

INFORMATION/EDUCATION PAGE

Technology for Persons With Blindness and Low Vision: Hardware to Improve Function and Quality of Life



This guide is for people with blindness or low vision and their care providers who may be in search of devices that support completion of everyday tasks, such as navigation, shopping, and object identification. In 2020, there were 1.1 billion people with unresolved visual impairments,¹ a number expected to rise to >1.8 billion by 2050.² The treatment of visual disease often leaves patients with residual impairments and day-to-day functional challenges. Visual rehabilitation builds on the current sensory ability of a patient. This works through technology and/or training to help restore, compensate, or substitute for vision-based information processing.³

Understanding assistive technologies as part of a vision-rehabilitation treatment approach is critical and urgent, as visual impairment and related disabilities are ever-growing. Recommendations for assistive hardware should be a key part of comprehensive treatment, offering immediate benefits for independence and quality of life. This guide aims to help both patients and practitioners better understand the available tools that may answer their needs, making informed decisions easier. This review is just the beginning of a comprehensive treatment approach to technology for people with blindness or low vision, focusing on devices that improve mobility and related functions.

Assistive technologies provide more possibilities for improved function

Assistive technologies help restore, compensate, or substitute lost visual abilities. There are 3 main techniques:

- Visual restoration attempts to amplify residual visual function and/or potentially restore lost visual function through repetitive training, retinal prosthetics, or electrical stimulation.⁴
- Visual compensation repurposes visual function through enhanced (eg, magnified) images, making them easier to interpret, or through use of behavioral strategies, compensating for lost ability (eg, eye movement training).⁵
- Visual substitution translates visual information into different sensory modalities such as tactile and/or auditory feedback, eg, turning distance into sound intensity, similar to a parking sensor.³

We focus on visual compensation and substitution hardware here. Software options such as screen readers and smartphone applications are also important alternatives to consider and will be addressed in a companion article.

Current hardware options for people with blindness or low vision

We present a list of commercially available devices designed to help users access more visual information. These tools are practical solutions that offer immediate benefits. They become more effective with continued use and learning. Our main emphasis is on tools for safe, efficient, and informed mobility. Our second focus is on helping with everyday activities of daily living. For each device, we provide facts and features, allowing clinicians and consumers to quickly determine

which options best suit their needs. The devices are grouped into 7 classes based on body placement that includes glasses, headsets, wearable garments/harnesses, wearable accessories, wrist-mounted, handheld, and cane-mounted.

Head-mounted and head-worn devices

Head-mounted and head-worn devices are often designed to make their camera feeds more accessible. This is done by displaying modified visual images or using artificial intelligence to extract key information. Many of these devices also include auditory and/or tactile features, such as text-to-speech, voice commands, and object identification. However, users should be aware that continuous use may cause discomfort or eyestrain. Rapid head movements can also affect device performance by causing image blur and missed objects/text in the scene.⁶ Therefore, using the device in a stable position with slow-to-no head movement may provide the best results. Although these devices can improve mobility, their greatest benefits are often seen during stationary tasks such as cooking, managing medications or finances, reading, and watching television.⁷

Body-worn devices for mobility and navigation

Body-worn devices come in various forms, such as modified garments, harnesses, or clip-on accessories. These devices offer stable sensor views because the torso/trunk has limited motion when mobile, improving image quality and device performance.⁶ Most offerings do not have visual displays but instead provide feedback through touch and/or sound, helping users with tasks such as navigation. They offer many features, such as trip planning, step-by-step guidance, orientation, and collision alerts. Because they are hands-free, users can effortlessly use their cane or guide dog and manage items such as shopping bags or door handles. Overall, these devices are great for safe travel, reducing user effort and cognitive load.⁸

Wrist/handheld devices

Handheld devices offer more freedom of manipulation than other approaches. For comparison,

the upper extremity has 7 types of motion (degrees of freedom), whereas the hand has 27.⁹ Users should be mindful that rapid or complex movements may lead to blurry images and lower system performance. These devices need to be small because they compete for precious space on the hand, considering the sensitive touch receptors of the fingertips. They often provide feedback through touch and/or sound, with some providing visual enhancements. Features include text/sign reading, hazard warnings, and object/scene descriptions, similar to body-worn devices. Overall, handheld devices are often small, comfortable, and more affordable, catering to specific needs such as marathon running or navigating a narrow and curvy area.¹⁰

Smart canes and cane-mounted devices

Smart canes and cane-mounted devices offer better hazard detection and mobility support than traditional white canes while maintaining their familiar design. They come with features such as global positioning system navigation, orientation guidance, alert systems, and smartphone integration using voice commands. However, use of these devices can be challenging because the cane is highly dynamic. Because of back-and-forth sweeping movements during proper cane use, feedback may be harder to understand. Despite this, they offer benefits, typically without adding much weight. Users must be careful not to abandon existing cane techniques when using such devices.¹¹

Recommending technology to boost function

Choosing the right assistive or adaptive hardware, as part of a vision-rehabilitation treatment plan, is important. It requires open discussions between care providers and patients. These conversations should include:

1. Identifying the most important functional needs, challenges (pain points), and preferences for technology.
2. Understanding how well a device(s) may match the patient's current or future sensory abilities.

Table 1 Overview of visual assistive devices.

Type	Functional Capabilities	Company	Product	Price	Battery	Weight
Glasses (Head)	Visual enhancement -Zoom; C-C; auto focus and lock; augmented contrast combinations; crosshair orientation; glare reduction; face ID; image stabilization; color enhancement; batch scan; brightness control; instant text Visual substitution (audio) -OCR text-to-speech -Voice command operation Additional features -Prescription inserts; 2-in-1 handheld magnifier	OxSight	Onyx*	\$\$	1-5 h	5-10 oz
		Orcam	MyEye2	\$\$\$	1-5 h	0-5 oz
		EnVision	Home Ed.	\$\$\$	5-10 h	0-5 oz
		Iris Vision	Inspire	\$\$\$	WS	5-10 oz
		Vision Aid	Jordy	\$\$\$	5-10 h	5-10 oz
		Acesight	S model*	\$\$\$	1-5 h	10-15 oz
		Cyber Eyez	Trifecta	\$\$\$	1-5 h	0-5 oz
		Eyedaptic	Eye3*	\$\$\$\$	1-5 h	Unk
		NuEyes	Pro 3	\$\$\$\$	5-10 h	0-5 oz
Headset (Head)	Visual enhancement -Zoom; C-C; auto focus; adjustable pupil/screen fit; Bioptic tilt; object ID; bubble view; photograph/video capture Visual substitution (audio) -OCR text-to-speech; face/object/emotion detection; scene description; bone conduction speakers Additional features -Screen placement flexibility	ARx Vision	Arx Vision	\$\$	5-10 h	0-5 oz
		Cyber Eyez	VR Headset	\$\$	1-5 h	10-15 oz
		Iris Vision	Live	\$\$\$	1-5 h	15+ oz
		NuEyes	E2+	\$\$\$	1-5 h	5-10 oz
		Esight	Esight 4	\$\$\$\$	1-5 h	10-15 oz
Wearable Garment-Harness (Body)	Visual substitution (audio) -Proximity-to-voice; GPS directions Additional features -Collision-risk alert system	Honda Research Institute	Biped	\$\$\$	5-10 h	10-15 oz
Wearable Accessory (Body)	Visual substitution (tactile) -Proximity-to-vibration Additional features -Water resistant to light rain	Merciv	Buzzclip	\$	5-10 h	0-5 oz
Wrist-Mounted Hardware (Wrist)	Visual substitution (tactile) -Orientation and navigation Additional features -Trip planning; water resistance	Wear Works	Wayband	\$	20+ h	0-5 oz
Handheld Hardware (Hand)	Visual enhancement -Zoom; 20 C-C; fast reading; freeze frame and panning; Auto focus; photograph gallery Visual substitution (tactile) -Proximity-to-vibration Visual substitution (audio) -Proximity-to-voice/audio; GPS directions Additional features -Media player; obstacle audio descriptions; built-in flashlight	Caretec	Ray Electronic Aid	\$	20+ h	0-5 oz
		GDP Research	Miniguide Mobility Aid	\$	20+ h	0-5 oz
		Human Ware	Explore 5*	\$\$	1-5 h	5-10 oz
		Human Ware	Victor Reader Trek	\$\$	10-20 h	15+ oz
		Human Ware	Stellar Trek	\$\$\$	10-20 h	15+ oz
		Freedom Scientific	Ruby 7HD	\$\$\$	1-5 h	15+ oz
Cane-Mounted Hardware (Cane)	Visual substitution (tactile) -Proximity-to-vibration Visual substitution (audio) -Proximity-to-voice; GPS directions; Additional features -Public transport timetables (with App); -Changeable tips (roller/rolling ball); Splash proof	Sound Foresight Technology	UltraCane	\$	20+ h	Unk
		Saksham	Smart Cane	\$	20+ h	0-5 oz
		WeWalk Smart Cane	WeWalk Smart Cane	\$	20+ h	5-10 oz

NOTE. This table categorizes various visual hardware assistive devices by their placement on the body, highlighting their functional capabilities and basic product details.

Key: Price: \$ (1-500), \$\$ (500-2000), \$\$\$ (2000-5000), and \$\$\$\$ (5000+)

Battery Time: (1-5 hours), (5-10 hours), (10-20 hours), (20+ hours), and WS (Wired Source)

Weight: (0-5.0 oz), (5.0-10.0 oz), (10.0-15.0 oz), (15.0+ oz), and (Unk)

Abbreviations: C-C, contrast control; GPS, global positioning system; ID, identification; OCR, object character recognition; Unk,

Unknown.

* Additional options available.

3. Considering user preferences and concerns about size, weight, design, appearance, and cost.

This review provides key information to help patients and providers answer these questions and select the most appropriate and available assistive/adaptive hardware or technology to improve daily tasks and quality of life. These

decisions must be made in context with an appreciation for medical treatments that address underlying eye conditions.

More detailed information about each hardware option can be found in [table 1](#) (below) or [table 2](#) (accessed through the linked QR code).

[Table 1](#) provides an overview of different assistive devices categorized by where they are worn

Table 2 Expanded overview of visual assistive devices.

Company	Name and Price	Body Placement	Hardware Design	Functional Capabilities	Technical Details	Physical Specifications	User Interface	Accessories	Interoperability	Insurance Coverage	Target Population (Visual Impairment)	References
Iris Vision	(Live) \$2950.00	Head	Headset	Visual Enhancement -Mag. 10x zoom -Auto focus -C-C -Bubble view Visual Substitution (Audio) -OCR -Text-to-speech Battery Life and Charging -3 to 4 hours continuous usage	-Field of view 70° -Camera type [Built-in] -Camera input [MP: unk] [FL: unk]	-Weight 17.6 oz	-Tactile buttons -Touch pad	-Fast Charger & Cable -Training guides -IrisVision Display Unit -Device holding lanyard -Headstrap -Headset lanyard -Carrying case	-Android and IOS compatibility -Television capabilities -Wifi Streaming capabilities	-VA is covered, then students and employed people may receive assistance	Legal blindness Low vision	https://irisvision.com/
	(Inspire) \$3950.00	Head	Glasses	Visual Enhancement -Mag. 12x zoom -Auto focus -C-C Visual substitution (Audio) -OCR -Text-to-speech Battery Life and Charging -Phone wired battery powered	-Field of view 70° -Camera type [Smart Phone] -Camera input [MP: var] [FL: unk]	-Weight 6.0 oz	-Tactile buttons remote wireless controller	-Fast Charger & Cable -Training guides -IrisVision Display Unit -Device holding lanyard -Headstrap -Headset lanyard -Carrying case	-Android and IOS compatibility -Television capabilities -Wifi Streaming capabilities	-VA is covered, then students and employed people may receive assistance	Legal blindness Low vision	https://irisvision.com/
MyEye2	(OrCam) \$3500.00	Head	Eyewear Attachment	Visual Substitution (Audio) -Face Identification -Text-to-speech -Voice command operation Battery Life and Charging -2 hours of continuous use -USB Charging	-Field of view- unk -LED illumination -Camera type [Smart Phone] -Camera input [MP: 13] [FL: unk] -USB Charging	-Weight 0.79 oz	-Device touch or swipe operated	-USB magnetic adapter piece and 2 spares -Wall charger -Magnetic mount -Scissors -Cleaning cloth -Lanyard -Carrying case	-Not available	-Not covered by insurance	Legal blindness Low vision	https://www.orcam.com/en-us/orcam-myeeye
Vision Aid	(Jordy) \$2500.00	Head	Glasses	Visual Enhancement -Mag. 30x zoom, -C-C -Screen base glare reduction Battery Life and Charging -4 or 8 h of continuous use -Rechargeable battery	-Field of view- unk -Camera type [Built-in 720p HD-60 FPS] -Camera input [MP: unk] [FL: unk] -HDMI Input	-Weight 8.0 oz	-Tactile buttons wired controller	-Control unit -Built in rechargeable battery -HDMI input cable	-HDMI input for Television and Desktop	-Payment alternatives -Federal funding for students and career schools, scholarships for students completed state specific (2)	Legal blindness Low vision	https://vision-forward.org/product/jordy/ https://www.visionaid.co.uk/jordy
NuEyes	(Pro 3) \$5995.00	Head	Glasses	Visual Enhancement -Increased reading ability Visual Substitution (Audio) -Text-to-speech Additional Features -Prescription Inserts available Battery Life and Charging -6 h of continuous use -USB-C charging	-Field of view- 52° -Camera type [Built-in] -Camera input [MP: 13] [FL: unk]	-Weight 4.5 oz	-Tactile buttons on frame of glasses	-USB type C connection for smartphone compatibility	-Not available	Vision insurance can feature reimbursements but is insurance coverage dependent	Legal blindness Low vision	https://www.nueyes.com/pro3
	(E2+) \$2800.00	Head	Headset	Visual Enhancement -Mag. -C-C Visual Enhancement (Audio) -Text-to-speech Battery Life and Charging -3-5 h of usage -Wireless charging	-Field of view- 101° -Camera type [Built-in] -Camera input [MP: 16] [FL: unk]	-Weight 9.4 oz	-Tactile buttons on headset	-None	-Wifi Streaming capabilities	Vision insurance can Features reimbursements but is insurance coverage dependent	Legal blindness Low vision	https://www.nueyes.com/e2

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Table 2 (Continued)

Company	Name and Price	Body Placement	Hardware Design	Functional Capabilities	Technical Details	Physical Specifications	User Interface	Accessories	Interoperability	Insurance Coverage	Target Population (Visual Impairment)	References
Esight	(Esight 4) \$7000.00	Head	Headset	Visual Enhancement -Mag. 24x zoom -C-C (manual) -Adjustable pupil and screen distancing -Bioptic tilt visual enhancement for face to face encounters -Photo and Video Capture Battery Life and Charging -4 h of continuous use -2 Rechargeable batteries -USB charging	-Field of view- 37.5° -Camera type [Built-in] -Camera input [MP: 18] [FL: unk]	-Weight 12.0 oz	-Tactile button headset controls -Tactile wireless remote controller -Mobile app controller	-Rechargeable batteries -Carrying case -Quick start user guide -Remote control with AAA x2 batteries -USB cable adapter	-Android and iOS compatibility -Television capabilities	VA is fully covered, other plans and financial payment plans are available for public	Legal blindness Low vision	https://lowvisionsource.com/product/esight-4-glasses/ https://www.esighteyewear.com/esight-4/
Eyedaptic	(Eye3) \$6000.00	Head	Glasses	Visual Enhancement -Mag. 10x zoom -Auto and manual zoom mode -Image stabilization -Color enhancement Battery Life and Charging -4 h of continuous use -USB charging	-Field of view- 55.5° -Camera type [Built-in] -Camera input [MP: unk] [FL: unk]	-Weight N/A	-Tactile buttons wireless controller	-Portable carrying case -Portable charging block -USB cords -Phone to glasses tether cord -Battery pack -Instruction manual	-Not available	VA has insurance reimbursement, but direct payment for others (2)	Legal blindness (Macular Degeneration)	https://eyedaptic.com/eyedaptic-eye3/
	(Eye4) \$2995.00	Head	Glasses	Visual Enhancement -Mag. -Auto zoom -Image Stabilization -Contrast Enhancement Additional Features -2-in-1 wearable visual aid Handheld Magnifier Battery Life and Charging -Phone wired battery power -USB charging	-Field of view- unk -Camera type [Smart Phone] -Camera input [MP: unk] [FL: unk]	-Weight 3.0 oz	-Tactile buttons wired phone controller	Portable carrying case Portable charging block -USB cords -Battery pack -Instruction manual	-Not available	VA has insurance reimbursement, but direct payment for others (2)	Legal blindness (Macular Degeneration)	https://eyedaptic.com/eyedaptic-eye4/
	(Eye5) \$4845.00	Head	Glasses	Visual Enhancement -Mag. -Auto zoom -Image Stabilization -Face detection -Contrast Enhancement Battery Life and Charging -3 h of continuous use and wired phone power source -USB charging	-Field of view- 45-55° -Camera type [Smart Phone] -Camera input [MP: 8] [FL: unk]	-Weight less than 3.0 oz	-Tactile buttons wired phone controller	Glasses case Companion phone box -Instruction guide -Charging block -USB charging cable -Glasses to companion phone cable	-Not available	VA has insurance reimbursement, but direct payment for others (2)	Legal blindness (Macular Degeneration)	https://eyedaptic.com/eye5/

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Company	Name and Price	Body Placement	Hardware Design	Functional Capabilities	Technical Details	Physical Specifications	User Interface	Accessories	Interoperability	Insurance Coverage	Target Population (Visual Impairment)	References
ARx Vision	(ARx Vision) \$1299.00	Head	Headset	Visual Enhancement -Magnification Visual Enhancement (Audio) -Text-to-speech -Face recognition -Object identification -Emotion detection -Scene description -Bone conduction speakers Battery Life and Charging -7 h of continuous use and wired phone power source	-Field of view- 109° -Camera type [Built-in] -Camera input [MP: unk] [FL: 2.8 mm]	-Weight 3.3 oz	-Phone App Controlled with voice command -Touch interface	-None	-Android compatibility -IOS in the future	-Not covered by insurance	Legal blindness Low vision	https://arx.vision/
EnVision Glasses	(Read Edition) \$1899.00	Head	Glasses	Visual Enhancement -Mag. 3x zoom -Instant text -OCR -Batch scan Battery Life and Charging -5 to 6 h of continuous use -USB to USB-C charging	-Field of view- unk° -Camera type [Built-in] -Camera input [MP: unk] [FL: unk]	-Weight 1.6 oz	-Tactile device touch and gesture pad	-Envision glasses body -Frames -Protective carrying case -USB to USB-C charging Cable -Quick start booklet	-Android and IOS operability	-Not covered by insurance	Legal blindness Low vision	https://www.letsenvision.com/glasses
	(Home Edition) \$2499.00	Head	Glasses	Visual Enhancement -Mag. 3x zoom -Instant text -OCR -Batch scan Visual Enhancement (Audio) -Text-to-speech Battery Life and Charging -5 to 6 h of continuous use -USB to USB-C charging	-Field of view- unk° -Camera type [Built-in] -Camera input [MP: unk] [FL: unk]	-Weight 1.6 oz	-Tactile device touch and gesture pad	-Envision glasses body -Frames -Protective carrying case -USB to USB-C charging Cable -Quick start booklet	-Android and IOS operability	-Not covered by insurance	Legal blindness Low vision	https://www.letsenvision.com/glasses
OxSight	(Onyx) \$1799.00	Head	Glasses	Visual Enhancement -Mag. 8x zoom -Face recognition -Object recognition -OCR -Brightness control -Auto focus Battery Life and Charging -2 h of continuous use -USB charging	-Field of view- 70° -Camera type [Built-in] -Camera input [MP: unk] [FL: unk]	-Weight 7.4 oz	-Tactile Buttons on top of device	-Rechargeable device with USB with 100 minutes per charge.	-TV Mode	-Not covered by insurance	Legal blindness Low vision	https://www.oxsightglobal.com/onyx/
	(Crystal) \$1834.00	Head	Glasses	Visual Enhancement -Magnification 3x zoom -Full color video -High contrast -Color enhancement Battery Life and Charging -2 to 3 hours of continuous use -USB charging	-Field of view- 68° -Camera type [Built-in] -Camera input [MP: unk] [FL: unk]	-Weight 2.9 oz	-Tactile buttons wired phone controller	-Cable -Controller -Charging unit	-Not available	-Not covered by insurance	Legal blindness (Peripheral Vision Loss) Low vision	https://www.oxsightglobal.com/crystal/

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Table 2 (Continued)

Company	Name and Price	Body Placement	Hardware Design	Functional Capabilities	Technical Details	Physical Specifications	User Interface	Accessories	Interoperability	Insurance Coverage	Target Population (Visual Impairment)	References
Acesight	(S model) \$2995.00	Head	Glasses	Visual Enhancement -Mag. 15x zoom -Auto focus and lock -4x augmented contrast combinations Battery Life and Charging -3 h of continuous use	-Field of view- 45° -Camera type [Built-in] -Camera input [MP: unk] [FL: unk]	-Weight 12.7 oz	-Tactile buttons wired phone controller	-Controller -Carrying case -Instruction guide -Power block -Charging cable	-Not available	-Not covered by insurance	Low vision	https://www.acesight.com/
	(Regular Model) \$4295.00	Head	Glasses	Visual Enhancement -Mag. 15x zoom -Auto focus and lock -10x augmented contrast combinations -Crosshair oriented (Narrow and find function) Battery Life and Charging -4.5 h of continuous use	-Field of view- 45° -Camera type [Built-in] -Camera input [MP: unk] [FL: unk]	-Weight 12.7 oz	-Tactile buttons wired phone controller	Controller Carrying case -Instruction guide -Power block -Charging cable	-Not available	-Not covered by insurance	Low vision	https://www.acesight.com/
Cyber Eyez	(VR Headset) \$1995.00	Head	Headset	Visual Enhancement -Mag. -Color contrast enhancement -Object identification Visual Substitution (Audio) -Text-to-speech Visual Substitution (Tactile) -Remote control Additional Features -Screen placement flexibility Battery Life and Charging -2-4 h of continuous use (smart phone powered)	-Field of view- unk° -Camera type [Built-in] -Camera input [MP: unk] [FL: unk]	-Weight 16.1 oz	-Tactile buttons wireless bluetooth controller	-Bluetooth controller	-Android Compatibility	-Not covered by insurance	Low vision	https://www.nimmed.com/cyber-eyez-trifecta.html https://cybertimez.com/cyber-eyez-vr/
	(Trifecta) \$2999.00	Head	Glasses	Visual Enhancement -Mag. 15x zoom -Augmented color contrast enhancement Visual Substitution (Audio) -Text-to-speech Visual Substitution (Tactile) -Remote control -Google object identification through barcode product reading Battery Life and Charging -2-4 h of continuous use (smart phoned powered)	-Field of view- unk° -Camera type [Built-in] -Camera input [MP: unk] [FL: unk]	-Weight 1.7 oz	-Tactile buttons wireless bluetooth controller	-Bluetooth controller	-Android Compatibility	-Not covered by insurance	Low vision	https://www.nimmed.com/cyber-eyez-trifecta.html https://cybertimez.com/cyber-eyez-vr/
WearWorks	(Wayband) \$249.00	Wrist	Wearable	Vision Substitution (Tactile) -Orientation and navigation Additional Features -Trip planning/auditing -Water resistance Battery Life and Charging -2-3 d of non continuous use -Magnetic charging	Unk	-Weight 2.53 oz	-Tactile Button on device and App controlled	-Bluetooth connection -Magnetic charging	-IOS compatibility -Android in future	-Not covered by insurance	Legal blindness Low vision	https://www.wear.works/wayband

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Company	Name and Price	Body Placement	Hardware Design	Functional Capabilities	Technical Details	Physical Specifications	User Interface	Accessories	Interoperability	Insurance Coverage	Target Population (Visual Impairment)	References
Honda Research Institute	(Biped) \$3112.00	Torso	Wearable	Vision Substitution (Audio) -Proximity-to-voice -GPS directional Additional Features -Collision-risk alert system Battery Life and Charging -6 h of continuous use per battery -Magnetic Charging	-Field of view- unk' -Camera type [3x Built-in] -Camera input [MP: unk] [FL: unk]	-Weight 31.2 oz	-Smartphone Application	-2 rechargeable batteries -Magnetic charger -Instruction manual	-Android and iOS compatibility	-Not covered by insurance	Legal blindness Low vision	https://www.biped.ai/ https://www.dezeen.com/2022/01/14/biped-smart-harness-visually-impaired-obstacles-ces-2022/
IMerciv	(Buzzclip) \$235.00	Body	Wearable	Vision Substitution (Tactile) -Proximity-to-vibration Additional Features -Water resistant (light rain) Battery Life and Charging -10 h of continuous use -Micro USB Charging	-Ultrasound Sensors	-Weight 1.0 oz	-Tactile Button controller on device	-10 hours rechargeable battery -Micro-USB cable -AC wall charger	-Not available	-Not covered by insurance	Legal blindness Low vision	https://coolblindtech.com/introducing-the-all-new-buzzclip-from-imerziv/
GDP Research	(Miniguide Mobility Aid) \$300.00	Hand	Handheld	Visual Substitution (Tactile) -Proximity-to-vibration Vision Substitution (Audio) -Audio/noise feedback Additional Features -Quick toggle preset distant range detection Battery Life and Charging -Lasts for many Months	-Ultrasound Sensors	-Weight 2.3 oz	-Tactile Button controller on device	-Wrist strap	-Not available	-Not covered by insurance	Legal blindness Low vision	https://independentliving.com/miniguide-mobility-aid/
Caretec	(Ray Electronic Mobility Aid) \$299.00	Hand	Handheld	Vision Substitution (Audio) -Proximity-to-audio Vision Substitution (Tactile) -Proximity-to-vibration Additional Features -Built in Flashlight Battery life and Charging -Unk hours of continuous use -AAA Battery required	-Ultrasound Sensors	-Weight 2.1 oz	-Tactile Button controller on device	-Lanyard	-Not available	-Not covered by insurance	Legal blindness Low vision	https://www.maxiaids.com/product/ray-electronic-mobility-aid-for-the-blind
Human Ware	(Stellar Trek) \$2195.00	Hand	Handheld	Vision Substitution (Audio) -Proximity-to-voice GPS directions -Text-to-speech Additional Features -Virtual/physical Keyboard Navigation -Voice dictation Battery Life and Charging -20 h of continuous use -USB-A or USB-C charging	-Field of view- unk' -Camera type [Built-in] with unk (Optical Sensor) -Camera input [MP: unk] [FL: unk]	-Weight 24.6 oz	-Tactile Button controller on device	-Handstrap -Belt clip -Power adaptor -USA A to USB C cable -Getting started guide	-Not available	-Not covered by insurance	Legal blindness Low vision	https://shop.visionaustralia.org/stellar-trek.html

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Table 2 (Continued)

Company	Name and Price	Body Placement	Hardware Design	Functional Capabilities	Technical Details	Physical Specifications	User Interface	Accessories	Interoperability	Insurance Coverage	Target Population (Visual Impairment)	References
Human Ware	(Victor Reader Trek) \$975.00	Hand	Handheld	Vision Substitution (Audio) -Proximity-to-voice -GPS directional Audio Additional Features -Media player -Descriptive Obstacle audio Battery Life and Charging -15 hours of continuous use -Micro USB charging	-Wifi/GPS Tracking	-Weight 15.0 oz	-Tactile Button controller on device	Power adaptor USB-Micro -Headphones -8 GB Memory Card -Carrying case -Wrist strap -Instructions	-Not available	-Not covered by insurance	Legal blindness Low vision	https://store.humanware.com/hus/victor-reader-trek-talking-book-player-gps.html
Freedom Scientific Ruby 7HD	(Ruby 7HD) \$1317.75	Hand	Handheld	Visual Enhancement -Mag. 24x zoom -Fast reading Freeze frame and panning -20 contrast combinations -Save images Additional Features -Rotating Camera -Blur free reading Battery Life and Charging -4 h of continuous use -USB Charging	-Field of view- unk* -Camera type [Built-in] -Camera input [MP: 5] [FL: unk]	-Weight 18.0 oz	-Tactile Buttons on device	Built in reading stand -USB cable -Charging adapter -Carrying case	-TV Mode	-Not covered by insurance	Low vision	https://www.freedomscientific.com/products/lowvision/ruby7/
Human Ware	(Explore 5) \$845.00	Hand	Handheld	Visual Enhancement -Mag. 22x zoom -18 contrast modes -Auto focus -Photo gallery Additional Features -Reading Stand -5 inch viewing screen Battery Life and Charging -3.5 h of continuous use -USB Charging	-Field of view- unk* -Camera type [Built-in 5MPi] -Camera input [MP: unk] [FL: unk] -HDMI input	-Weight 8.0 oz	-Tactile Buttons on device	Carrying case -USB power adapter -3x International power adapters -USB cable -HDMI cable -Lanyard -Microfiber cleaning cloth -User manual and start guide	-TV Mode	-Not covered by insurance	Low vision	https://store.humanware.com/hus/explore-5-handheld-electronic-magnifier.html
	(Explore 8) \$1275.00	Hand	Handheld	Visual Enhancement -Mag. 30x zoom -18 contrast modes -Auto focus Additional Features -Customization options (Zoom preferences, lines/blinds, text size, color schemes, 35 language options) -Reading Stand -8 inch viewing touch screen with gesture usage -LED illumination -Power save mode/sleep mode Battery Life and Charging -7 h of continuous use (Device only) -4.5 h of continuous use (Device + LED) -USB charging	-Field of view- unk* -Camera type [2x Built-in] -Camera input [MP: unk] [FL: unk] -HDMI input	-Weight 20.5 oz	-Tactile Buttons on device	-Protective case -USB power adapter -3x International power adapters -USB cable -HDMI cable -LCD projector -User manual and start guide	-TV Mode	-Not covered by insurance	Low vision	https://store.humanware.com/hus/explore-8-handheld-electronic-magnifier.html

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Table 2 (Continued)

Company	Name and Price	Body Placement	Hardware Design	Functional Capabilities	Technical Details	Physical Specifications	User Interface	Accessories	Interoperability	Insurance Coverage	Target Population (Visual Impairment)	References
(Explore 12) \$1895.00	Hand	Handheld	Visual	Enhancement -Mag. 30x zoom -18 contrast modes -Auto focus -Power save mode/sleep mode Additional Features -Customization options (Zoom preferences, lines/blinds, text size, color schemes, 35 language options) -Reading Stand -12 inch viewing touch screen with gesture usage -LED illumination Battery Life and Charging -3.5 h of continuous use (Device only) -2 h of continuous use (Device + LED) -USB charging	-Field of view- unk' -Camera type [2x Built-in] -Camera input [MP: 21] [FL: unk] -HDMI input -Type-C USB	-Weight 40.0 oz (Device) -Weight 40.0 oz (Stand)	-Tactile Buttons on device	-Neoprene carry case -Screen protector -Cleaning cloth -Shoulder bag -Folding transportable reading stand -International power adapters -Type-C USB and HDMI Cables -User manual and start guide	-TV Mode	-Not covered by insurance	Low vision	https://store.humanware.com/hus/explore-12-portable-video-magnifier.html
Sound Foresight Technology	(UltraCane) \$761.00	Hand	Smart Cane	Vision Substitution (Tactile) -Proximity-to-vibration Additional Features -Interchangeable tips (Roller or Rolling Ball) Battery Life and Charging -Lasts for 3 mo with 3 h of use a day -2x AA Batteries	-Ultrasound sensors	-Weight unk oz	-Tactile Buttons on device	-None	-Not available	-Not covered by insurance	Legal blindness Low vision	https://www.ultracane.com/about_the_ultracane
Saksham	(SmartCane) \$60.00	Hand	Smart Cane	Vision Substitution (Tactile) -Proximity-to-vibration (handheld or mountable on cane) Additional Features -Splash proof Adjustable Battery Life and Charging -8 hours of continuous use -Power adaptor	-Ultrasound sensors	-Weight 4.8 oz	-Tactile Buttons on device	-Charger	-Not available	-Not covered by insurance	Legal blindness Low vision	https://smartcane.saksham.org/?page_id=8
WeWalk SmartCane	(WeWalk SmartCane) \$599.00	Hand	Smart Cane	Vision Substitution (Tactile) -Proximity-to-voice (mountable on cane), GPS directions Additional Features -Public Transport time tables (with application use) Battery Life and Charging -20 h of continuous use -Adaptor power cable	-Ultrasound sensors	-Weight 8.9 oz	-Smartphone application	-Foldable White Cane -WeWalk White Cane Adaptor -Adaptor Power Cable -Wrist Strap -User manual -Waterproof case -Bluetooth headset	-Android and IOS compatibility	-Not covered by insurance	Low vision	https://wewalk.io/en/product-details/

NOTE. This table provides an expanded comparison to table 1, offering additional in-depth information and details about the various visual hardware assistive devices.

Visual impairment: Legal Blindness is visual acuity of 20/200 or worse, or a visual field of $\leq 20^\circ$; low vision is visual acuity between 20/70 and 20/40, or visual field of $\leq 20^\circ$.

Abbreviations: C-C, contrast control; FL, focal length; Mag, magnification; MP, mega pixel; OCR, optical character recognition; Unk, unknown; Var, variable

on the body. It describes what each device offers and provides basic details such as price, weight, and battery life.

The QR code or link below will take you to the more detailed [table 2](#) with additional information about each product, including design, features, and specifications. Purchase links are also provided.

Full Table:



Link to Full Table: <https://shorturl.at/bkyQ9>

Authorship

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Keywords

Assistive hardware technology; Blindness; Low vision; Quality of life; Rehabilitation; Wearable technology

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