Assistive Technology in the Workplace and Training Needs: Insights from Employed Young Adults who are Blind or Have Low Vision

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Abstract

This study examines the assistive technology (AT) used at work by employed young adults who are blind or have low vision, focusing on their learning methods, self-perceived skill levels, and training needs. The findings indicate that more than half of participants who used a screen reader or braille notetaking device at work learned to use these technologies in school. However, self-taught was by far the most common method selected for learning to use AT, and it was also the primary learning method many people selected for their workplace AT. Participants generally rated their AT skills as high, though some expressed a need for additional training. The insights from this study are valuable for professionals who support the transition of young adults with visual impairments into the workplace.

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Our world is becoming increasingly digital, and digital skills are essential for today's workplace: a recent study found that 92% of jobs in the U.S. labor market require digital skills (Bergson-Shilcock et al., 2023). Digital skills can be defined as the ability to use digital devices (e.g., computers, tablets, smartphones) and software to find, evaluate, use, share, and create content. For most individuals who are blind or have low vision to possess digital skills, they must first be skilled with assistive technology (AT) that allows them to access digital devices and software.

Teachers of students with visual impairments (TVIs) are often the primary professionals who provide AT training to children who are blind or have low vision. Research has suggested that many TVIs may not be well-prepared to provide this training (Ajuwon et al., 2016; Zhou et al., 2011, 2019). The number of AT tools and skills that high school students who are blind or have low vision should know more than doubled between 2004 and 2018, with 30 recommended AT tools and skills for youth who utilize braille in 2018 (Kelly & Kapperman, 2018). Keeping up to date with the increasing necessary AT and skills may be challenging for the students themselves as well as their TVIs. Ultimately, the AT needed to succeed in school may likely also be needed in the workplace, but until recently, we have had little information about what AT is used at work by people who are blind or have low vision. The National Research & Training Center on Blindness & Low Vision (NRTC) began a research project in 2020 to learn more about AT being used in the workplace, challenges users experience with AT at work, and any gaps in needed and available AT.

The purpose of the present study was to provide information about the AT that employed young adults who are blind or have low vision are using at work as well as their self-reported

need for training on their workplace AT. In addition, we wanted to provide information about how they learned to utilize their workplace AT and their self-perceived skill levels with the AT. We employed four research questions to guide our analyses.

1. What AT is used at work by employed young adults who are blind or have low vision?
2. How did employed young adults who are blind or have low vision learn to use their workplace AT?
3. What is the self-perceived skill level with individual AT for young employees who are blind or have low vision?
4. What percentage of employed young adults who are blind or have low vision would benefit from additional training on their workplace AT?

Method

Data Source and Sample

Data were obtained from the NRTC's longitudinal study about AT in the workplace. Using a panel design, survey data were collected annually between 2021 and 2024. Eligibility criteria for the study included being blind or having low vision, being 21 years or older, being employed or recently employed, using AT on the job, planning to work for the next 4 years, and living in the U.S. or Canada. After the authors' university's Institutional Review Board determined the study exempt from oversight, recruitment for study participants began in early 2021. Researchers utilized multiple avenues, including a national participant registry, previous research study participants, organizations for people with visual impairments, social media, listservs, and blindness-specific websites. Potential study participants completed a prescreen survey to determine eligibility.

For the present study, data were obtained from Survey 1 and Survey 2. Data collection

for Survey 1 occurred between May and September 2021. Survey 2 data collection occurred the following year, from June to August 2022. Additional recruitment occurred in 2022, resulting in new participants who answered selected questions from Survey 1 and all questions from Survey 2. Eligible participants were invited to complete each survey either online via a personal survey link generated by Qualtrics or by telephone.

To focus on younger adults who may have received AT training from a TVI, we restricted the sample to currently employed participants born after 1980 who experienced vision loss before the age of 19. The final sample included 121 participants, whose demographic information is presented in Table 1.

[Table 1 about here]

Variables

Participants were asked to identify the types of AT they used at work by selecting from a list of 28 options in Survey 1. For research question 1, we focused on 20 of the most commonly used AT reported in Survey 1. The list of AT was revised for Survey 2, with the most notable change being the replacement of built-in accessibility tools (on a computer) into two separate categories for built-in (computer) screen readers and built-in (computer) screen magnification.

Participants were asked to select all the methods they used to learn how to utilize the work AT they identified in Survey 2. Response options were: a) in school (by a TVI), b) training provided through a vocational rehabilitation (VR) agency or agency for the blind, c) vendor who sold the technology, d) self-taught, e) tutorials, f) another person with blindness or low vision taught me/demonstrated, and g) other. Participants were then asked to identify which of the selected methods they considered the primary method used to learn each specific AT. This data was used to address research question 2. Some participants who completed Survey 1 did not

complete Survey 2, resulting in a smaller sample size (*N*=105) for the learning methods variables.

To measure self-perceived skill level (research question 3), participants rated their skill level for each AT they reported using at work in Survey 1, using a scale from 1 (*beginner*) to 10 (*advanced*). To measure need for training on workplace AT (research question 4), participants who rated their workplace AT skill as 7 or lower were asked whether they would benefit from more training on that particular AT (yes/no).

Analytic Strategy

We used SAS 9.4 to generate descriptive statistics (i.e., frequencies or means) for all variables.

Results

Table 2 shows the percentage of participants who use each type of AT for work, sorted from most to least commonly used. On average, participants reported using 6.50 (*SD*=3.89) types of AT at work. Computer screen reader software (85.1%) was the most commonly used workplace AT, followed by optical character recognition (OCR) apps (58.7%) and built-in accessibility tools (48.8%), which could include built-in screen readers, screen magnifiers, or dictation tools.

[Table 2 about here]

Table 3 presents the percentage of workplace AT users who reported using each learning method, sorted by the number of users for each AT. Self-teaching was a predominant method, reported for each type of AT. Tutorials were also a frequent learning method, though less common than self-teaching. Training from VR or other agencies was used for all but one type of AT, while vendor training was reported for 18 out of the 21 types of AT. Learning from another

person with blindness or low vision was reported for 16 types, and training in school by a TVI was reported for 14 types of AT. There is variability in the use of learning methods across different types of AT. For example, OCR apps and remote-sighted assistance apps were largely self-taught, whereas screen reader software had a somewhat balanced distribution of learning methods, including instruction from TVIs, tutorials, VR or other agencies, and another person with blindness or low vision.

[Table 3 about here]

Table 4 shows the percentage of users who selected each method as their primary learning method for each type of AT. Self-teaching was most commonly reported as the primary method for learning to use most work AT, with the highest rates across each AT except for electronic video magnifiers and orientation/wayfinding/navigation devices. VR or other agency training was reported as the primary learning method by some participants for 19 of the 21 AT, but was only the primary learning method for most users of two AT: orientation/wayfinding/navigation devices (42.9%) and electronic video magnifiers (33.3% - tied with TVIs). TVIs, tutorials, and another person with blindness or low vision were reported as the primary learning method to a lesser extent. Vendor training was not commonly utilized as the primary learning method.

[Table 4 about here]

Table 5 shows the self-rated skill levels and training needs for workplace AT. Users generally rated their AT skills highly, with many rating themselves above 8 on a 10-point scale. Average skill levels ranged from 9.33 (*SD*=1.15) for digital labeling apps to 7.40 (*SD*=2.79) for wearable devices. Training needs varied across AT types, with wearable device users showing the highest training need at 60%. Other types of AT with a large share of users who indicated

that they would benefit from additional training include OCR software/hardware (40%), navigation/wayfinding apps (27.6%), and OCR apps (27.1%).

[Table 5 about here]

Discussion

In our study, just over half of participants who used a screen reader or a braille notetaking device at work reported that a TVI helped them learn to use those technologies in school. For all other ATs they used on the job, less than half, and in some cases no one, reported that a TVI provided instruction in their use. We do not know what ATs are used in school by youth with blindness or low vision who match our sample characteristics. A recent study investigated AT use among 51 students with blindness or low vision, but the majority of the students had low vision, followed by 22% who were legally blind and 10% who were totally blind, and more than two-thirds of the students had additional disabilities (Tuttle & Carter, 2022). That study documented the use of different AT and a smaller number of AT than found in our study, likely due to the large differences in sample characteristics (Tuttle & Carter, 2022). In contrast to our study, the students in the Tuttle and Carter study who used screen readers and refreshable braille appear to have all been provided instruction in those areas.

An OCR app was the second most commonly used workplace AT in our study, but no participants reported receiving training from a TVI on using this AT. Very few participants reported receiving training from a TVI on any of the mobile apps they used in the workplace. For older participants, smartphones and mobile apps would not have been available while in school or would not have been as commonly used as they are today, which could explain the lack of training. However, it is important for TVIs to be aware of the common use of mobile apps at work today and introduce students to the wide array of apps that could be beneficial to them.

Offering training to students on the most commonly used workplace apps would also be helpful, assuming they are also useful for their schoolwork.

Most participants who received training from a TVI on their workplace AT did not consider that training to be the primary way that they learned to use the AT (with electronic video magnifiers being the exception). Self-taught was by far the most common method selected for learning to use AT, and it was also the primary learning method many people selected for their workplace AT. This finding supports the importance of TVIs and other AT trainers preparing their students for the need to continue learning to utilize their AT and expand their skills over time. Not only are some ATs complicated, with many different features and functions, those features and functions are constantly evolving with the rapid advancements in AT for people who are blind or have low vision. Students should be informed of their need to continue learning and advancing skills with their AT. They should also be taught to problem-solve technology challenges that are likely to arise (Kamei-Hannan et al., 2023).

On average, participants rated their skill level with their workplace AT as high, with only three of the 20 AT having average skill ratings below 8 on a 10-point scale. Although most participants were very confident with their AT skills, some expressed a need for training. More than one-fifth of participants would benefit from more training on eight ATs they were currently using at work. ATs with the greatest need for training were wearable devices, OCR software/hardware, orientation/navigation/wayfinding apps, and OCR apps. OCR technology is an AT that would typically be needed by students, and our findings suggest that more training while in school could be beneficial. Interestingly, Tuttle and Carter (2022) identified a gap in device use and instruction provided in document scanning in their study of AT use among students.

Limitations of our study should be mentioned. First, traditional limitations to data collected via surveys apply to this study (e.g., sampling bias, response bias, measurement error). Our study utilized data from two separate surveys, administered approximately one year apart, and we made some changes to our AT list between the surveys. Thus, our AT list for skill level and training needs does not match exactly to the list for learning methods. We may have underestimated the AT training needs based on how we limited who was provided the question. Finally, we anticipate that the participants in this study would have had access to a TVI, as they were all blind or had low vision while in K-12 education in the mid-1980s or later, but we do not know the extent of services, if any, they received from a TVI. We also do not know if the participants utilized the AT they reported using at work while attending K-12 school.

Despite these limitations, the findings from this study should be of interest to professionals who work with students who are blind or have low vision. This is the first study to investigate AT used in the workplace by young adults with blindness or low vision and to document training needs for this population. Being aware of the AT that blind or low vision students may likely need when they enter the workforce should be valuable to the professionals who work with them to prepare them for future success.

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Table 1

Sample Characteristics, Employed Participants Under Age 40 (Born After 1980)

Variable	*n*	%
Age (in years)		
22-29	36	29.8
30-34	41	33.9
35-39	44	36.4
Gender		
Female	77	63.6
Male	44	36.4
Race/Ethnicity		
Hispanic/Latinx	13	10.7
Asian	10	8.3
Black/African American	9	7.4
White	81	66.9
Some Other Race	8	6.6
Education Level		
Less than Bachelor's degree	26	21.5
Bachelor's degree	45	37.2
Graduate or professional degree	50	41.3
Level of Vision		
Totally blind	74	61.2
Legally blind with minimal functional vision	26	21.5
Legally blind with some functional vision	15	12.4
Low vision, not legally blind	6	5.0
Age of Blindness Onset		
Pre-school (ages 0-4)	92	76.0
Primary school (ages 5-11)	13	10.7
Secondary school (ages 12 or older)	16	13.2
Non-Visual Disability		
Yes	34	28.1
No	87	71.9
Employment Type		
Employer job	106	87.6
Self-employed	6	5.0
Both	9	7.4
Income		
< $40,000	45	37.2
$40,000 to <$80,000	52	43.0
$80,000 or more	17	14.0
Prefer not to answer	7	5.8

Note. $N = 121$.

Table 2

AT Most Commonly Used in the Workplace

AT Type	Use	
	n	%
Screen reader software	103	85.1
OCR app	71	58.7
Built-in accessibility tools[a]	59	48.8
OCR software/hardware	45	37.2
Refreshable braille display	44	36.4
Remote sighted assistance app	40	33.1
Digital reading app	37	30.6
Braille notetaking device	35	28.9
Navigation/wayfinding app	30	24.8
Digital reading software/device	27	22.3
Audio recorder app	22	18.2
Screen magnification software	18	14.9
Other identification app	14	11.6
Dictation/speech recognition software	12	9.9
Electronic video magnifier	11	9.1
Handheld electronic video magnifier	10	8.3
Other built-in accessibility features	9	7.4
Orientation/wayfinding/navigation device	5	4.1
Wearable device	5	4.1
Digital labeling app	4	3.3

Note. Total $N = 121$. OCR = Optical Character Recognition.

[a] Built-in accessibility tools were primarily screen readers/magnifiers but could include dictation software.

Table 3

Learning Methods for Workplace AT

AT Type	*n*	In School (by a TVI)	Self-Taught	VR/Agency Training	Vendor	Tutorials	Person w/ B/LV
Screen reader software (3rd party)	87	55.2	81.6	52.9	14.9	63.2	55.2
OCR app	66	---	95.5	12.1	4.6	24.2	22.7
Refreshable braille display	49	24.5	83.7	24.5	12.2	59.2	24.5
Remote sighted assistance app	48	---	91.7	2.1	8.3	20.8	22.9
Built-in screen reader	42	35.7	85.7	40.5	14.3	66.7	40.5
OCR software or hardware	41	19.5	75.6	31.7	14.6	36.6	43.9
Digital reading software/device	36	25.0	86.1	11.1	13.9	44.4	25.0
Braille notetaking device	32	53.1	75.0	34.4	34.4	53.1	37.5
Digital reading app	30	10.0	93.3	16.7	3.3	23.3	20.0
Navigation/wayfinding app	28	7.1	89.3	28.6	3.6	21.4	28.6
Audio recorder app	20	---	90.0	5.0	10.0	20.0	20.0
Other identification app	17	---	82.4	5.9	---	17.7	29.4
Other built-in accessibility features	14	21.4	71.4	35.7	21.4	57.1	14.3
Dictation/speech recognition software	13	23.1	84.6	23.1	7.7	61.5	23.1
Screen magnification software (3rd party)	11	45.5	81.8	54.6	---	18.2	---
Built-in screen magnification	11	18.2	81.8	27.3	---	36.4	---
Orientation/wayfinding/navigation device	7	42.9	100.0	57.1	42.9	42.9	42.9
Handheld electronic video magnifier	6	---	66.7	50.0	33.3	16.7	---
Electronic video magnifier	6	33.3	33.3	50.0	16.7	16.7	---
Wearable device	5	---	80.0	20.0	40.0	20.0	40.0
Digital labeling app	5	---	80.0	---	40.0	40.0	---

Note. *N*=105. The ‘Other” method option is not shown. TVI = teacher of students with visual impairments. VR = vocational rehabilitation. B/LV = blind or low vision. OCR = Optical Character Recognition.

Table 4

Primary Learning Method for Workplace AT

AT Type	In School (by a TVI)	Self-Taught	VR/Agency Training	Vendor	Tutorials	Person w/ B/LV
Screen reader software (3rd party)	21.8	36.8	18.4		10.3	11.5
OCR app		80.3	6.1		7.6	6.1
Refreshable braille display	6.1	63.3	10.2		12.2	8.2
Remote sighted assistance app		81.3		4.2	6.3	6.3
Built-in screen reader	4.8	57.1	14.3		9.5	14.3
OCR software or hardware	14.6	46.3	17.1	2.4	4.9	14.6
Digital reading software/device	13.9	63.9	2.8	2.8	16.7	
Braille notetaking device	25.0	46.9	6.3		9.4	12.5
Digital reading app	6.7	83.3	6.7		3.3	
Navigation/wayfinding app	3.6	60.7	10.7		3.6	21.4
Audio recorder app		85.0	5.0			10.0
Other identification app		64.7	5.9		5.9	17.7
Other built-in accessibility features	7.7	61.5	15.4		15.4	
Dictation/speech recognition software		61.5	7.7		15.4	15.4
Screen magnification software (3rd party)	9.1	63.6	27.3			
Built-in screen magnification	9.1	81.8	9.1			
Orientation/wayfinding/navigation device		28.6	42.9		14.3	14.3
Handheld electronic video magnifier		50.0	33.3	16.7		
Electronic video magnifier	33.3	16.7	33.3	16.7		
Wearable device		60.0	20.0			20.0
Digital labeling app		60.0		20.0	20.0	

Note. *N*=105. The ‘Other” method option is not shown. Rows may not sum to 100 percent. TVI = teacher of students with visual impairments. VR = vocational rehabilitation. B/LV = blind or low vision. OCR = Optical Character Recognition.

Table 5

Self-Rated AT Skill Level & Share of Users Who Would Benefit from AT Training

AT Type	Skill Level				Training Needed	
	n	*M*	*SD*	Range	*n*	%
Screen reader software	100	8.45	1.39	3-10	23	23.0
OCR app	70	8.14	2.07	1-10	19	27.1
Built-in accessibility tools[a]	58	8.17	2.00	1-10	6	10.3
OCR software/hardware	45	7.60	1.79	4-10	18	40.0
Refreshable braille display	44	8.20	1.77	3-10	10	22.7
Remote sighted assistance app	40	8.50	2.00	2-10	6	15.0
Digital reading app	37	8.95	0.91	6-10	1	2.7
Braille notetaking device	35	8.57	1.67	4-10	6	17.1
Navigation/wayfinding app	29	7.97	1.52	4-10	8	27.6
Digital reading software/device	26	8.27	2.03	1-10	5	19.2
Audio recorder app	22	8.41	1.97	2-10	2	9.1
Screen magnification software	18	7.61	2.23	2-10	4	22.2
Other identification app	14	8.93	1.44	5-10	0	0.0
Dictation/speech recognition software	12	8.92	1.00	7-10	1	8.3
Electronic video magnifier	10	8.70	2.31	4-10	2	20.0
Handheld electronic video magnifier	10	8.50	2.17	3-10	1	10.0
Other built-in accessibility features	9	8.11	1.54	5-10	2	22.2
Orientation/wayfinding/navigation device	5	9.00	1.22	7-10	1	20.0
Wearable device	5	7.40	2.79	4-10	3	60.0
Digital labeling app	3	9.33	1.15	8-10	n/a	n/a

Note. *N* = 121. OCR = Optical Character Recognition.

[a] Built-in accessibility tools were primarily screen readers/magnifiers but could include dictation software.