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Research Report

The Jordy Electronic Magnification Device: Opinions, Observations, and Commentary

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The Jordy electronic magnification device is one of a small number of electronic headborne devices designed to provide people with low vision the capability to perform near-range, intermediate-range, and distance viewing tasks. This report seeks to define the benefits of using the Jordy as a low vision device by people who are legally blind. The staff of the low vision program of the Central Texas Veterans Health Care System in Waco, Texas, began using the Jordy electronic magnification device, manufactured by Enhanced Vision Systems (EVS) in 2000, when it was still a boxlike structure, and have been using the latest gogglelike model, with its improved focusing capability, since August 2003. The staff of the program, at a 15-bed facility that serves approximately 100 veterans a year in an inpatient vision rehabilitation program, issued 27 Jordy units to clients from October

1, 2003 to October 1, 2004. In this article, I summarize my observations of the design and serviceability of the Jordy as a distance, intermediate-range, and near-vision device. I also include suggestions for improving the use of the Jordy.

The physical unit

EVS incorporated the Jordy camera and displays into a compact gogglelike structure that can be strapped on one's head (see [Figure 1](#)). However, as small as the unit is, its bulk and weight are the first considerations as to whether it is an appropriate device for a particular person. As a general rule, the larger the user's head and nose, the greater the comfort of using the Jordy as a headborne device. Persons with smaller heads and noses have problems with the Jordy displays sagging in front of their eyes. EVS has an optional over-the-head elastic band to help with this problem, and it does help to a point. Also, two styles of nosepieces are included in the basic kit. The installed nosepiece can be adjusted in and out to help with the sagging, but it does not always hold in the adjusted position. Some persons with small heads have found that wearing a baseball cap turned backward with the Jordy placed on top provides the support that is needed to eliminate the sagging problem. Even for persons with large heads and noses, the Jordy becomes weighty after it is worn for an extended period.

The Jordy has an autofocus camera with 16 levels

of magnification. In its distance-lens setup, its focal ranges, measured from the plane of the face of the Jordy to the target, are as noted in [Table 1](#).

The Jordy's close-focus lens is available when magnification in the 8–16 power level settings is required to perform near-range tasks. This lens is attached to a distinctly prominent bar, which is located on the right front face of the Jordy headset and can be located tactilely; when pushed to the left, the close-up lens is engaged. For near-range activities that require the use of the close-focus lens, the focal ranges, measured from the plane of the face of the Jordy to the target, are as noted in [Table 2](#).

When it is set on the 16th power level, the Jordy has a zone of 27.5 centimeters to 98 centimeters (about 11 inches to 39 inches) in which it will not focus properly. This dead zone shrinks as the magnification is reduced to the 7th power level. At the 7th power level, the Jordy operates without the near-focus lens, and the dead zone is no longer a problem.

The Jordy has two rectangular-shaped electronic displays (each measuring 18mm × 28mm, or .071 × .091 inch) that are set up for binocular viewing. It can be worn with eyeglasses, which is helpful for persons with significant refractive errors. In addition, persons with an extreme sensitivity to glare or photophobia may wear tinted prescription eyeglasses or sunglasses of their choice for glare control when

they use the Jordy.

The control unit–battery pack buttons are of different sizes, shapes, and colors to help the user identify them both visually and tactilely. The molding and design of the control pack are such that the button operations are seldom accidentally activated by involuntary bumping the buttons. The large Size control knob is easily located and adjusted. The Viewing Mode button is a large round white button set next to the Size Control knob. The Locator button is a large square button that is located on the opposite side of the Size Control knob from the Viewing Mode button. Two small ridgelike buttons increase or decrease the brightness of the image. The Power On/Off button and Focus Lock button are small round buttons that are set next to each other. The AC/DC input jack is visually identified by its yellow color. The video In/Out jacks are tactilely discriminated, since the In jack is set flush to the housing and the Out jack is raised.

Releasing and inserting the battery from the control unit require some instruction and practice but pose no significant problems. Two-hour and four-hour rechargeable batteries are available and serve the unit well. The battery charger is separate from the control unit. The insertion and release of the battery from the charger are similar to the release and insertion of the battery from the control unit. The charger will not overcharge the batteries.

The soft side shields that come with the unit are designed with three options for mounting. The user can unfasten the buckle on the elastic headband and feed the loop of each side shield up the band and onto the temple piece or attach the side shield in either a high or low position using the Velcro flaps. The user positions the shields to block ambient light from the display screens. However, even with optimum positioning, the shields do not screen out all ambient light from the electronic displays. Therefore, users with a moderate-to-severe reduction in contrast sensitivity may not be able to use the Jordy effectively outdoors, particularly on sunny days. Wearing a cap or hat to shield one's eyes from more light can help reduce the loss of image contrast on the electronic displays but does not necessarily resolve the problem in outdoor settings.

The belt clip is stout and reliably holds the control unit that is clipped to a belt. For persons who do not wear a belt or for persons who have difficulty attaching the belt clip because they have difficulty manipulating objects with their hands, a fanny pack with an open pocket that is worn around the waist is an alternative way of transporting and gaining access to the control unit. Also, it is easier to attach the belt clip to one's belt first and then engage the post of the belt clip in the clip.

An AC/DC adapter, 12-foot video cable, 5-foot VCR cable, and cable coupler are provided with each Jordy kit. These peripherals are dependable and provide the optional capabilities for which they were intended.

Although the hard-shell briefcase-style case provides optimum protection when transporting the Jordy, it is not the most convenient way for a user with low vision to carry the Jordy. A soft-shell, padded camera case with a shoulder strap, which can be purchased at a department or camera store, is much more practical for transporting the unit when traveling and using the unit on a daily basis.

The optional docking station (X/Y viewing table) enables the Jordy to be used as a side-by-side video magnification system (see [Figure 2](#)). The headset drops snugly into the holster over the docking station, and the control unit slides into its connection in a small tray at the rear of the X/Y table. The wire that connects the headset and control unit can be woven down a series of fins on the back of the holster arm to hold the wire out of the way. The docking station has an attached power cable that leads to an electrical wall outlet and a video cable that runs to a television monitor. When the control unit is installed in the connection tray of the docking station, the Jordy operates on electrical power, and its image is displayed on the adjoining television monitor. Fluorescent lights are mounted on either side of the holster to illuminate reading materials that are placed on the X/Y tray table. A separate On/Off switch for the lights is located at the base of the support arm of the headset holster. The X/Y tray table is large and easily holds large books or magazines. The tray table moves smoothly in all directions. There is no friction brake for the in-and-out movement of the tray table. A

locking mechanism at the center front of the tray table allows the tray table to be locked in a fixed position. The design of the docking station is well thought out and allows the Jordy to serve as a serviceable side-by-side video magnification system.

Magnification ratings

I have not rated the Jordy's magnification capabilities, but have made some general observations about its magnification performance. For example, a person with macular degeneration whose distance acuity is 10/200 achieves an improved acuity of 10/30 with the optical device 7×30 Beecher headborne binoculars, and will generally gain improved distance acuity by one or two lines to either 10/25 or 10/20 when he or she properly uses the Jordy. Thus, the distance-magnification capability of the Jordy is similar to the distance magnification of a conventional 8x or 10x telescope.

The Jordy's magnification rating for near-range tasks is even more difficult to define. Often, a person with macular degeneration and 10/100 distance acuity will read 0.8M size letters on a near-acuity card with the Jordy using power levels 3–7 simply by holding the card close to the face of the Jordy. The person's acuity performance may then decline as the person shifts the Jordy to power levels 8–12 when the close-focus lens is engaged, and the near-acuity card must be held at a greater working distance from the Jordy's face. The

same person is usually able to read 0.5M letters on the near-acuity card in the range of power levels 12–16 at a working distance of 26 centimeters (about 10 inches).

Distance viewing and intermediate-range activities

The Jordy's 16 levels of magnification provide advantages over conventional optical devices of fixed magnification for viewing plays, concerts, and sporting events, as well as presentations at school and in the community and museum exhibits. The magnification can be adjusted to accommodate the distance from the viewer to the point of interest. If the viewer wants to see a broader field of view, he or she lowers the magnification. If the viewer wants to see more detail in a certain aspect of the performance or presentation, he or she increases the magnification. The brightness controls allow the user to adjust the screen image on the headset for optimum viewing in all indoor lighting situations. The Locator button allows the user to pull down the magnification long enough to expand the field of view, locate the target, center on it, and release the Locator button to zoom back to the set magnification level. The primary weaknesses in using the Jordy to address these goals are the loss of image contrast on the display screens in bright outdoor conditions and the viewer's tolerance for the weight of the Jordy. Conventional headborne optical devices are lighter weight and provide a clearer image in outdoor settings. Also, optical devices provide a clearer image

when the user views a video presentation on a television or computer monitor. However, conventional headborne optical devices do not have the Jordy's variable magnification capability.

The Jordy has potential benefits and limitations in shopping situations. When the Jordy is first turned on, its setup screens warn against walking or driving with the Jordy. However, only persons with better acuity are able to read these warnings. Therefore, users should be informed of the danger of walking or driving with the Jordy because of the distortions in size and distance that occur with magnification. Thus, while shopping, the user needs to push the Jordy up on his or her forehead while walking about the store. When the user wants to view an item with the Jordy, he or she needs to stop, drop the Jordy in place, and begin viewing while standing or sitting still. The user can scan an area on lower magnification with the advantage of the expanded field and zoom up to higher magnification to read aisle signs, identify products on shelves, and read price tags on the edges of shelves. Persons with 20/60 to 20/200 acuity who have the visual capability to scan and locate products with their unaided vision may do better scanning aisles unaided and using a conventional optical telescopic device to read the aisle signs or price tags on the edges of shelves. Persons with 20/200 or poorer acuity who cannot scan and spot products well unaided may do better using the Jordy on a lower magnification setting to scan store areas and then zoom up to higher magnification to read the aisle sign,

product name, or price tag on the edge of a shelf. Also, persons with 20/60 or poorer acuity with hand-dexterity problems that prohibit them from holding a telescope steady or focusing a manually focused telescope may appreciate the autofocusing capability of the Jordy and the steadiness of using it in a headborne position. Persons who are skilled in using a handheld telescope and pocket magnifier for shopping may prefer these devices to the Jordy, since they are less cumbersome to carry and shop with than is the Jordy.

Intermediate- and near-range activities

Table games

For the purpose of this discussion, I use the example of playing card games. At a typical card table, the player needs to be able to see cards on the far side of the table, in the middle of the table, on the near side of the table, and in his or her hand. These distances vary according to the size of the table and chair and the height and weight of the card player. For this example, I assigned the following viewing distances from the face of the Jordy to the location of the cards:

- the far side of the table = 110 centimeters (about 43 inches)
- middle of the table = 85 centimeters (about 33 inches)

- near side of the table = 57.5 centimeters (about 23 inches)
- the player's card hand, held at 35 centimeters (about 14 inches)

The Jordy's first seven power levels focus easily from 7.5 centimeters (about 3 inches) to infinity with the distance-lens setup. Persons whose vision is good enough to read the cards at a distance of 110 centimeters using the seventh power level or less can set the power level that is needed to read the cards at 110 centimeters and read the cards at 85 centimeters, 57.5 centimeters, or 35 centimeters using the same power level without any special focusing adjustments. They can also reduce the power level for closer-range viewing and increase the power level for longer-range viewing without any special focusing adjustments as long as they stay in the first seven power levels of magnification. For persons with this type of visual capability, using the Jordy is fairly simple and straightforward. They need to set the brightness level appropriately for the lighting conditions and be skilled in spotting the cards at various distances.

For persons who require more magnification than the first seven power levels to read the cards at the various working distances, the focusing process and adjustments are more complex. In the distance-lens setup, with the Jordy set on the 16th power level, the maximum magnification, the closest point of clear

focus that the Jordy can achieve is 98 centimeters (about 39 inches). Those who require the 16th level of magnification for reading the cards on the far side of the table at 110 centimeters will be able to do so without any special focusing adjustments. However, when they attempt to read the cards at the other three closer-range distances, they need to make size or focusing adjustments or both. To read the cards in the middle of the table, at 85 centimeters, they either have to shift back 13 centimeters (about 5 inches) to 98 centimeters while using the 16th power level or stay at the 85-centimeters distance and reduce the power setting to the 12th power level. To read the cards at the near edge of the card table, the 57.5-centimeter range, they have either to shift the near-focus lens into position and lean down to the focal range that is required for the power needed to read the cards or remain in the distance-lens setup in the 57.5-centimeter range and reduce the magnification to the 9th power level. Finally, to read the cards held in his or her hand in the 35-centimeter range, a player either has to shift the near-focus lens into position and bring the cards into the focal range that is required for the power level needed to read the cards or remain in the distance-lens setup with the cards in the 35-centimeter range and reduce the magnification to the 7th power level. Those who require this type of magnification are dealing with the most-complex focusing processes. As the magnification requirements lessen, the complexity of focusing lessens.

In a card game in which the Jordy must be constantly adjusted to read the cards at the four different focal ranges, the player may find the game more of a tiring visual exercise than a pleasant pastime. Spotting targets at these ranges is more difficult than is spotting targets at greater distances. The Locator button is helpful for easing the spotting problem. Persons for whom the Jordy would be issued for playing table games would need to have good spotting skills at close range, a good understanding of the Jordy's focal ranges, and good skills in using the Size and Locator controls. By finding adaptive table-game equipment and training the other participants with whom he or she is playing, the player can lessen the visual complexity of the game. In most cases, the Jordy is not issued solely for playing table games, but, for persons who have several goals for which the Jordy could be used, the Jordy could meet some of their needs for playing table games.

Reading in the headborne position

As with conventional low vision devices, the less magnification required by persons with low vision who use the Jordy for reading, the better the results will be. As the magnification requirements increase, the focal-range sensitivity increases, the area that is viewed on the display screens decreases, and thus the difficulty of reading with the Jordy increases. The ease and efficiency of reading are improved by placing the reading material on a reading stand. Such placement

maintains the material at a constant distance from the reader, thus improving the focus. If the image continues to shake or bounce, users will have to lean into the table, place their elbows on the table, and steady their heads with their hands. The three black-and-white mode settings provide improved contrast and a clearer image when reading with the Jordy. The low vision program in Waco has never issued a Jordy to be worn as a headborne device as the primary reading device for long-term reading tasks, such as reading newspapers, magazines, or books. Persons who can use the Jordy for reading on a lower magnification setting can also use conventional optical devices for reading and prefer them to the Jordy for comfort and ease of use. Persons who require higher magnification settings for reading with the Jordy prefer reading with a more conventional video magnification device when reading for extended periods.

Because the Jordy is portable, it can meet some short-term reading needs, such as reading the directions on a label. Even short-term reading tasks, however, may be accomplished more quickly and easily using a simple pocket magnifier or other optical device. However, the Jordy does provide inverse video for enhancing the contrast of reading material, which is a distinct advantage for some persons with poor contrast sensitivity. Nevertheless, other portable electronic magnification devices, such as the Pocket Viewer, manufactured by HumanWare; QuickLook, manufactured by Ash Technologies of Ireland; or

Compact, manufactured by Optelec USA, may be more effective in achieving the user's reading goals. Thus, for reading in the headborne position, the Jordy is not the device of choice in the majority of cases.

Reading in the docking station

As noted earlier, placed in its optional docking station and used with an external monitor, the Jordy provides the service of a good side-by-side video magnification system. Its advantage over an in-line closed-circuit television system is the large open space between the camera and the X/Y table. This open space allows for easy movement of large volumes of reading materials underneath the camera. Also, writing instruments and other tools can be easily maneuvered in this large open space, allowing the user to perform writing tasks and some simple handiwork tasks on the X/Y tray table with no interference from a low-hanging camera housing. The four Viewing Mode options—full color, black and white, high-contrast black and white, and inverse black and white—provide good-quality options for reading, writing, and viewing photographs and pictures. The system works well with good room ambient lighting only or with the system's mounted fluorescent lights. However, the location of the system's lights causes severe glare with the display image when reading materials that are printed on glossy paper, such as magazines. If one turns off the fluorescent lamps and relies on ambient lighting from overhead ceiling lights or from a well-placed task

lamp, glare in the image display can be eliminated. Since the system has a dark-colored X/Y tray table and soft fluorescent illuminating lamps, there is no harsh glare from the surface of the X/Y table to bother the user. Because the system is a side-by-side system, users who prefer to have their faces close to the monitor have difficulty getting close to the monitor and operating the X/Y table comfortably. Another disadvantage is the location of the controls, which are at the rear of the X/Y table. To turn the system on or off, adjust the size, and change the viewing modes, the user must make a fairly long and somewhat awkward reach to the controls. The side-by-side presentation requires more desktop space, and a stand may be needed to raise the television monitor to a comfortable viewing height. Finally, the Jordy's Brightness and Contrast buttons do not control the display monitor's image. Rather, the user must access the display monitor's settings to change the brightness or contrast of the display image.

Using the Jordy for handiwork activities

For the craftsman or handiworker with a visual acuity of 20/200 or poorer, the Jordy provides some positive options for the higher magnification requirements needed to perform fine-detail tasks. Conventional optical devices, such as high-plus aspheric spectacles or headband magnifiers, require too close a working distance to perform many handiwork activities comfortably and effectively. Conventional

optical telescopic devices with near-focus capability have sensitive focal distances and limited fields of view that hinder their use for handiwork activities.

Used in power levels 1–7, the Jordy focuses at any distance from 7.5 centimeters (about 3 inches) on out, allowing users to position their work at a comfortable distance while performing an activity. Persons who require the higher magnification of power levels 8–16 to perform a task engage the close-up lens and adjust their working distance appropriately to work on the fine-detail aspects of their task. As with conventional optical devices, the higher magnification required of the Jordy, the more sensitive the focal distance required and the smaller the field of view. The Jordy's variable magnification is a distinct advantage over the set magnification levels of conventional devices. The user can lower the Jordy's magnification and thus expand the field of view and gain a better overall perspective of the relationship of a task's individual components to each other and then increase the magnification as needed to deal with the finer details of the task.

Users need to learn to use the Focus Lock feature for working on three-dimensional objects or moving tools in and out of the field of view between the camera and the desired point of focus. For instance, if they are trying to focus on the point of a pyramid, the camera's focusing system may be targeting some point down on the sides of the pyramid, so the pinnacle of the pyramid

is out of focus. Users can set the desired magnification, place a business card on the point of the pyramid, allow the Jordy to focus on the business card, hit the Focus Lock, remove the card, and see the pinnacle of the pyramid in good focus. When the Focus Lock is activated, the letters "FL" are supposed to appear in the top left corner of the display screens. However, many users with lower visual capabilities do not notice the letters in the display.

When the Jordy is used in a headborne position, it is difficult to hold an object on which one is working at a consistent distance from the face of the Jordy and to hold one's head steady while viewing the object on which one is working. Thus, the Jordy may lose focus, or the viewer may have difficulty aligning on the target and holding that alignment when trying to perform a handiwork task. To make the Jordy more shop friendly, the Waco staff has designed a boom arm to hold the Jordy while the user views the magnified image on a television display that is set to one side of the work station (see [Figure 3](#)). Currently, we are using either a Luxo 25- or 41-inch long, 1-pound capacity, microphone boom arm with a fabricated holster to hold the Jordy. The user can mount the arm using any of the Luxo task-lamp mounting options. The boom arm can be manipulated up or down and in or out, and the head can be angled to various positions to give the user a view of the area of the task being performed. This setup works well for reading the directions that are printed on product labels. We primarily use a 20-inch

television monitor and often present the monitor on a hospital tray table. The adjustable height of the tray table allows the user to lower the display when sitting and working on a project or raise the display when standing and working. The wheeled table allows the user to position the display in its optimum viewing position while performing a task. Also, the user can easily wheel the display to other work stations in the shop.

The boom-arm mounting with the image display on an adjoining television monitor has greatly improved the Jordy's serviceability as a handiwork magnification device for the veterans in the Waco low vision program. EVS has shown no interest in providing a boom arm as an option in its product line for the Jordy. The Clarity video magnification system with a boom arm provides comparable capabilities to the Jordy used in a boom-arm setup, and one does not have to fabricate a boom arm. However, if the user is seeking a device with diverse applications, the Jordy stands out because it can be easily removed from the boom arm and used in a headborne position for other tasks.

Conclusion

To summarize my perspective of the effectiveness of the Jordy as a low vision device, I developed the ratings presented in [Table 3](#), which were made for a hypothetical "average" legally blind person with 20/200 acuity and no other special physical, mental, or

emotional impairments. The ratings address the use of the device to perform the noted activities and are based solely on my own observations and opinions; I did not use a formal research instrument to substantiate them.

In 2003–2004, the low vision program at Waco issued 27 Jordy units, the majority of which were issued with boom-arm mounting options to improve the performance of handiwork tasks. The program's largely male population of retired veterans includes many men who wish to improve their visual ability to perform home repairs and shop tasks. Conventional devices do not satisfy their need to see detail when performing these tasks. When used in both the headborne position and with the boom-arm mount, the Jordy takes them a step beyond conventional optical devices in performing these tasks. Without the boom-arm mounting option, the program's issuance rate of the Jordy would be much lower, for although the Jordy may be used for many other viewing activities, it does not necessarily surpass the effectiveness of other low vision devices that are designed to perform the same activities. Thus, in our low vision program, the Jordy is one of several low vision devices that are issued to patients to meet their goals. We spend an extensive amount of time teaching each person who is issued a Jordy how to use it optimally in his or her daily activities. Considering the low vision devices that are available today, we will continue to use the Jordy electronic magnification device to meet the needs and goals of our low vision population.

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