

UK Biobank

Lens Refractometry Testing

Version 1.0

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This manual details the procedure for Lens Refractometry testing at an Assessment Centre of the UK Biobank

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1. Introduction

1.1: This manual details the procedure for Lens Refractometry testing at an Assessment Centre of the UK Biobank. This takes place at the 4th 'station' of the Assessment Centre visit, as listed in Table 1.

Table 1: Sequence of assessment visit

	Visit station	Assessments undertaken
1	Reception	<ul style="list-style-type: none"> • Welcome & registration • Generating a USB key for Participants
2	Touch screen Section	<ul style="list-style-type: none"> • Consent • Touch screen questionnaire • Hearing Test • Cognitive function tests (Shape, Pairs, Fluid Intelligence, Snap)
3	Interview & blood pressure	<ul style="list-style-type: none"> • Interviewer questionnaire • Blood pressure measurement • Measurement of arterial stiffness (Pulse Wave Velocity)
4	Eye measurements	<ul style="list-style-type: none"> • Visual acuity • Auto-refraction • Intraocular pressure • Retinal image (OCT Scan)
5	Physical measurements	<ul style="list-style-type: none"> • Height (Standing and Sitting) • Hip & waist measurement • Weight and Bio-impedance (Body Composition) measurement • Hand-grip strength • Heel-bone ultrasound • Spirometry (Lung function Test)
6	Cardio (Physical fitness)	<ul style="list-style-type: none"> • Exercise ECG (Cycling)
7	Sample collection & exit	<ul style="list-style-type: none"> • Blood samples collected • Urine sample sought • Saliva sample sought • Consent & result summary printed • Travel expense claim provided
8	Web-based diet questionnaire	<ul style="list-style-type: none"> • Dietary assessment

1.2: Throughout this document, the term 'Participant' signifies a study participant who is taking part in the Assessment Centre process, regardless of whether they eventually give or withhold consent to take part in the UK Biobank study.

1.3: The collection of data from assessment visits uses the direct data entry system of the Assessment Centre Environment (ACE). This has five components (**Assessment Centre Environment**), of which Vox operates the Ocular station of the assessment visit.

1.4: At the start of their visit, each participant is issued with a USB Key at the Reception station. This USB Key acts as a participant identifier (it contains Participant ID, name, date of birth and gender) and as a temporary storage device for the recorded data. As the participant progresses between stations, the USB key acts as an identifying token and also as a data transfer mechanism. At the Reception & Exit module, all data on the USB key is removed, after it has been backed up to the Assessment Centre head PC.

2. Staff

Assessment centre technicians trained in this procedure are responsible for carrying it out. The Duty Manager oversees that all assessment centre staff work in accordance with the standard operating procedure.

3. Start of Session Preparation

The dust cover is removed from the Tomey RC – 5000 and the device is switched 'On' before switching the computer base unit on. The chin rest is supplied with paper and the plastic lens cover is removed.

4. Lens refractometry

4.1: Lens refractometry is a measure of the participant's current eye prescription. This test gives output of refractometry (Sphere, Cylinder, Axis, Pupil diameter) and keratometry (corneal refraction and astigmatism). The instrument used is the Tomey RC – 5000 (Figure 1; Tomey, USA).

Figure 1: Tomey RC – 5000



4.2: This is the second of the eye tests at this station of the Assessment Centre. The participant is seated in an enclosed dark room, free from sources of glare and conditioned to maintain the correct humidity and temperature for the efficient running of the eye measurement equipment. The participant's USB key remains in the computer, and Vox continues to operate following the previous eye tests at the Ocular station. Prior to the first test, of **Visual Acuity**, the participant is checked for previous eye surgery and/or infection.

4.2: On the Eye Check page, the participant is asked if they have ever had eye surgery, and if within the last 4 weeks. The details of the eye surgery and which eye operated on, if known, is recorded on Vox.

The screenshot shows a web-based questionnaire titled "UK Biobank, Miss Caron Paterson : Ocular, Eye Checks * TRAINING/DEMONSTRATION VISIT *". The form contains the following sections:

- Ever had eye surgery:** Radio buttons for "Yes, in last 4 weeks", "Yes, but more than 4 weeks ago" (selected), "Possibly, but more than 4 weeks ago", and "No".
- Has the participant EVER had:**
 - Cataract surgery:** Radio buttons for "No", "Right eye only" (selected), "Left eye only", "Both eyes", and "Do not know".
 - Refractive laser eye surgery:** Radio buttons for "No" (selected), "Right eye only", "Left eye only", "Both eyes", and "Do not know".
 - Surgery for glaucoma or high eye pressure:** Radio buttons for "No" (selected), "Right eye only", "Left eye only", "Both eyes", and "Do not know".
 - Laser treatment for glaucoma or high eye pressure:** Radio buttons for "No" (selected), "Right eye only", "Left eye only", "Both eyes", and "Do not know".
 - Corneal graft surgery:** Radio buttons for "No" (selected), "Right eye only", "Left eye only", "Both eyes", and "Do not know".
- Both eyes present:** Radio buttons for "Yes" (selected), "Right only present", "Left only present", and "Both eyes missing".
- Currently has infectious eye condition (e.g. viral conjunctivitis):** Radio buttons for "Possible" and "No" (selected).

At the bottom, there are navigation buttons: "< Prev", "Help", "Lock", and "Next >". A progress indicator shows a dashed line with a small square at the beginning.

Note: If the participant has had any eye surgery within the last 4 weeks they cannot continue with Ocular measurements

4.5: On the 'Both eyes Present' section, it is recorded if the participant has a prosthetic eye(s). Eye measurements are attempted on both eyes where eyes are physically present.

Note: Participants with possible eye infections do not undergo refraction, intra-ocular pressure or OCT measurements but may complete the Visual Acuity Measurement.

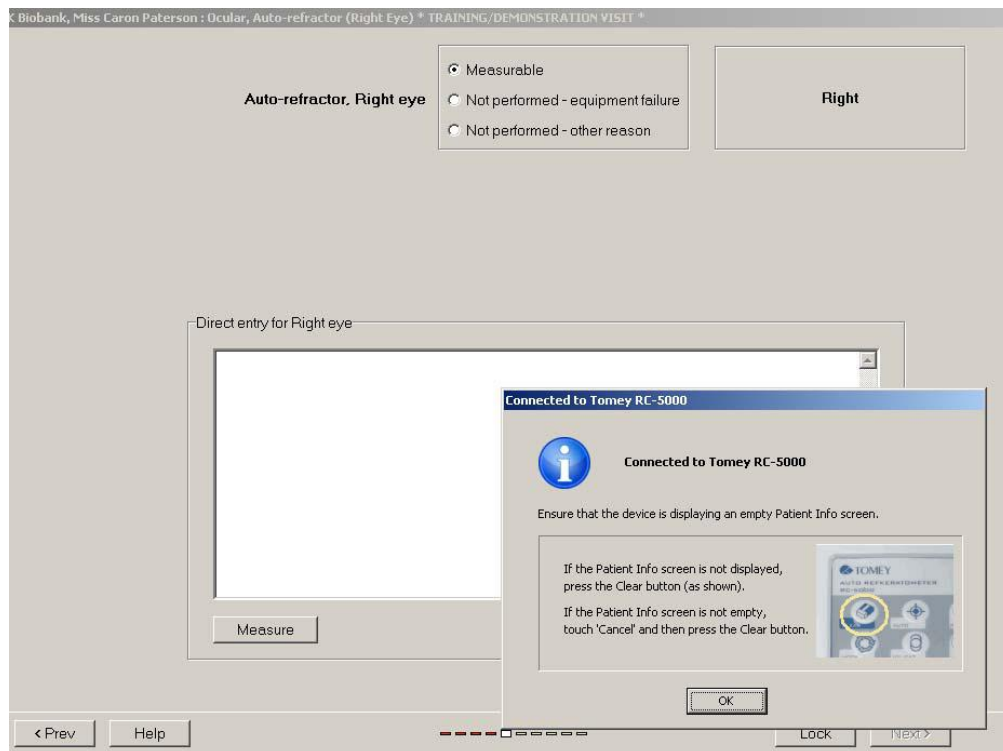
4.6: suspected or confirmed eye infections are recorded by selecting the 'Possible' option.

5. Measurement of Refraction

5.1 The measurement procedure is explained to the participant: that this test will measure the equivalent of the eye prescription. The right eye will be measured first, then the left. During the test they will be asked to focus on an image on the centre of the screen. The participant is reassured that the lens may move in and out but nothing will touch the eye, and that the image will go in and out of focus.

5.2 On the Vox screen 'Measurable' is selected if Auto-Refractor of the Right eye is measurable. If Auto-refraction cannot be measured the reason why is selected (Equipment Failure or Other Reason. Other Reason can be either a reason from the drop down menu or free text entered in the blank window space).

5.3 The participant is asked to remove their glasses or contact lenses. Contact lens cases and solutions are provided for this purpose. If the participant does not wish to, the test is not performed and the reason is recorded.



5.4: The display screen is viewed on the Tomey device. This shows an empty Patient Info field. 'OK' is selected so that the participant ID number becomes visible on the Tomey display screen.

5.5: The participant is positioned using the height adjustable table to ensure they are comfortable and sitting upright. The participant's chin should be rested on the chin rest with their eye level with the middle marker on the lateral bar of the head frame and their forehead resting against the headrest, with no hair between the eye piece and the eye. The position of the chin rest can be raised or lowered using the 'Up' and 'Down' arrows on the Tomey keypad.

5.6: On the Tomey display screen the 'R' square (top left of the screen) is selected to move the eye piece over to the participants right eye. The joystick is used to fine-tune the positioning of the green circle to the middle of the pupil as shown below.



5.7: The participant is instructed to focus on the image in the middle of the screen, to keep both eyes open wide and not to blink. They are warned that the image will become blurred during the test but this is normal and is to be expected.

5.8: When the green circle is correctly positioned over the pupil the measurement is automatically taken. When the green circle is almost in position the participant is asked to blink twice then keep both eyes wide open.

5.9: Once the results are displayed on Tomey screen (that is with values against 'S', 'C' & 'A') the 'Tomey Link' and 'Export' buttons are pressed to transfer the data on the Vox screen.

Note: Three green dots under the S, C and A values means that this was a good measurement. If three Red dots appear under these values then the test is repeated. No more than three attempts can be made at obtaining a valid result. If the test cannot be performed the 'Not Performed' option is selected and a detailed explanation is given why the test was not done.

5.10: If the participant blinks or moves during the measurement this may result in an error message (indicated by one or more red 'E' on the Tomey touchscreen) the test may be repeated by selecting the 'Cancel' and 'Measure' buttons on Vox.

5.11: The left eye is measured as for the right eye, positioning the eye piece over the left eye by selecting the 'L' square on the Tomey screen.

5.12: Following completion of the left eye measurement Azowipes are used to wipe the headrest, arm of chair and chin rest if chin paper is not used. The participant proceeds to **Intraocular Pressure** measurement.

5.13: The device lens is never touched, cleaned or wiped.

6. End of Session Procedures

6.1 At the end of the session the external casing and head and chin rests of the Tomey RC – 5000 are cleaned using Azowipes.

6.2 The lens cover is replaced on the Tomey RC 5000.

6.3 The Tomey RC – 5000 is covered with a dust cover.

6.4: After the last participant has left the eye station, the data are archived onto USB keys and securely transported to the UK Biobank Coordinating Centre.