
	Plumber (n=171)	24(14.0)	18(10.5)	14(8.2)	3(1.8)	0	1(0.6)

Disability Type - Frequency (% of Apprentices in the Program)							
Demographic and Apprenticeship Traits		**Any Disability[1]**	**Diagnosed Learning Disability (n=209 (14.0%))**	**Difficulty Con-centrating and Remembering or Making Decisions (n=163 (10.9%))**	**Hearing Impairment (n=40 (2.6%))**	**Mobility Impairment (n=16 (1.1%))**	**Vision Impairment (n=16 (1.1%))**
Program	Refrigeration And Air Conditioning Systems Mechanic (n=90)	8(8.9)	5(5.6)	7(7.8)	0(0)	0	0
	Tool And Die Maker (n=25)	7(28.0)	5(20.0)	4(16.0)	2(8.0)	0	1(4.0)
	Truck And Coach Technician (n=160)	47(29.4)	33(20.6)	28(17.5)	9(5.6)	5(3.1)	4(2.5)
	Welder (n=20)	3(15.0)	3(15.0)	2(10.0)	0	0	0
Release Type	Block (n=960)	170(17.7)	119(12.4)	94(9.7)	22(2.3)	6(0.6)	8(0.8)
	Day (n=508)	122(24.0)	86(16.9)	65(12.8)	16(3.1)	9(1.8)	6(1.2)
	Unknown Release Type/ Prefer not to answer (n=18)	6(33.3)	4	4	2	1	2

Disability Type - Frequency (% of Apprentices in the Program)							
Demographic and Apprenticeship Traits		**Any Disability[1]**	**Diagnosed Learning Disability (n=209 (14.0%))**	**Difficulty Concentrating and Remembering or Making Decisions (n=163 (10.9%))**	**Hearing Impairment (n=40 (2.6%))**	**Mobility Impairment (n=16 (1.1%))**	**Vision Impairment (n=16 (1.1%))**
Apprenticeship Level	1 (n=707)	144(20.4)	105(14.9)	85(12.0)	16(2.3)	6(0.8)	6(0.8)
	2 (n=319)	74(23.2)	48(15.0)	40(12.5)	10(3.1)	7(2.1)	5(1.6)
	3 (n=460)	80(22.2)	56(12.2)	38(8.3)	14(3.0)	3(0.6)	5(1.1)
Age Group	15-24 years (n=682)	132(19.4)	92(13.5)	69(10.1)	19(2.8)	7(1.0)	9(1.3)
	25-34 years (n=508)	108(21.3%)	78(15.4)	59(11.6)	9(1.8)	3(0.6)	4(0.8)
	35 years or older (n=156)	29(18.5)	21(13.5)	16(10.3)	9(5.8)	3(1.9)	0
	Unknown Age (n=140)	29(20.7)	18	19	3	3	3

Disability Type - Frequency (% of Apprentices in the Program)							
Demographic and Apprenticeship Traits		**Any Disability[1]**	**Diagnosed Learning Disability (n=209 (14.0%))**	**Difficulty Con-centrating and Remembering or Making Decisions (n=163 (10.9%))**	**Hearing Impairment (n=40 (2.6%))**	**Mobility Impairment (n=16 (1.1%))**	**Vision Impairment (n=16 (1.1%))**
Gender Identity	Male (n=1,363)	250(18.3)	173(12.7)	135(9.9)	32(2.3)	11(0.8)	10(0.7)
	Female (n=62)	23(37.1)	17(27.4)	14(22.6)	1(1.6)	0	2(3.2)
	Transgender (n=13)	8(61.5)	7(53.8)	5(38.5)	1(7.7)	1(7.7)	1(7.7)
	Non-binary (n=10)	7(70.0)	7(53.8)	5(50.0)	3(30.0)	1(10.0)	0
	Other gender identities/ Prefer not to Disclose (n=30)	7(23.3)	7(23.3)	4(13.3)	3(10.0)	3(10.0)	3(10.0)
Racial Identity	Indigenous (n=31)	12(38.7)	10(32.3)	7(22.6)	2(6.5)	1(3.2)	1(3.2)
	Unknown Indigenous Identity (n=33)	9(27.3)	6	7	2	2	2
	Visible Minority (n=196)	58(29.6)	41(20.9)	31(15.8)	11(5.6)	4(2.0)	6(3.1)
	Unknown Visible Minority Identity (n=79)	17(21.5)	14	11	5	3	3

*Unknown refers to responses chosen as prefer not to disclose or left blank in the survey questionnaire.

1 Disability of any type is counted separately as participants with a disability may have identified with more than one disability, therefore, those rows cannot be used as additive measures.

The prevalence of each disability varied across programs (Table I). The prevalence of disabilities varied minimally across the three program levels but was higher among day- than block-release training.

Disability prevalence was higher among non-male, Indigenous, and visible minority apprentices. Male apprentices had a disability prevalence of 18.3%, while prevalence was 37.1% among female, 61.5% among transgender, and 70.0% among non-binary apprentices. Disability prevalence was 38.7% among Indigenous and 29.6% among visible minority apprentices.

Most apprentices with a disability (72.1%) indicated their disability did not affect their ability to work (Table II). Extreme impacts on their ability to work were rarely reported but were most common among apprentices with a mobility (18.8%) or vision impairment (12.5%).

Table II. Frequency of disability types among apprentice participants and their relative impact on training and working.

Disbility Type	Self-Rated Impact of Disability on Working in Their Chosen Trade Frequency (%)				
	None	Slight	Moderate	Extreme	Prefer not to Answer
Any One or More Disability/ies (n=298)	215(72.2)	66(22.2)	8(2.7)	6(2.0)	3(1.0)
Diagnosed Learning Disability (n=209)	157(75.1)	41(19.6)	4(1.9)	5(2.4)	2(1.0)
Difficulty Concentrating and Remembering or Making Decisions (n=163)	104(63.8)	45(27.6)	6(3.7%)	6(3.7)	2(1.2)
Hearing Impairment (n=40)	27(67.5)	8(20.0)	1(2.5)	3(7.5)	1(2.5)
Mobility Impairment (n=16)	6(37.5)	6(37.5)	0	3(18.8)	1(6.3)
Vision Impairment (n=16)	9(56.3)	3(18.8)	1(6.3)	2(12.5)	1(6.3)

OHS Knowledge and Belief in OHS Value

Apprentices with disabilities reported lower OHS knowledge across 11 of 13 domains ($p < 0.001$) (Table III). There were no common characteristics among the domains where significant differences were observed between the apprentices with and without a disability. Both groups were aware of their rights under OHS legislation and uncertain about how to access additional OHS information when needed.

Apprentice Confidence in OHS Domains (n) 1	Apprentices with a disability (% Agree)	Apprentices without a disability (% Agree)	$\chi 2$	Probability ($p < 0.05$) *	Odds Ratio (Confidence Interval)
Ability to work safely (n=1,459)	260(89.3)	1,108(94.9)	12.12	<0.001*	0.454 (0.283,0.741)
Ability to keep coworkers working safely (n=1,460)	264(90.1)	1,376(95.3)	11.61	<0.001*	0.450 (0.276,0.748)
Ability to know which health and safety precautions to take while doing my current or future job (n=1,460)	274(93.8)	1,140(97.6)	10.86	0.001*	0.374 (0.197,0.729)
Ability to identify OHS hazards/ equipment issues (n=1,463)	281(95.3)	1,150(98.5)	11.31	<0.001*	0.314 (0.146,0.692)
Knowledge of OHS rights (n=1,461)	266(90.8)	1,084(92.8)	1.37	0.243	0.763 (0.478,1.251)
Knowledge of labour rights (n=1,454)	236(80.8)	1,045(89.9)	18.47	<0.001*	0.472 (0.329,0.682)
Ability to find additional OHS information (n=1,462)	231(78.3)	960(82.2)	2.44	0.778	0.778 (0.563,1.085)
Knowledge of common workplace injuries (n=1,465)	278(94.2)	1,135(97.0)	5.29	0.022*	0.504 (0.271,0.975)
Knowledge of workplace physical demands (n=1,463)	283(95.9)	1,162(99.4)	24.48	<0.001*	0.122 (0.037,0.355)
Knowledge of emotional/ mental demands of job (n=1,402)	260(91.5)	1,078(96.4)	12.34	<0.001*	0.402 (0.232, 0.711)
That the workplace will provide equipment that is safe and ergonomically designed (n=1,445)	200(69.4)	898(77.6)	8.44	0.004*	0.655 (0.488,0.884)
That training and mentorship will be received through their employer (n=1,443)	227(78.5)	994(86.1)	10.22	0.001*	0.589 (0.421,0.832)
That assigned tasks in the workplace will help to build competency and skills in their trade (n= 1, 452)	261(89.1)	1,110(95.8)	19.89	<0.001*	0.360 (0.221, 0.594)

*Unknown refers to responses chosen as prefer not to disclose or left blank in the survey questionnaire.

1 Disability of any type is counted separately as participants with a disability may have identified with more than one disability, therefore, those rows cannot be used as additive measures.

Apprentices with a disability were significantly less likely to agree they believed in four of the five potential values potential value than their peers without a disability (Table IV). The value that OHS improves performance and productivity in the workplace was the only non-significant difference in beliefs between participants with and without a disability; belief in this value was approximately 10% lower than the other beliefs investigated.

Table IV. Apprentice beliefs in the value of OHS by disability status, compared between apprentices with and without a disability by Chi-Square Tests and reported as unadjusted odds ratios.

Apprentice Belief in the Potential Values of OHS Training (n) [1]	Apprentices with a disability (% Agree)	Apprentices without a disability (% Agree)	$\chi 2$	Probability ($p < 0.05$) *	Odds Ratio (Confidence Interval)
Reduce work injuries/ accidents (n=1,463)	277(94.5)	1,146(97.9)	10.24	0.001*	0.262 (0.182,0.741)
Reduce workplace financial loss (n=1,450)	258(89.3)	1,087(93.6)	6.53	0.011*	0.567 (0.359,0.912)
Reduce lost time claims for injuries/ accidents (n=1,462)	269(91.5)	1,117(95.6)	8.16	0.004*	0.491 (0.293,0.844)
Improve performance and productivity for individual and organization (n=1,452)	231(80.2)	942(80.9)	0.08	0.781	0.955 (0.685,1.346)
Improve overall OHS in the workplace (n=1,457)	272(93.8)	1,133(97.1)	7.32	0.007*	0.453 (0.245,0.867)

*Indicates a significant difference

[1] Only completed responses were included in the analysis.

Workplace Injuries and Pain Profiles

Apprentices with disabilities reported 1.81 (95% CI: 135,2.40; $p < 0.001$) times higher odds of experiencing a workplace injury in the past year compared to those without disabilities (Table V). They also reported 2.01 (95% CI:1.399,2.871, $p < 0.001$) times higher odds of more serious injury in the past year than their peers without a disability.

Table V. Apprentice self-reported workplace injury in the past 12 months compared between apprentices with and without a disability by Chi-Square Tests and reported as unadjusted odds ratios.

	Disability Frequency (%)	No Disability Frequency (%)	$\chi 2$	(p < 0.05) *	OR (CI)
Any injury in the workplace (n=368)	101(35.4)	184(17.3)	17.68	<0.0001*	1.809 (1.353,2.401)
Injury requiring first aid treatment, change of job activities, or lost time from work (n=206)	68(32.7)	138(19.5)	16.16	0.0001*	2.01 (1.399,2.871)

*Indicates a significant difference at alpha of $p<0.05$

Apprentice participants with a disability reported significantly higher prevalence of short term and chronic pain in nearly all body segments than those without a disability (Table VI). Excluding pain in their hands, there were no significant differences between the reports of long-term pain prevalence between groups.

Table VI. Short-term, long-term, and chronic pain profiles compared between apprentices with and without a disability by Chi-Square Tests and reported as unadjusted odds ratios.

Body Segment	Pain Duration	With Disability Frequency (%)	Without Disability Frequency (%)	$\chi 2$	(p < 0.05) *	OR (CI)
Back (n=1,377)	N/A	n=282	n=1,095			
	None	72(25.5)	402(36.7)			
	Short-Term	116(41.1)	497(45.4)	2.60	0.107	1.303 (0.934, 1.826)
	Long-Term	22(7.8)	72(6.6)	3.83	0.050	1.706 (0.944, 2.993)
	Chronic	72(25.5)	124(11.3)	38.15	<0.001*	3.242 (2.166, 4.842)
Elbow (n=1,326)		n=272	n=1,054			
	None	135(49.6)	683(64.8)			
	Short-Term	108(39.7)	312(29.6)	14.92	0.001*	1.751 (1.300, 2.354)
	Long-Term	4(1.5)	21(2.0)	0.00	0.947	0.964 (0.237, 2.920)
	Chronic	25(9.2)	38(3.6)	21.14	<0.001*	3.328 (1.857, 5.865)
Hand (n=1,348)	N/A	n=269	n=1,079			
	None	84(3.1)	490(45.4)			
	Short-Term	121(45.0)	476(44.1)	6.43	0.011*	1.483 (1.081,2.040)
	Long-Term	19(7.1)	46(4.3)	9.20	0.002*	2.409 (1.266,4.432)
	Chronic	45(16.7)	67(6.2)	40.05	<0.001*	3.918 (2.445,6.231)
Leg (n=1,360)	N/A	n=275	n=1,085			
	None	89(3.2)	528(48.6)			
	Short-Term	122(44.4)	404(37.2)	14.51	<0.001*	1.792 (1.310,2.455)
	Long-Term	10(3.6)	48(4.4)	0.34	0.562	1.236 (0.537,2.590)
	Chronic	54(19.6)	105(9.7)	32.10	<0.001*	3.051 (2.003,4.618)

Body Segment	Pain Duration	With Disability Frequency (%)	Without Disability Frequency (%)	$\chi 2$	(p < 0.05) *	OR (CI)
Neck (n=1,348)	N/A	n=271	n=1,077			
	None	119(43.9)	596(55.3)			
	Short-Term	104(38.4)	386(35.8)	4.05	0.044*	1.349 (0.995,1.827)
	Long-Term	8(3.0)	33(3.1)	0.23	0.633	1.214 (0.472,2.766)
	Chronic	40(14.8)	62(5.8)	29.02	<0.001*	3.231 (2.012,5.138)
Shoulder (n=1,352)	None	n=271	n=1,081			
		107(39.5)	568(52.5)			
	Short-Term	108(39.9)	403(37.3)	5.47	0.019*	1.422 (1.046,1.934)
	Long-Term	10(3.7)	44(4.1)	0.26	0.608	1.206 (0.525,2.528)
	Chronic	46(17.0)	66(6.1)	39.01	<0.001*	3.700 (2.344,5.797)

OHS Training and Accommodations

Learning preferences were similar among apprentices with a disability and those without (Figure 2). Hands-on-practice was overwhelmingly the most preferred and assigned readings was the least preferred learning strategy among both groups.

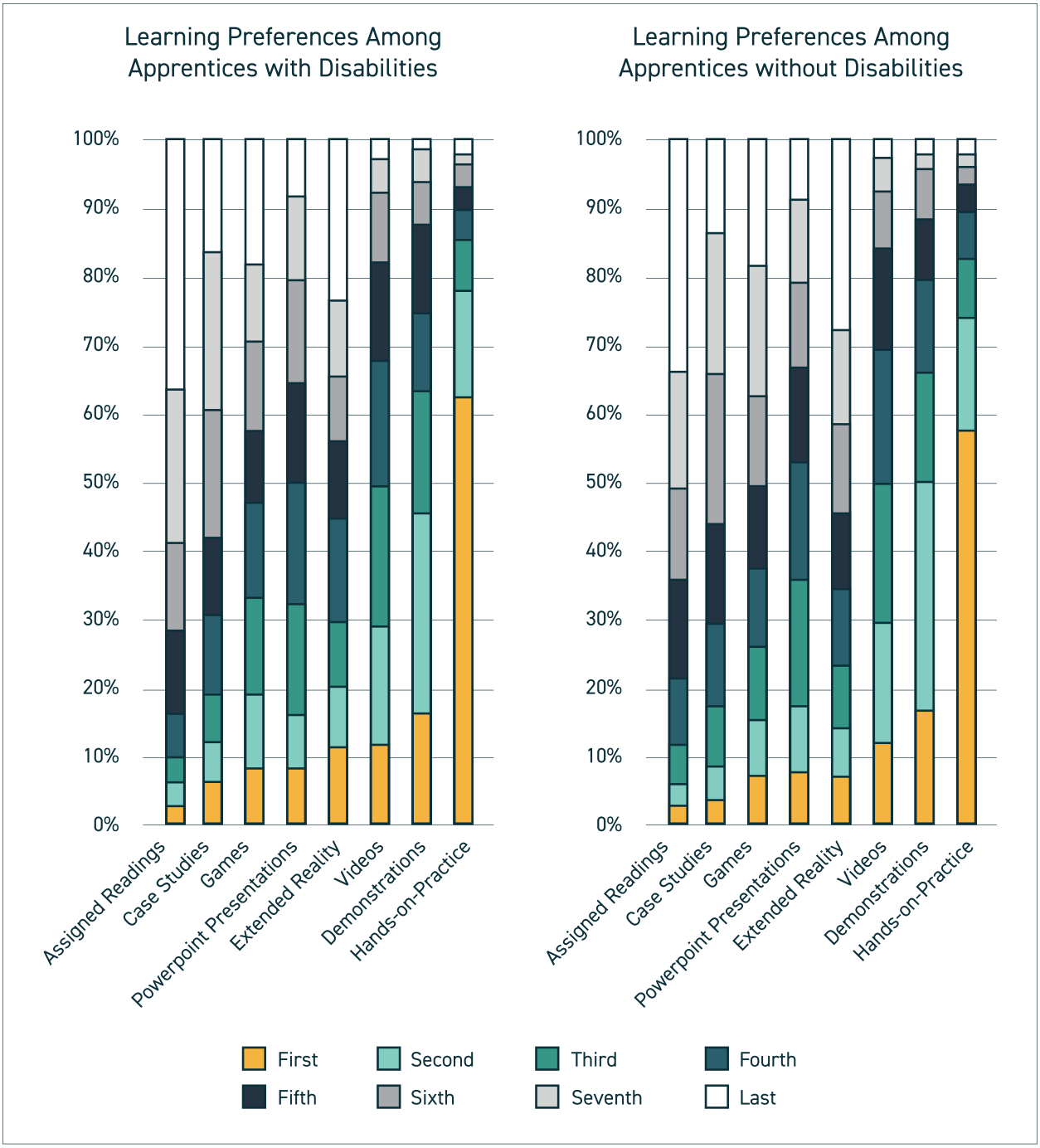

Figure 2. Ranked learning preferences among apprentice participants with and without a disability.

40.6% of apprentices with a disability recommended in-class accommodations to support their learning. Further, 20.6% of the 145 participants with a disability asked about workplace accommodations for disabilities, recommended accommodations. Recommendations for accommodation primarily fit into three main themes: learning style, resources, and physical settings (Figure 3); examples of direct actions to support accommodation were provided.

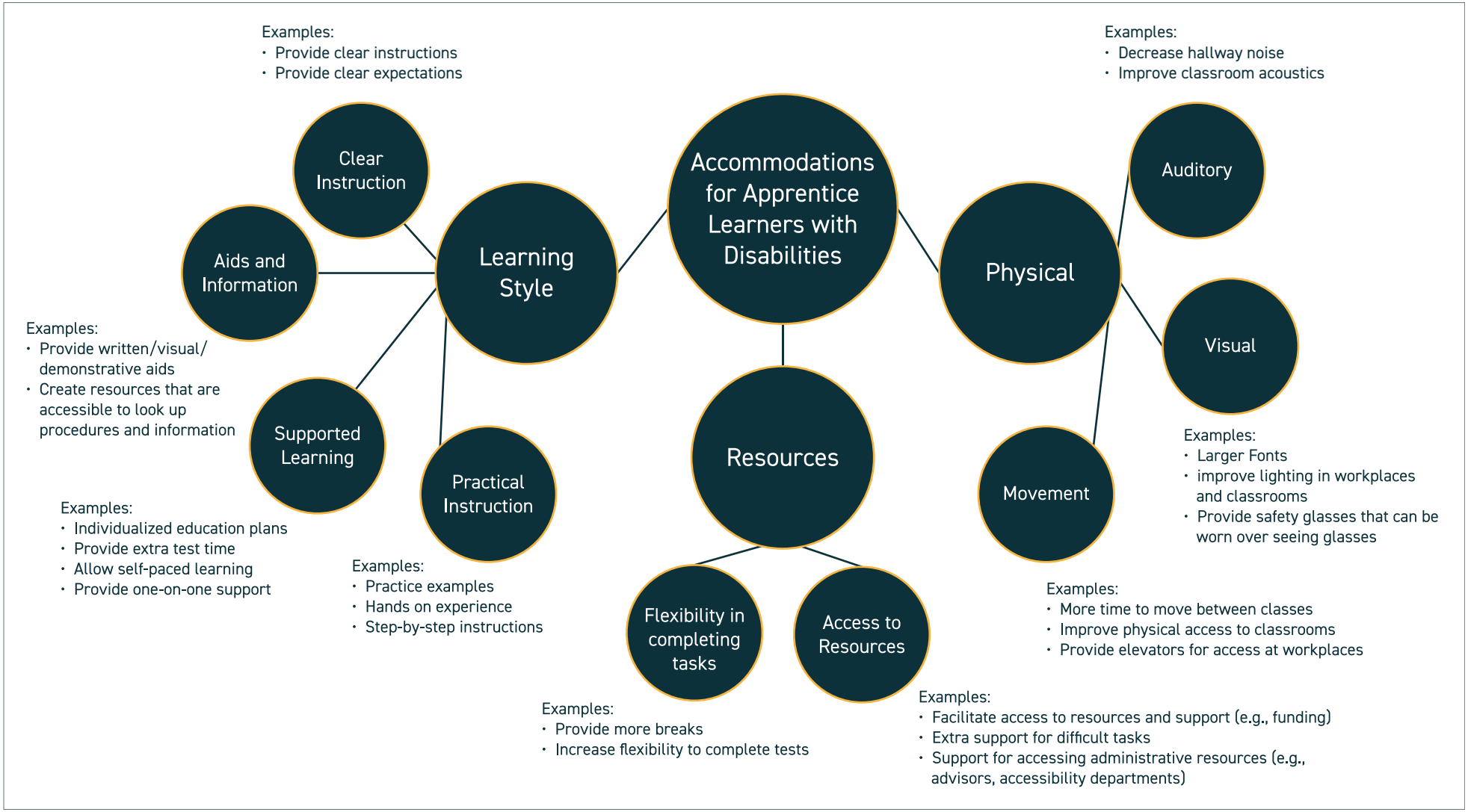

Figure 3. Thematic map of apprentice learning accommodations recommended by survey questionnaire participants with learning disabilities and examples provided by participants.

The first sub-theme for learning style was related to clear instructions for tasks and expectations. Apprentices recommended making aids and information available to apprentices as a reference when completing tasks. Another theme was providing supported learning opportunities in the classroom that met the individual needs of students with disabilities. Finally, apprentices recommended using practical instruction that made the information directly applicable.

Apprentices recommended accommodations that allowed for increased flexibility in completing their tasks, such as order of tasks or timing to complete tasks. Accommodations to support improved access to resources for their learning were recommended.

Several recommendations were directly related to the accommodations needed for physical spaces; these recommendations were more targeted to specific impairments. Reducing white noise for apprentices with auditory impairments, using larger fonts and spaces with better lighting for visual impairments, and classroom designs that meet movement needs for apprentices with mobility impairments were recommended.

DISCUSSION

This study identified significant differences between apprentices with and without disabilities in OHS-related knowledge, perceived training value, workplace injury risk, and pain profiles. The prevalence of disability among apprentices (20.1%) was lower than the national rate of 27% among working-age Canadians (Statistics Canada, 2023), but higher than reported in skilled trades workforce data (CAF, 2023). Learning and memory-related disabilities were most common, contrasting with national patterns where pain and mobility impairments predominate (CSD, 2022). This difference likely reflects the younger age profile of apprentices and potential barriers to entry for individuals with mobility limitations.

Representation in the Skilled Trades

Females accounted for 4.2% of participants, despite representing 14.8% of Red Seal skilled trades workers in Canada (CAF, 2023). Red Seal workforce participation reflects the 50 nationally recognized Red Seal Skilled Trades (CAF, 2023), while Ontario recognizes 144 skilled trades (Skilled Trades Ontario, 2025). Participants represented 14 skilled trades programs, which may not represent some predominantly female skilled trades, such as hairstyling. The gender distribution within the trades is uneven (CAF, 2023); hairstyling, baking, and cooks contribute more female representation in the skilled trades. The CAF report (2023) does not report representation of other gender identities in the trades. 2.1% of participants were Indigenous compared to 5.8% of Red Seal skilled trades workers in Canada; 13.2% of participants were visible minorities compared to 18.2% of Red Seal skilled trades workers (CAF, 2023). This underrepresentation may be related to the distribution of demographics across different trades, as diversity in trades specialities varies significantly (CAF 2023; Su et al., 2024). Alternatively, underrepresentation may be related to the regional specificity of the study, which was conducted in Southern Ontario, while the Red Seal Report presents national averages (CAF, 2023).

Apprentices with a disability were more likely to be non-male, Indigenous or a visible minority, and to be enrolled in day-release training. The prevalence of disability was over two times higher among females, and over three times higher among transgender and non-binary participants than male participants. The disability prevalence was two times higher among Indigenous than non-Indigenous apprentices, and 1.6 times higher among visible minority than non-visible minority apprentices. Detailed disability demographics on skilled tradespeople by gender or other characteristics are not available (CAF 2023; Su et al., 2024; Hardy and Vergara, 2025).

The disability prevalence among Canadians aged 15 years and over increased significantly between 2017 and 2022 (Statistics Canada, 2023; CSD 2017; CSD, 2023). Prevalence increased most among youth ages 15-24, followed by adults, aged 25-64, but remained highest among adults aged 65 and over (Statistics Canada, 2023). Employment among working-age adults with a disability declined significantly from 78% in 2017 to 62% in 2022; employment for adults without a disability increased slightly during this period (Statistics Canada, 2023). 20.1% of apprentices in this study reported a disability, indicating moderate representation compared to 27% of working-age adults in Canada in 2022 (Hebert et al., 2024).

Learning and Working in Skilled Trades with a Disability

Nearly three-quarters of apprentices with a disability reported that their disability did not affect their ability to learn or work. More than half of apprentices with each impairment reported no effect on their work, except for vision impairment, where effects were more common. These findings may indicate that work in the skilled trades interacts differently with various impairments, exacerbating barriers to entry for some groups. This pattern has been observed in broader employment contexts (Vornholt et al., 2018; Padkapayeva et al., 2017) and within the trades (Jones 2024). By identifying the disability types most affect learning and working, targeted accommodation strategies can be developed to enhance workforce engagement (Padkapayeva et al., 2017).

Evidence suggests that lack of safety knowledge, training, or familiarity may affect OHS-related decision-making and increase the risk of workplace injuries (Teufer et al., 2019). Research examining barriers to employment for persons with disabilities identified self-esteem as a key barrier across both physical and cognitive impairments (Shier et al., 2009). While prior literature has focused on employers underestimating the skills or knowledge of employees with disabilities (Shier et al., 2009), these results suggest that apprentices may also lack confidence in their own OHS knowledge. Ability to find additional OHS information was lower among both groups, with approximately 80% of apprentices expressing confidence in this skill. The qualitative findings of this study recommended providing additional resources, which could support learning for all apprentices (Lovett et al., 2021).

The values where apprentices with disabilities reported lower belief aligned with the domains where apprentices with disabilities reported lower knowledge. This pattern may be linked to self-esteem (Shier et al., 2009), suggesting that lower perceived value of OHS training may stem from broader issues of self-confidence among apprentices with disabilities. No

significant differences were observed between the two groups for the belief that OHS training improves performance and productivity. Both groups reported lower levels of agreement (i.e., approximately 80%) endorsing this value. Despite extensive evidence of the relationship between OHS and productivity (Lamm et al., 2007), apprentices may be unaware this is a value of OHS. Increasing awareness of the benefits of OHS training may foster greater engagement in safety practices among apprentices.

Apprentices with disabilities were significantly more likely to report experiencing workplace injuries, especially serious injuries, in the past 12 months than their peers without a disability. The relationship between an apprentice's disability status, OHS training, and risk of workplace injury is well documented. The Government of Canada's Disability Management Program (2019; Nevala et al., 2015; CAF, 2009) outlines that the risk of workplace injury increases without appropriate accommodations. Therefore, the accommodations outlined in this research become increasingly essential components of OHS training in the skilled trades.

While long-term musculoskeletal disorder symptoms or pain profiles were similar between the two groups, short-term and chronic pain profiles varied significantly. The reason for this variation is unclear but may relate to how participants with a disability define or experience pain, or how those without disabilities anticipate recovery from temporary ailments. Participants with a mobility impairment were not excluded from pain analyses, meaning their pain may stem from their condition rather than apprenticeship work. However, the cause of pain was not asked, so excluding this group could have omitted relevant non-conditional-related pain. Considering this, these findings should be interpreted with caution.

Apprentices with and without a disability overwhelmingly preferred hands-on-learning over other strategies. These findings align with previous research showing higher ratings of instructor effectiveness, learning strategies, and overall effectiveness of OHS training among construction workers who received face-to-face, hands-on training compared to those in distance learning formats (Sarpy et al., 2021).

Based on the literature, tradespersons with disabilities may not request accommodations due to: low self-esteem or underestimation of their own abilities (Shier et al., 2009); concerns about negative attitudes toward workers with a disability (Shier et al., 2009; Vornholt et al., 2018; Nevala et al., 2015); perceived barriers to implementing accommodations (Vornholt et al., 2018); doubt about the effectiveness of interventions (Jones 2023); fear of damaging learning relationships (Brown et al., 2024; CAF 2009); concerns that accommodation may

widen learning-equity gaps (Lovett 2021); worry about being treated as a homogenous group (Cocks et al., 2015); challenges in learning to use assistive technology (Nevala et al., 2015); or lack of union support during apprenticeship phases (Richards and Sang, 2016). The diversity of accommodations described by participants underscores the importance of collaboratively designed, personalized supports (Richards and Sang, 2016).

Study Implications

Findings from this research highlight differences in knowledge, values, application, and outcomes of OHS training among apprentices with disabilities and those without. Inclusive practices in the skilled trades must prioritize personalized and proactive accommodations, as some impairments, such as vision- or mobility-related, pose greater barriers. Training providers and employers should identify impairment-specific barriers and collaboratively design appropriate supports. To address knowledge differences and perceived value of OHS training among apprentices with disabilities, programs should integrate strategies like mentorship, provide accessible resources in multiple formats, and emphasize the broader benefits of safety training, including injury prevention and improved productivity. Given the higher odds of serious workplace injuries among apprentices with disabilities, inclusive safety practices should include early co-identification of accommodations and regular safety check-ins.

Future Research

The current gap in demographics of skilled tradespeople with disabilities represents a critical gap in research that should be addressed, as understanding the demographics of the skilled tradesperson population with disabilities is essential for the targeted implementation of accommodations (Nevala et al., 2015; Padkapayeva et al., 2017). Future research should further explore how intersectional identity factors, such as race, ethnicity, age, socioeconomic status, and immigration status, intersect with disability to influence training, including OHS training. Such analyses are essential for developing meaningful accommodations and OHS training plans, including injury prevention strategies, to effectively support inclusive apprenticeships.

Future research should explore the barriers to entry for various impairments, which would provide valuable insights for designing inclusive apprenticeship pathways. Relatedly, future research should investigate disability-specific accommodations that apprentices recommend for training and investigate trade-specific accommodations. For example, it would be valuable to understand the accommodations that are supportive for apprentices with a visual impairment compared to a hearing impairment and to understand accommodations that are

supportive for plumbing apprentices compared to carpentry apprentices. Longitudinal studies that investigate training accommodations for apprentices with a disability and their long-term workplace outcomes, job satisfaction, and job retention, would extend the current understanding and support development of causal relationships.

Guidance documents about recommendations for hiring people with disabilities in the skilled trades are needed to help organizations strengthen their capacity for inclusive workforce integration. These trade-specific guidelines would serve as a launching pad for organizations to strengthen their capacity to hire skilled trades workers with disabilities in the future.

Study Limitations

As a preliminary study of apprentices with disability and their OHS experiences, this study provides important insights and contributes to the growing knowledge base in this area. Limitations of this study fall into two main categories: participant characteristics and questionnaire design. All participants were recruited from one region, which may limit the external validity to other regions; however, this study provides a good exploratory assessment of this population, which informs future studies that aim to produce more generalizable results. It is unclear whether part-time students were adequately represented, as these questions were not included, which may impact the prevalence estimates for disability if apprentices with disabilities disproportionately enroll in part-time studies. The study did not include measures for chronic health conditions or mental health-related disabilities, which may have influenced the results, as these are common categories of disabilities (Statistics Canada, 2025; Statistics Canada, 2023). The sample included relatively few older and non-male apprentices, making it difficult to determine whether the observed patterns apply broadly across diverse demographic groups; however, this is generally representative of the skilled trades apprentice population. The questionnaire relied on a long recall period, which increases the risk of recall bias. Measures of pain and injury were self-reported, which may not align with clinical or workplace records. The questionnaire did not include questions about instructor experiences, the accessibility of OHS training materials, or workplace culture, which may have provided additional insights into these findings. Finally, the study collected cross-sectional data, which limits the ability to establish casual relationships or to measure changes overtime, such as in OHS knowledge, or pain and injury. Cross-sectional data collection can serve several purposes, including the development of new hypotheses and the simultaneous measurement of multiple exposures and outcomes (Da Cruz Figueiredo et al. 2025). This is particularly valuable for early-stage research in emerging areas of inquiry, such as this one.

CONCLUSIONS AND APPLICATION OF FINDINGS

This research offers valuable insights into how apprentices with disabilities experience OHS training and provides recommendations for enhancing training. Apprentices with disabilities expressed a shared preference with their peers for hands-on-learning approaches to OHS topics. They also identified specific accommodations, primarily related to physical access, resources, and learning styles, that enhance their OHS training and application in both classrooms and workplaces. The diversity of needs and perspectives among apprentices with disabilities underscores the essential need to prepare accommodations collaboratively with apprentices, tailored to individual needs.

These findings will inform how skilled trades training providers, program developers, instructors, and apprentices engage with OHS training for persons with disabilities. Instructors and program developers are encouraged to work with apprentices with disabilities to co-create individualized accommodation strategies and plans that support their learning. Skilled trades training providers should establish support systems and transition plans that facilitate accommodations in workplaces, ensuring the health and safety of all workers.

The findings from this research support the shared responsibility for training across the spectrum of actors, including but not limited to, instructors and curricula developers, apprentices, workplaces, and legislative and policy bodies. There is a need for broader systems-level change that addresses the implications of this work within skilled trades training. Adjustments to the OHS legislation regarding workplaces and that for training providers should be enhanced to include collaborative efforts to support and accommodate apprentices with disabilities to enhance safety for all workers on a job site.

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