

Attachment 13

Dynamic Visual Acuity (DVA)

Name of test: Dynamic Visual Acuity (DVA)

Estimated time burden: 10 minutes

Number of items: One static visual acuity task plus two dynamic visual acuity tasks

Materials:

Dynamic visual acuity equipment: rate sensor on data acquisition board (DAQ, small black box), attached to headgear participant wears; long USB cable to plug DAQ into computer

Laptop computer and 19" monitor

Laminated card with HOTV letters (for ages 3-7 only)

Chair (with booster seat and/or Kaboost™ for smaller children)

Two small tables or one long table

Isopropyl alcohol wipes or spray (for disinfecting headgear for each new participant)

Description:

This activity is intended to measure visual acuity (static) as well as deficits of the vestibular ocular reflex in adults and children. A brief training procedure is included in the test to ascertain that the participants, both child and adult, know what needs to be done to complete the assessment. If they do not succeed in the training, testing can be discontinued.



Public reporting burden for this collection of information is estimated to average 2 1/2 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to: NIH, Project Clearance Branch, 6705 Rockledge Drive, MSC 7974, Bethesda, MD 20892-7974, ATTN: PRA (0925-xxxx*) EXP: (xx/xxxx). Do not return the completed form to this address.

Set-up: The cable from the DAQ should be already plugged into your laptop's USB port. **Be sure it is plugged in before launching this test within the software.** The headgear is placed on the participant during the dynamic acuity testing (after static testing is completed, as described below).

Note: Before testing begins, ascertain if the participant wears corrective lenses for distance, and ensure he/she is wearing them. If necessary, ask the participant if he/she wears glasses or contact lenses for distance vision. If the participant does wear lenses but indicates he/she has forgotten them (or does not have them for any reason), the examiner may choose to continue testing or not; it is the examiner's discretion. However, if the participant requires a very strong correction, testing will not likely be valid. The examiner should note any such irregularities and, if testing is completed, should interpret results with caution.

Testing: Testing will use different sets of optotypes (images) for children and adults. For both the dynamic and static parts of this measure, the participants are to be seated **12.5 feet** away (at eye level) from the viewing monitor. The monitor should be at eye level as shown in the picture below (note: symbols behind monitor should not be part of adult setup).

Administration Instructions for ages 3-7 — Static Visual Acuity:

Because a number of children may not be able to name one or more of the letters **HOTV**, a laminated card is also used with young participants, allowing them to point to what they saw on the screen without verbalizing. The accompanying adult may sit next to the child and report to the examiner which letter the child chose. **Before static testing begins, there is a training sequence and then practice items.**

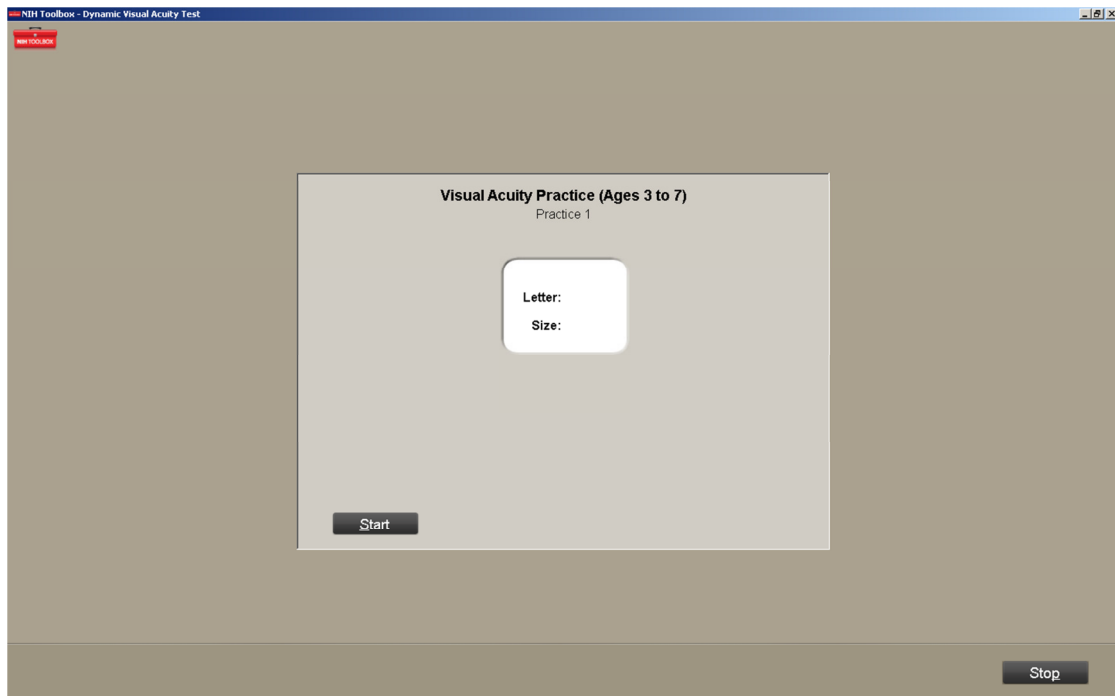
Training:

The examiner should have the child sit in the chair where visual acuity testing will be administered, then say: “Now we are going to do an activity that shows us how well you can see pictures on the TV screen. Sometimes you will do this as you sit like you are now, and then you will do it again with your head moving.” Hand the child the laminated card and say: “Everything you will see is shown on this card. This is a picture of an H, this is a picture of an O, this is a picture of a T, and this is a picture of a V (point to each letter while naming). Now, you try to name the pictures.” Encourage the child to name the letters as best he/she can. If the child names all four letters correctly, say, “Good job.”

If any are named incorrectly, point to each letter and say *only one time* as before: **“This is a picture of an H, this is a picture of an O, this is a picture of a T, and this is a picture of a V.”** (Because letter naming is not required to complete the test, it is OK if the child does not correctly name each letter. Encourage the child’s efforts without providing negative feedback.) Then say, **“Let’s do some more.”**

Say: **“You are going to look on this screen (point to monitor); then, you will see a picture (for children who clearly know the alphabet, it is OK to say “letter” instead of “picture”). Each time, I want you to tell me or point on this card to what you saw on the screen. If you are not sure, it is OK to guess. Are you ready to start? Let’s begin.”**

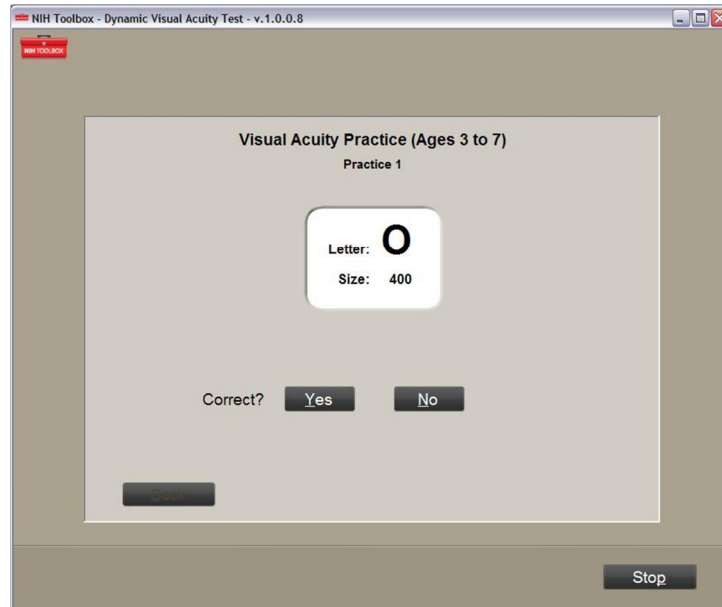
Practice:



Opening screen for Practice 1

The examiner should present one set of practice static acuity trials (4) at 20/400.

- a. If 3 or more correct, continue to static testing.
- b. If the child misses 2 or more of 4, review the 'pointing chart' and ask him/her to identify (either orally or by pointing) the optotypes ('pictures'), namely the letters HOTV. If all are done correctly, see b1. If child cannot correctly identify the optotypes on the HOTV set, more training will be needed before testing can continue.
 1. Proceed to a second practice trial set. If 3 or more of 4 are done correctly, proceed to live static testing. If not, repeat (third practice trial set). If 3 or more correct, begin static test. If 2 or more are incorrect, stop test since this is the third practice trial (see b2).
 2. Practice trials should be limited to a total of 3 sets. If after 3 trials the criterion of 3 or more of 4 correct is not achieved, then stop the test.



Static Testing:

The examiner should say: “**You did great. Now we will see how well you can see pictures as they get smaller. They will get smaller – just tell me what you see, ok?**”

The examiner should click on Start Test on the examiner's screen. Each time a letter is displayed, say, “**Tell me or point to what you see.**”

It is the examiner's job to use the computer to record (click on) whether the response was correct or incorrect. Simply note the child's verbal or pointing response, compare it to the correct answer listed on the examiner's screen, and score it accordingly. The next item will not appear until the examiner has scored the item currently on screen. If the child is trying but struggling to verbalize the letters, remind him/her that pointing is OK by saying, “**You can show me what you see.**”

The test will progressively present smaller letters if the child answers correctly or larger ones if the child is answering incorrectly, until an acuity score is established. The test will automatically end when the computer has calculated the acuity score. The examiner should click the **Next** button to move on to the next section.

Note: If a child's static score is equivalent to 20/400 vision or worse, the program does **not** allow the examiner to administer the Dynamic Visual Acuity test portion, because the results would not be valid. Specifically, if a child scores this poorly on the static portion of the test, it suggests there are

serious uncorrected distance vision deficits. Please suggest follow-up evaluation by a vision professional.

Administration Instructions for ages 3-7 — Dynamic Visual Acuity:

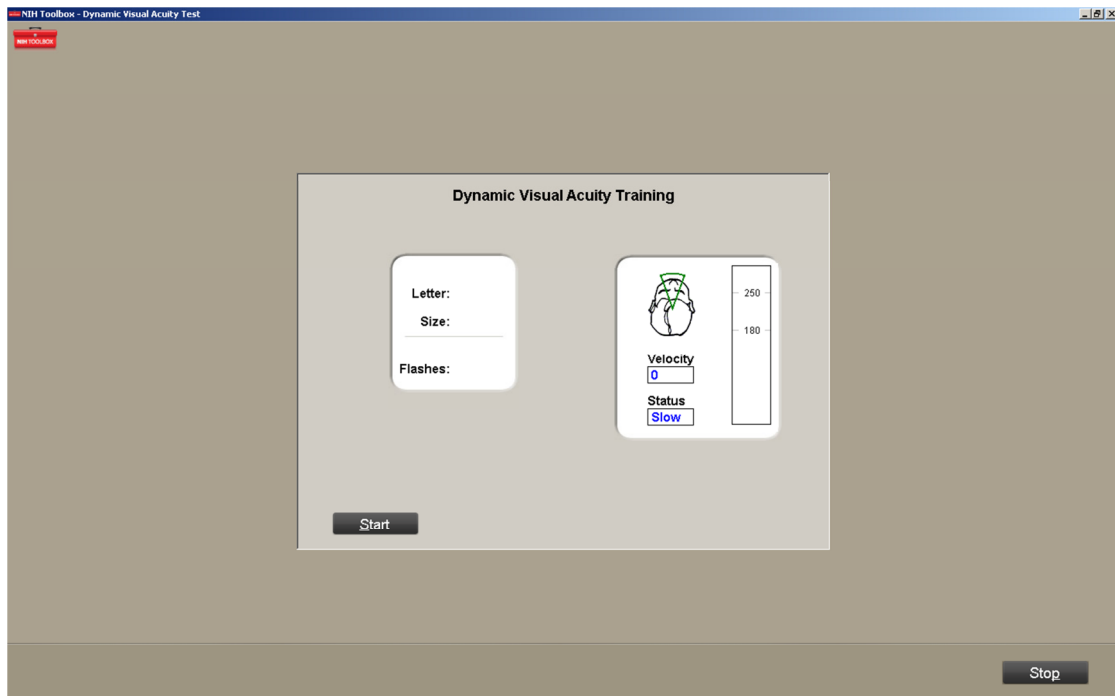
The examiner needs to explain to the participant that he/she must wear the headgear ("hat") to enable the computer to know if his/her head is turning. For young children, it may be helpful to embellish the headgear with decorations, to encourage them to wear it. Show the headgear with rate sensor to the child, saying something like the following (adapt as needed): **"Now we are going to do the same activity, but this time you will move your head back and forth as if saying NO. If you move it just right, the letters will appear. This special hat will be on your head so the computer can know if your head is moving just right. If it is, the pictures will show up!"** Can you help me put it on your head?" Place the headgear securely on the child's head, making sure it is comfortable and correctly adjusted.

Training

When the headgear is properly positioned, say, "To make a picture appear on the screen, you need to move your head, like you are saying 'no,' or 'uh-uh.' Watch me". Demonstrate for the child and then say, "Now you try it. Shake your head like you are saying 'no.'" Give appropriate feedback until the child demonstrates an understanding of the required motion.

"This time when you shake your head, a picture will flash on the screen. I want you to tell me, or point to, what you see each time. It is OK to make your best guess. When you see the picture flash on the screen, stop shaking your head."

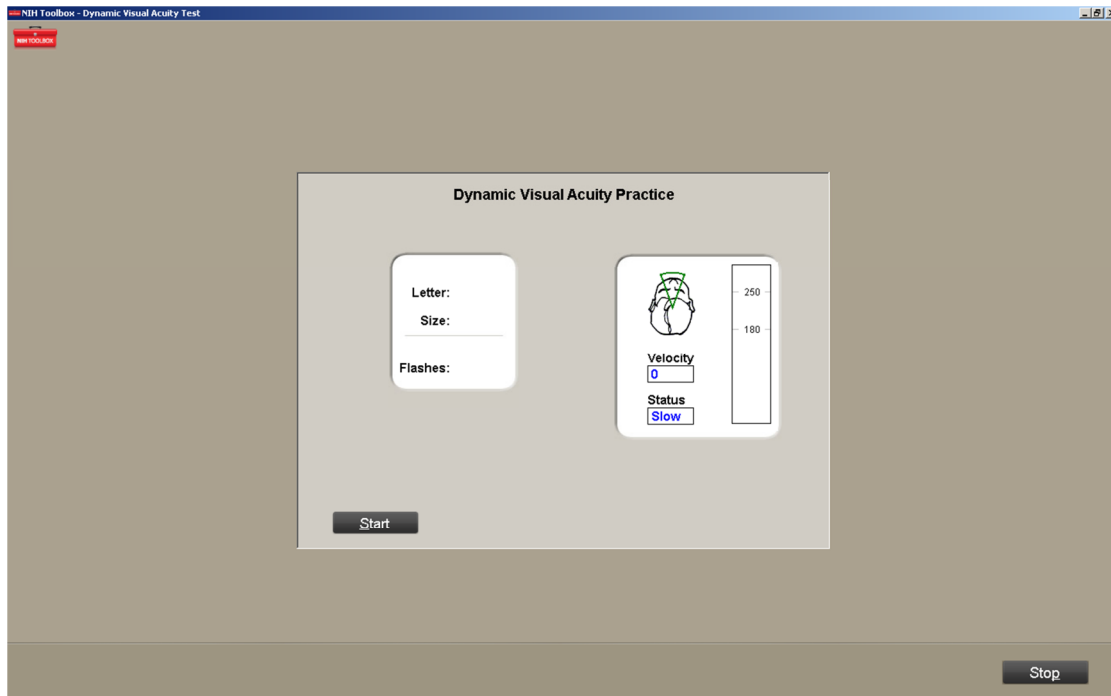
Using a practice trial at 20/400 size, sit with child and have him/her make the pictures appear with the correct head movement. The examiner can judge the correctness of the movement by watching the moving vertical bar on the computer screen and whether it is in the green range or not (between the numbers 180 and 250). The examiner may need to demonstrate again; the purpose of this practice is to make sure the child has learned to move his/her head correctly. It is important that the size of the head movement is not too large. If so, the child will not be able to see the letter. The movement amount should be small and quick (like shaking the head no). Try to make this part fun. If done correctly, give the child praise. If not correct, the examiner should demonstrate while directly in front of the child.



Dynamic Visual Acuity training screen

Practice:

Once the child has learned to move his/her head correctly, there is a practice series with the **HOTV** letters at size 20/400. The child receives 10 trials (each trial involves up to 3 flashes of each letter) and is asked to identify the letters by either pointing to or saying the letters. The child needs to achieve 60 percent (6 of the 10 trials) correct to continue with testing. When 5 practice trials are incorrect, the test is automatically discontinued. This logic is built into the computer program. Specifically, as soon as the child gets 6 correct, the program moves on. Similarly, if the child gets 5 incorrect, the administration stops. The practice items will measure leftward head rotation, as the testing itself begins with rightward rotation.



Dynamic Visual Acuity practice screen

Dynamic Testing:

Click on the **Start** button and say, “Now we are going to do some more of these. Ready? Go ahead.”

The letters will begin at 3 sizes above the achieved static score and will become progressively smaller or larger, depending on the child's performance. A given letter will flash up to 3 times after the head rotation. The child should be encouraged not to answer until he/she is certain which letter flashed; after 3 letter flashes, the letter will no longer appear, regardless of head movement.

The examiner should prompt the child each time by saying something like, “**Go ahead,**” or “**Now shake your head no.**” If the child is trying but struggling to verbalize the letters, remind him/her that pointing is OK by saying, “**You can show me what you see.**” The examiner should provide encouragement and praise regardless of whether the letter identified is correct, so that the child will continue.

The examiner should use the computer to record whether the response was correct or incorrect by clicking either the **Yes** or **No** button. The next item will not appear until the examiner has scored the item currently on screen (but will be available to appear – prompted by the child's head-shaking – after the examiner has scored the previous item).

If the child has not used all 3 trials and has not responded or seems uncertain about his/her answer, the examiner should prompt the child by saying something like, “Go ahead,” or “Now shake your head no again.” If the child has used all 3 trials and/or is trying but struggling to verbalize the letters, remind him/her that pointing is OK by saying, “You can show me what you saw.”

The examiner should remind the child as needed that after he/she says or points to a letter in response to what flashed on the screen, he/she should stop the head-shaking and wait for the examiner to indicate that it is time for the next item (since the letter flashes up to 3 times, the same letter will flash if the child continues to shake his/her head until the examiner enters the child's response; this must be carefully managed by the examiner).

If the child sees the presentation of a letter multiple times (up to 3 are possible) and provides different responses, the examiner should go with the preponderance of responses given by the child. In a case where the child gives different responses each time, the examiner should score the child's last response to the flashing letter presentation. The test will progress and automatically end when the child reaches the discontinue criterion, or he/she has correctly identified the smallest-size letters presented.

The test is divided into Part 1 (right) and Part 2 (left), meaning that the letter will only flash for a rightward (Part 1) head rotation and then leftward (Part 2) head rotation. However, the child makes head rotations to both sides (as if saying “No”), not in one direction only, so there is no change in instructions to the child. When the test is completed, the examiner's screen and the letters will no longer flash.

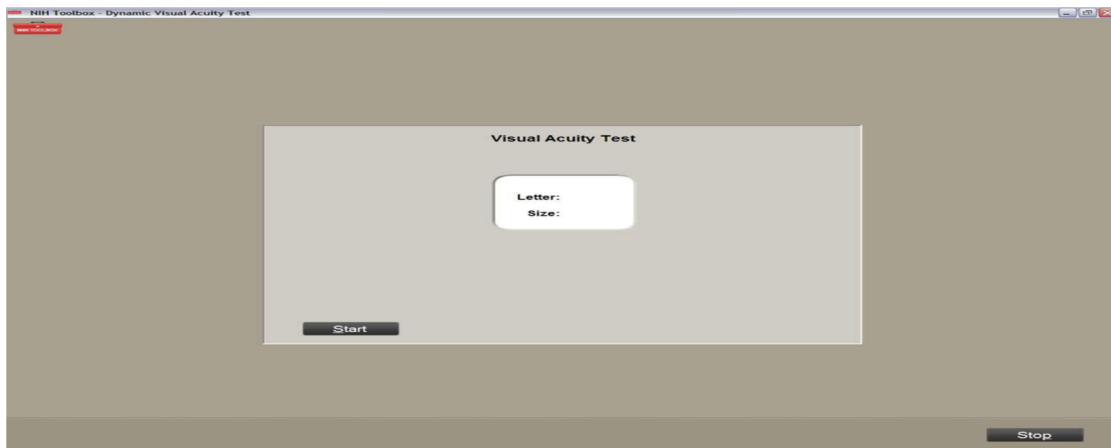
The computer automatically ends the test after it has determined the dynamic acuity score; the examiner then says: “We're all done with this activity.”

Administration Instructions for ages 8-85 — Static Visual Acuity:

The examiner should have the participant sit in the chair where visual acuity testing will be administered, then say:

“Now we are going to do an activity where you will tell me what letters you see on the screen. You are going to look on this screen (point to monitor) and you will see a letter. Each time, I want you to tell me the letter you saw on the screen. If you are not sure, it is OK to guess. The letters will get smaller and smaller until you cannot really see them. That is ok. We are trying to determine how small they can get before you cannot see them. Are you ready to start? Let's begin.”

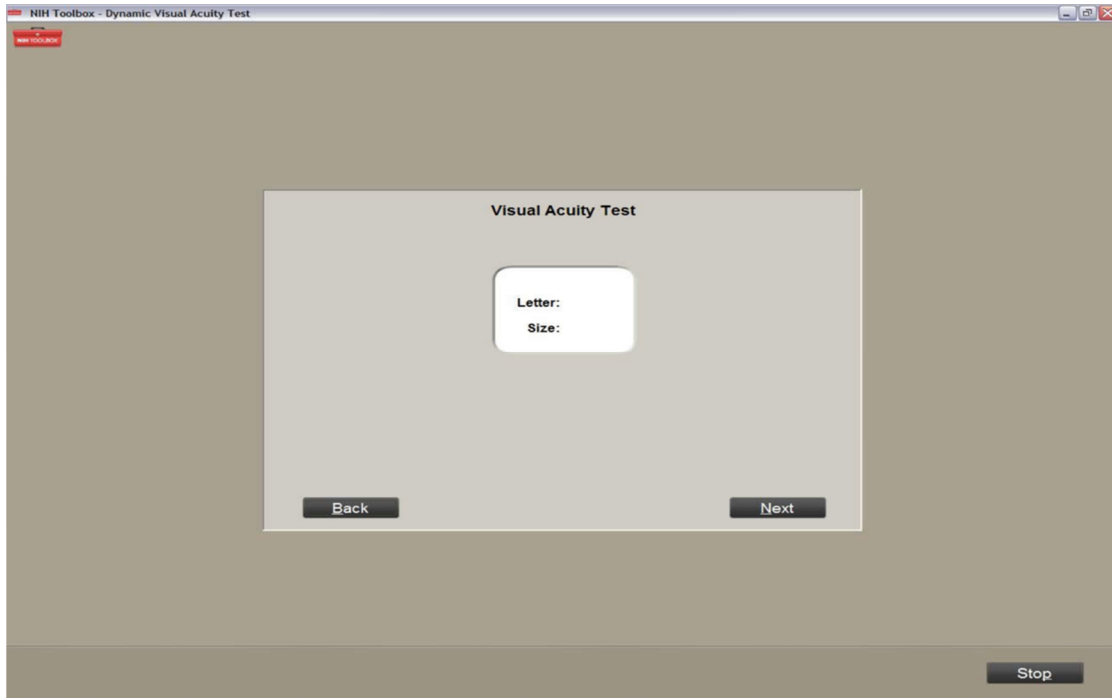
Static Testing 1 (with glasses or contact lens if usually worn for distance vision):



Opening screen for Static Visual Acuity Test

The examiner should click on the **Start** button on the examiner's screen. Each time a letter is displayed, say, "**Tell me, what letter is this?**" (At the examiner's discretion, this can be replaced by: "**Go ahead**" after a few letters have been displayed.) It is the examiner's job to use the computer to record whether the response was correct or incorrect by clicking either the **Yes** (correct) or **No** (incorrect) button. Simply note the participant's response, compare it to the correct answer listed on the examiner's screen, and score it accordingly. The next item will not appear until the examiner has scored the item currently on screen (but it will appear immediately after the examiner clicks Yes or No).

The test will progressively present smaller letters if the participant answers correctly and larger ones if the participant answers incorrectly, until an acuity score is found. The test will automatically end when the computer has calculated the acuity score. The examiner should click the **Next** button to move on the next section.



Static Acuity last screen

Note: If a participant's static score is equivalent to 20/400 vision or worse, the program does **not** allow the examiner to administer the Dynamic Visual Acuity test portion, because the results would not be valid. Specifically, if a participant scores this poorly on the static portion of the test, it suggests there are serious uncorrected distance vision deficits.

For participants who wore glasses, the examiner should ask: “**Are your glasses progressive or multifocal?**” if the answer is **yes**, then the examiner should proceed with Static Testing 2; if the answer is **no**, the examiner should proceed to testing Dynamic Visual Acuity.

Static Testing 2 (only for those participants with glasses that are multifocal or that have progressive lens):

Say: “**Now we are going to do this test again, this time without your glasses.**”

The examiner should click on the **Start** button on the examiner's screen. Each time a letter is displayed, say, “**Tell me, what letter is this?**” (At the examiner's discretion, this can be replaced by: “**Go ahead**” after a few letters have been displayed.) It is the examiner's job to use the computer to record whether the response was correct or incorrect by clicking either the **Yes** (correct) or **No** (incorrect) button. Simply note the participant's response, compare it to the correct answer listed on the examiner's screen, and score it accordingly. The next item will not appear until the

examiner has scored the item currently on screen (but it will appear immediately after the examiner clicks Yes or No).

The test will progressively present smaller letters if the participant answers correctly and larger ones if the participant answers incorrectly, until an acuity score is found. The test will automatically end when the computer has calculated the acuity score. The examiner should click the **Next** button to move on the next section.

Administration Instructions for ages 8-85 — Dynamic Visual Acuity:

NOTE: For participants with glasses that are multifocal or that have progressive lens, this part of the testing should be done without glasses. Other participants wearing single-vision lenses should continue to wear them for Dynamic Visual Acuity assessment

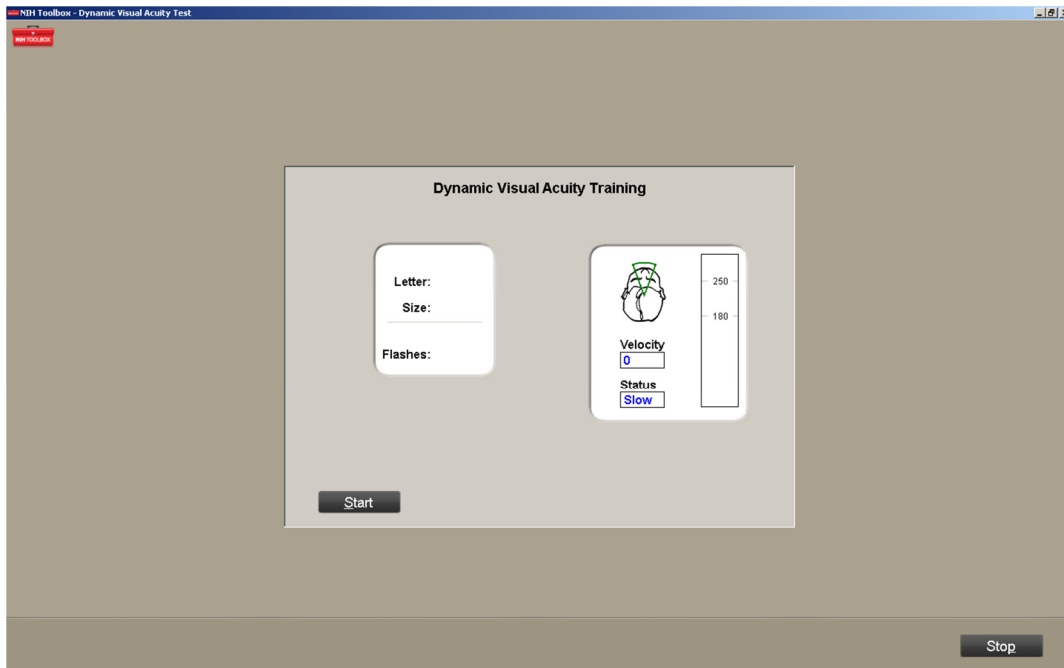
The examiner needs to explain to the participant that he/she must wear the headgear to enable the computer to know if his/her head is turning. Show the headgear with rate sensor to the participant, saying something like the following (adapt as needed): “**Now we are going to do some more, but this time, you need to wear this special headband to make the letters appear. May I put it on your head now?**”

Place the headgear securely on the participant's head, making sure it is comfortable and correctly adjusted (rate sensor should be on right side of head, with headgear adjustment knob at the back of the head; see photo on page 1).

When the headgear is properly positioned, say, “**To make a letter appear on the screen, you need to move your head, like you are saying ‘no.’ Watch me. Demonstrate for the participant and then say, “**Now you try it. Shake your head like you are saying ‘no.’**” *Before dynamic testing begins, there is a training sequence and then practice items.***”

Training:

Using a practice trial at 20/400 size, the participant make the letters appear with the correct head movement. The examiner can judge the correctness of the movement by watching the moving vertical bar on the computer screen and whether it is in the green range or not (between the numbers 180 and 250). If the participant is not making the correct movement, the examiner may need to demonstrate again; the purpose of this training is to make sure the participant has learned to move his/her head correctly.



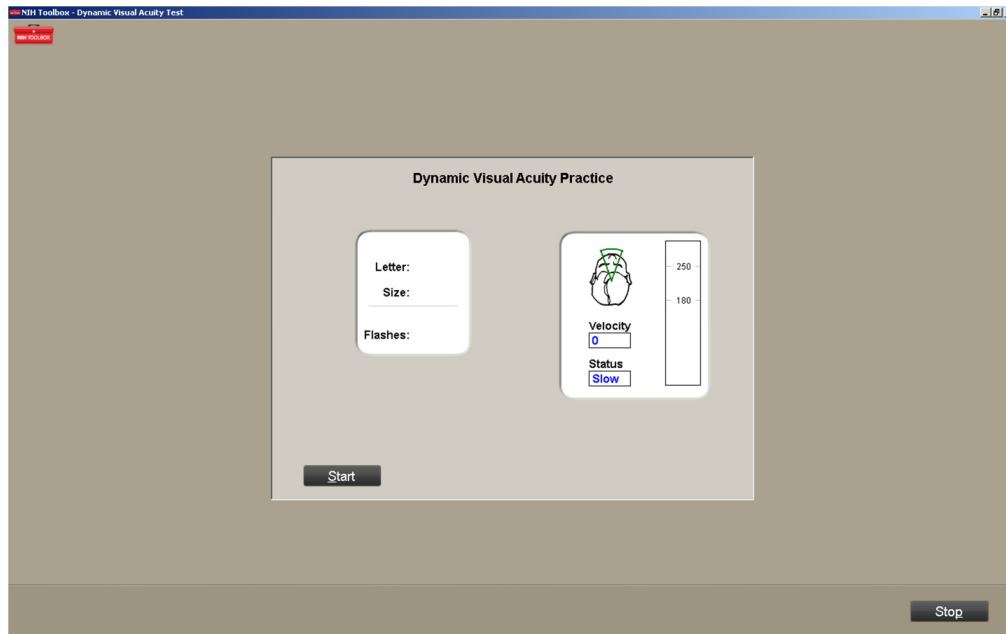
Dynamic Visual Acuity training screen

Practice:

Once the participant has learned to move his/her head correctly, there is a practice series with the letter size set at 20/400.

Now the examiner should say: **“This time when you shake your head, a letter will flash on the screen. I want you to tell me what you see each time. It is OK to make your best guess. When you see the letter flash on the screen and after you have told me your answer, stop shaking your head.”**

The participant receives 10 trials (each trial involves up to 3 flashes of each letter) and is asked to identify the letters by saying them out loud. The participant needs to achieve 60 percent (6 of the 10 trials) correct to continue testing. When 5 practice trials are incorrect, the test is automatically discontinued. This logic is built into the computer program. Specifically, as soon as the participant gets 6 correct, the program moves on. Similarly, if the participant gets 5 incorrect, the administration stops. The practice items will measure leftward head rotation, as the testing itself begins with rightward rotation.

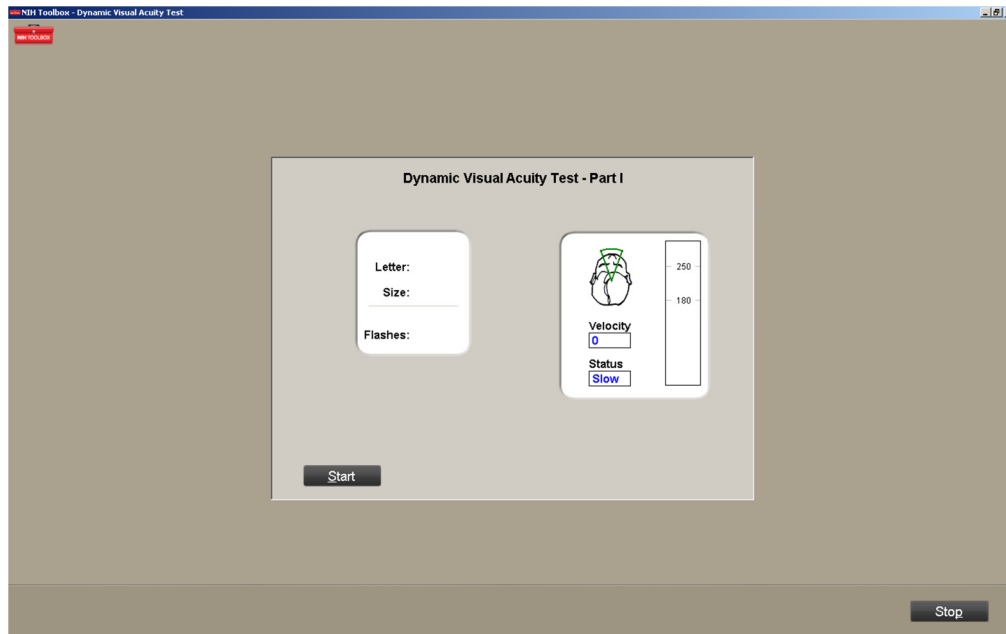


Dynamic Visual Acuity practice screen

Dynamic Testing:

Click on Start Test and say, “Now we are going to do some more of these. The letters will be smaller than the one we just practiced with. Ready? Go ahead.”The letters will begin at 3 sizes above the achieved static score and will become progressively smaller or larger, depending on the participant’s performance. A given letter will flash up to 3 times after the head rotation. The participant should be encouraged not to answer until he/she is certain which letter flashed, although after 3 letter flashes, the letter will no longer appear, regardless of head movement.

The examiner should use the computer to record whether the response was correct or incorrect by clicking either the **Yes** or **No** button. The next item will not appear until the examiner has scored the item currently on screen (but will be available to appear – prompted by the participant’s head-shaking – after the examiner has scored the previous item). If the participant does not appear to have seen the letter flash or is in any way unsure of his/her response, allow him/her up to the full 3 attempts at the letter. The examiner should prompt the participant each time by saying something like, “Go ahead,” or “Now shake your head no again.”



Dynamic Visual Acuity Test – Part 1

The examiner should remind the participant as needed that after he/she says a letter in response to what flashed on the screen, he/she should stop the head-shaking and wait for the examiner to indicate that it is time for the next item (since the letter flashes up to 3 times, the same letter will flash if the participant continues to shake his/her head until the examiner enters the participant's response; this must be carefully managed by the examiner).

If the participant sees the presentation of a letter multiple times (up to three are possible) and provides different responses, the examiner should go with the preponderance of responses given by the participant. In a case in which the participant gives different responses each time, the examiner should score the participant's last response to the flashing letter presentation. The test will progress and automatically end when the participant reaches the discontinue criterion, or he/she has correctly identified the smallest-size letters presented.

The test is divided into Part 1 (right) and Part 2 (left), meaning that the letter will only flash for a rightward (Part 1) head rotation and then leftward (Part 2) head rotation. However, the participant makes head rotations to both sides (as if saying "No"), not in one direction only, so there is no change in instructions to the participant. When the test is completed, the examiner's screen and the letters will no longer flash.

OMB: 0925-XXXX

Expiration Date: XX/XX/XXXX

The computer automatically ends the test after it has determined the dynamic acuity score; the examiner then says: **“We’re all done with this activity.”**