The New Frisby Davis Distance (FD2™) Stereotest

Test Design & Test Instructions

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Contents

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A. BRIEF HISTORY OF FD2™ and NFD2 DEVELOPMENT

Development work began on the FD2 in 2000. Our first paper on it appeared two years later (Davis & Frisby, 2003). In response to requests we then began the process of making the FD2 commercially available. The first step was a beta release test in 8 UK Orthoptic clinics. The results were encouraging and so we decided to go ahead with production. There are now over 80 FD2s in use worldwide. It fills a gap in the orthoptic test battery by providing distance stereoacuity measurements using real objects as targets.

There have been **thee major changes** in the developmental history of the FD2. The **first** was to mount the target shapes on rods rather than on sheets of transparent plastic as originally used. This reduced weight and speeded up test time considerably.

The **second** is the introduction of the revised test protocol set out in this booklet. The key feature of this is to use a monocular test phase after the initial binocular one, as a further check on the observer using monocular cues. The underlying idea (Holmes & Fawcett, 2005) is to accept the binocular result only if it is better than the monocular one. Following our own trial of this type of FD2 protocol (Davis, Toft, Buckley & Frisby, 2005), we now recommend it for general use. A major advantage is that it opens up using the FD2 for adults at 3m, which will suit clinics lacking 6m test alleys. Previously we had recommended that only young children should be tested at 3m. The revised protocol is closely based on that of Holmes & Fawcett but with some slight differences aimed at making the monocular test phase less time-consuming. We look forward to learning the views of FD2 users about this new protocol in the years ahead.

The **third** major change is the substitution of the FD2 by the *New* FD2- see next section.

B. HOW THE NFD2 DIFFERS FROM THE FD2

The new version, NFD2, has been designed with several objectives in mind. One is simplifying the design to reduce costs. This has led to the elimination of the need for an integral light source set in a light compartment to provide back-illumination of the targets. This has been coupled with removing the cabinet-type structure of the FD2 to allow ambient light to reach the targets for their back-illumination. These changes have led to a substantial reduction in cost without altering the

test's norms (Read et al, *in press*), or causing any problems in testing. The targets are themselves unchanged except that the frame which holds them now has a translucent front surface and it is mounted on a simple base which has a front door at the observer's end and a second translucent screen at the rear end.

Because the same geometric shapes targets are employed please use the NFD2 in exactly the same way as the FD2, following directions in this booklet. The FD2 was supplied with a second set of targets using animal shapes but these are not supplied with the NFD2 as it seems they are rarely used and their elimination further reduces costs.

A further objective of the redesign is that the NFD2 will permit in the future the presentation of a much wider range of target types, such as spatial frequency (SF) filtered textures that have the potential to reveal useful additional measures of distance stereoacuity when diagnosing and managing ocular disorders (Frisby, Dasani and Davis, 2012). To use the NFD2 in this way requires additional pieces of equipment that are fitted to the NFD2 and these will soon be made commercially available. Meanwhile, to explain the point of these new targets, the reference list includes papers comparing results for cases of intermittent exotropia using the FD2 with the Distance Randot (DR) stereoacuity test: see Leske, Birch & Holmes (2006) and Holmes, Birch, Leske, Fu & Mohoney (2007). The conclusion of these papers is that the existing FD2 targets (real world objects and coarse) reveal fusion in intermittent exotropia even when control is poor, whereas the DR targets (stereograms using fine textures) reveal performance deterioration at the earliest stages of intermittency. The new range of targets made possible in the NFD2 includes real objects made with SF-filtered textures (Frisby, Dasani & Davis, 2012). We hope future research will explore whether these SF targets will be a useful complement to the standard coarse FD2 targets, with the potential to reveal breakdown in fusion when control is weak.

C. GETTING STARTED WITH THE NFD2

For economy the NFD2 is supplied flat-packed for assembly by the purchaser. Hence the first step after (carefully) unpacking your NFD2 is to fit the front and back panels to the base, using the screws provided (these will be found in the holes for fixing – see assembly instructions).

The next step is to insert the frame that holds the rods on which the targets are mounted into the slots on the base plate. Please be careful to check that the frame is inserted with the translucent surface closest to the front door. Also, ensure that frame is firmly pressed down into its mount.

Having done this, insert the rods into the holes into the support frame. Take care to hold the rods and not the targets when doing this (and also whenever adjusting the positions of the targets when testing patients). The rods should be inserted into the frame on the translucent side so that the shapes are positioned on the door side of the frame.

The NFD2 comes with panels to be fitted into the slots at either side of the front panel. Their function is to stop the patient seeing the tester's hands when adjusting the positions of the rods. They will stay in place if the NFD2 is on a large enough flat surface to support them but if necessary tighten the screw at the top of the slots to hold them in place.

Finally, **position the NFD2 in your test area in such a way that the targets are suitably lit by the ambient light and the patient sees the targets squarely at eye level**. Avoid strong down-lights or side-lights that could cause shadows from the rods, hence providing a monocular cue to the target shape. Trying out various locations for the NFD2 in your test environment should soon enable you to establish a suitable test position.

We welcome feedback – so please do not hesitate to email us with your comments and ideas.

D. FD2 and NFD2 DESIGN PRINCIPLES

The development of the FD2 was based on experience with the *Frisby Stereotest* (Near). Thus the FD2 and its successor the NFD2 is a free space test of real depth, hence avoiding potential problems with stereograms. For example, some young children are unwilling to wear red-green or polarising spectacles.

As for the FD2 that it replaces, the basic NFD2 supplied with these notes uses four differently shaped flat plastic objects mounted on rods that are set horizontally in a translucent support frame such that they point towards the observer. On each trial, one shape (the *target*) is set to be nearer to the observer than the other three shapes. This is done by moving forward the position of the rod supporting the target, with the remaining three

shapes set in a background plane, defined by the front surface of the support frame. The shapes are translucent but sufficiently dark to obscure the supporting rods.

Markings on the rods enable the disparity of the target with respect to the other shapes to be set in the range 50 to 5" in 5" steps, for 6m viewing distance. However, nearer viewing distances can be used with caution (see below).

The design of the FD2 has features in common with various other pieces of equipment that have been used for measuring stereoacuity in the history of stereoscopic vision research. One of its main attributes is that the shapes are seen as free-floating objects in space without any visible means of support.

The observer is told that the task is to pick out the *target* - the shape that is nearer than the others. The shape selected by the tester to be the target is varied from presentation to presentation. The door is closed when the rods are being adjusted to obscure the observer's view. The side panels also serve this purpose.

Shapes have been chosen to be familiar to children so that they usually have no problem in naming them – an arrow, a cross, a star, and a moon crescent.

The FD2 was originally designed for use at 6m, as at that distance we were satisfied that monocular cues were not a significant problem. The new protocol is based on that devised by Holmes and Fawcett (2005) to provide a way of using the FD2 (and now also the NFD2) safely at 3m and 4m. The essence of this **new protocol is to test first binocularly and then monocularly**. Only if the binocular result is better than the monocular result is the binocular threshold recorded as the NFD2 stereoacuity. A conversion *Table of Stereoacuitie*s is given on rear page of this booklet, and on one of the side doors of the NFD2, that translates the 6m stereoacuities marked on the rods to values for 3m and 4m.

We noted in the original test booklet that we had run a study of 22 children aged 4 years none of whom passed the FD2 monocularly at 3m with the largest disparity (200", generated by the 6m rod marking of 50"). This suggests that young children may not be as sensitive to monocular cues. Therefore, it may be possible to use 3m and 4m safely for younger children unwilling or unable to cooperate with the second monocular test phase now recommended. However, it needs to be noted that Holmes & Fawcett's age range included 4 years old.

Stereoacuities for the FD2 have been computed assuming PD of 65mm, which is a commonly used convention in texts despite population mean

PDs being considerably smaller. For example, Jimenez et al (2004) report mean PDs of 52mm and 57mm for 6 and 12 years old children respectively. These values are similar to those reported by MacLachlan & Howland (2002), who also report PDs of 60mm and 62mm for female and male young adults aged 19 years (closely comparable to own PD data for young adults: Frisby & Davis, 2004).

It is an open question whether PD should be used to scale stereoacuity measurements from clinical tests. However, as present practice is not to do so, we presently recommend keeping to that practice with the NFD2, pending future research. Given this background, stereoacuity values for the FD2 are given only for PD of 65mm but adjustments can be made using the standard approximate disparity formula, which is adequate for clinical practice and which is:

$$\textbf{Disparity in radians} = \frac{\textbf{PD x Depth Difference}}{\textbf{(Viewing distance)}^2}$$

To convert radians to sec arc, multiply by 57.29x60x60. This equation has been used for the table of FD2 stereoacuities, with values rounded to 5".

The maximum of the NFD2 disparity range at 6 metres is 50". This might appear surprisingly small for those unfamiliar with the way disparities decline exponentially with viewing distance, and when judged by the norms of *near* stereoacuity tests. But 50" is in fact generated at 6 metres by the depth difference of 13.4cm for PD 6.5mm. The same depth difference at 3 metres generates approximately 200". It is an open scientific question how best to compare and interpret stereoacuities at substantially different distances for the purposes of patient assessment and management. Choosing 13.4cm as the largest depth difference for the FD2 represents a compromise between various factors, particularly the essential requirement of minimising potential monocular cues (Section F).

E. NFD2 TEST OBJECTIVE

The test objective is to establish the smallest disparity difference between target and background shapes that can be reported reliably by the observer. The usual FD2 clinical criterion of 'reliable' is at least two correct and reasonably quick discriminations out of three, with discriminations being based on a seen difference in depth.

Requiring two out of three correct discriminations is a compromise reflecting the clinical fact that many observers, particularly young children, will lose interest and attention if asked to make a long series of target identifications. Of course, if the tester is in doubt then more presentations

should be tried, guided by clinical judgement and feasibility. We recommend using the more stringent criterion of 4 correct choices out of 5 for observers able to respond correctly only to the larger disparities (50-40" at 6m), and/or whose responding is slow and hesitant.

It is important if the tester is in doubt that the observer should be asked to report if they see a *depth difference* between the target and the other shapes. The tester should be suspicious of very hesitant correct responses to the larger disparities if the observer says they see no depth differences, as the probability of making the correct choice at random on any given presentation is 1 out of 4.

The hesitant observer should be encouraged to identify the target shape but not to the point of extracting an unwilling forced-choice that is not based on a perceived depth difference. As for many other vision tests clinical judgement needs to be exercised in finding a balance between encouraging the observer to try hard and avoiding wholly random choices. There is rarely sufficient time in the clinical setting to ask for the long sequences of presentations that are needed to allow for random responding. This is why the tester needs to take full advantage of clues from the way the observer responds to the NFD2, and to be suitably cautious about hesitant choices to the larger disparities.

The care needed in using the FD2 is offset by the critical advantages of: (a) its suitability for young children for whom no other currently available distance stereotest seems appropriate, (b) its ease of use, and (c) the general benefits that flow from not using stereograms.

F. GUARDING AGAINST MONOCULAR CUES

Numerous precautions have been incorporated into the NFD2 to minimise the risk of correct responding using monocular cues, as follows:-

- Present the NFD2 squarely at eye level. It can be helpful to use a tape measure to establish that the middle of the NFD2 targets is at eye level height t[9].
- The depth cue of monocular parallax must be avoided by discouraging head movements. The potential value of this cue is minimised by the shapes being well separated and seen against a clear texture-less translucent background.
- Using back-illuminated translucent shapes of the same colour helps eliminate shading, illumination and colour cues to the depths of the shapes.

- The dark and translucent nature of the shapes hides the rods.
- The NFD2 shapes not only to facilitate responding by naming but also reduce a size cue to the nearest shape, as might arise from four identical shapes with the nearer one then projecting a more readily discriminable larger retinal image. Nevertheless, it needs to be borne in mind that when a shape is moved from the background plane to become a target at the extreme of the NFD2 range (13.4cm nearer), then its retinal projection increases in size by about 2.25% at 6m and by about 4.5% at 3m. We suspect that this size cue may be above threshold for some adults although not for young children (see earlier remarks). In any event, the second monocular test phase in the new protocol allows the tester to assess directly the role of monocular cues for each person tested. At the same time, the tester must at all times be vigilant and use clinical judgement in assessing hesitant responses, particularly to the larger disparities and for the nearer distances.
- Considerable care has been taken to select shapes that seem roughly equal in generating possible shape-related monocular depth cues and/or shape factors to do with 'capturing attention'. The latter factor is not a monocular *depth* cue as such but there is the potential for distorted results if one or two shapes are disproportionately selected as the target for reasons that could be described as 'relative attractiveness'.
- Positional cues relating to where the shapes appear in relation to the edges of the display window are reduced by the shapes not being mounted exactly centrally on the rods. This means that their positions change subtly when they are slightly rotated. The tester is advised to vary slightly the rotation of *all* shapes between presentations to exploit this design feature. For the animal targets, care needs to be taken that they are not rotated far from their upright positions. This potential position cue can also be controlled by occasionally swapping the positions of the shapes in the support frame, if the tester is doubtful about a patient's response.
- **Rotating all shapes slightly on each trial** also ensures that the target cannot be detected on the basis of it being the only shape whose orientation has altered between trials.
- Opportunities for the observer to see which shape is being selected as the target, when rod positions are being adjusted between presentations, are prevented in the NFD2 by the front door being closed when rods are being adjusted, and the side

panels that screen the tester's hands when adjustments are being made.

- Finally, the test procedure is to ask the hesitant observer whether they see a *depth difference* when making their responses. This helps direct attention to depth as the proper basis for responding, rather than to potential monocular cues.

The effectiveness of these various precautions has been tested extensively by using normal observers restricted to monocular viewing and by using observers lacking stereopsis. Nevertheless, we reiterate by way of giving emphasis that as for all forms of vision testing the clinician needs to be on guard against inappropriate responding.

In the case of the NFD2, if an observer responds slowly to the larger disparities while saying something like: "I am not sure which is nearest but I will go for shape X", then the tester needs to be cautious. Hence, as for other tests, clinical judgement is important for the correct use of the FD2, with due notice taken of the general style of responding, such as the speed and confidence of the observer's decisions. **The NFD2 is supplied in good faith as a guide in assessing an observer's stereopsis. The diagnosis and any resulting action is the sole responsibility of the practitioner.**

G. NFD2 TESTING METHODOLOGY

See summary chart giving the following steps in a flow chart format.

1. **Arrange for the NFD2 to be viewed squarely and at eye level. The observer's head should be stationary once testing proper begins.**

2. **Train for Test Understanding.** It is critically important for any clinical test that the observer knows what is required before the test proper is begun. In the case of the NFD2, it should first be established that the observer understands the task of naming the nearest shape. This is often easily done by setting up the largest disparity (50" at 6 metres) and asking whether the observer sees a depth difference. Many observers immediately understand this simple request. Others do not and need to be helped. For example, the tester can try putting a hand in the FD2 to touch the target shape, or the observer can be shown the FD2 shapes at near. This can be done by inviting the observer to walk up to the FD2, or by taking out the support frame holding the shapes and bringing it to the observer. In either case, one shape should be

made to protrude to the full extent, and the observer then asked to say “Which of the four shapes is sticking out from the others?”, or “Which shape is closest to you?” This should be repeated if necessary, with a different shape as the target and with different rod settings, until the tester is convinced that the observer understands the task.

3. It should be explained during the training phase that any shape might be the one “sticking out”. Monocular cues are permitted in this *Test Understanding* phase, e.g. head movements are allowed. Indeed, it can be valuable to exploit monocular cues deliberately during the training phase for observers suspected of having reduced stereopsis, to ensure that subsequent poor performance on the FD2 is not due to poor test understanding. For example, if the support frame is taken from the NFD2 and shown at near then it can be shown sideways to reveal the depth difference needing to be identified.

4. Finally, it is necessary to check during the FD2 training phase whether the observer can name the shapes. Some observers prefer to call the arrow a triangle or a tree, or the cross may be called a plus. These different labels do not matter as long as the observer is consistent and makes clear which shape is chosen. Also, a matching response card is provided for patients who prefer not to call out their choices but top indicate on this card which shape they have selected.

5. **Testing then proceeds at 6m (or other chosen distance; all directions here are described for 6m trials but they translate straightforwardly to 3m and 4m distances)**. The front door is closed and one rod is selected at random and set to protrude to the 50" mark. All rod disparity markings should be aligned with the *front surface* of the transparent support frame. When moving the rods avoid grasping the shapes. All rods other than the one supporting the target should be set so that their shapes are resting up against the front of the support frame. When all the rods are in place and all have been rotated slightly to mask a potential position cue (see above), open the front door to reveal the shapes. The observer is asked to identify the target shape by name, or by pointing to it on the matching card, as the one that appears closest to them, and/or as the one that appears to be sticking out in front of the other shapes. Be sure to ask the hesitant observer whether the chosen shape appears to be at a nearer depth (see remarks above). If guessing is suspected, it can be useful to set all shapes

to have the same depth (called in psychophysics a 'catch trial'). It can also be helpful to make a game of the NFD2 for very young children, as they often like the task of "*Finding the Special Shape when The Magic Box is opened*!"

6. If the patient makes an incorrect response on the initial presentation of 50" then repeat this disparity with a second shape selected at random. If an error is made a second time, record *N**FD2 –ve***.

7. If the 50" target is selected correctly but hesitantly, then make a further presentation at 50" with a randomly selected shape before proceeding to a smaller disparity. Use clinical judgement in deciding how to proceed thereafter for such an observer, bearing in mind the various precautions referred to above. If the observer's endpoint appears to be in the 50-40" range, then use the more stringent criterion of 4 out of 5 responses for these values, as a precaution against inappropriate responding.

8. If the 50" target is selected correctly and confidently then close the front door, select at random a shape and set it to protrude, with all other shapes pressed up against the front of the support frame. Choose a disparity for the target rod using the following principle: ***roughly halve the last disparity for the next presentation***. Thus, if a correct choice is made at 50" then the next presentation is 25". For correct responding throughout, the sequence would therefore follow on as 15", then 10" and finally 5". If the observer makes two out of three correct choices at the finest disparity difference then record ***NFD2 5"***.

9. If after getting 50" correct an observer makes an incorrect choice at a smaller disparity, then the tester should select a larger disparity and proceed with the **overall goal of finding the disparity for which the observer makes at least two out of three correct and confident responses**. For example, if 50" was correctly perceived but an error occurred for 25", then the next setting might be 35" or 40". If this is responded to correctly then the next step could be 30", or perhaps back to 25" to check that level again, or 35" or 40" could be repeated first. Using roughly halving steps speeds up the process of finding the threshold stereoacuity level, but clinical judgement should be exercised in pursuing a reliable NFD2 endpoint. Due note should be taken that the NFD2 is a clinical test that has to recognise the constraints on time available for testing and the (often) limited observer

compliance for long presentation runs. The NFD2 aims at supplying a reasonable estimate of distance stereoacuity: it is not intended to mimic a proper psychophysical study.

10. When the observer's threshold stereoacuity level has been found, defined for the NFD2 as the smallest disparity for which the observer makes at least two out of three correct choices, then record this level as ***NFD2 in sec arc***.

11. For younger children with short attention spans, it might be necessary to attempt fewer presentations.

12. **General Precautions concerning the avoidance of monocular cues should be observed at all times**. The introduction of the monocular test phase (see next) does not relieve the tester of using careful NFD2 testing practice during the binocular phase. Thus the NFD2 should be viewed squarely at eye level height, with no head movements allowed. Avoid cues as to which shape has been selected as the target when adjusting the rods in between presentations by rotating the rods slightly between trials. Check hesitant responses by asking for reports of perceived depth differences and consider extra presentations if in doubt, particularly for the larger disparities.

13. **Monocular Test Phase.** Occlude the non-dominant eye and go back two markings on the rod from the level reach during the binocular phase. If the observer fails to find the target then *Record the NFD2 Binocular Disparity Score as confirmed.* If the target is found then proceed to find the monocular threshold using the same general procedure employed for the binocular threshold, except reduce target depth by single rod markings. If this threshold is worse than the Binocular Threshold then *Record the NFD2 Binocular Disparity Score as confirmed.* If it is equal to or better than the Binocular Threshold then *Record the NFD2 Inconclusive.* [*Note*: Holmes & Fawcett (2005) recommend going back to the largest disparity target setting to launch the Monocular Test Phase. This entails a longer monocular test phase which we avoid by starting only two markings back from the binocular threshold.]

H. EXPERIENCE WITH THE FD2 and NFD2

We have reported encouraging early FD2 results to meetings of the International and European Strabismological Associations[1, 7]. Our present

data indicate that the FD2 6m norm for young adults with no ocular abnormalities aged 19-22 yrs is about 10” (SD=6.8”, N=217, no significant gender differences). Hence our present confidence limit estimate for a ‘normal adult’ response is 25” or better – see Table of Stereoacuities. These figures have been confirmed for the NFD2 in a large study by Read *et al,* in press).

Repeating FD2 measurements on a subset of this sample (N=30) two months later produced a reliability correlation coefficient of r=0.42 ($p<.05$, r^2 =0.18). This value is reasonable given that for these young normal subjects the data were bunched largely in the <15” range. There was a small (mean about 3”) but significant improvement on retest ($p<.01$).

Patients with microtropia and/or anisometropic amblyopia would be expected to have reduced stereoacuities. The capacity of the FD2 to detect this was tested on a small sample of 11 such patients. Their FD2 mean of 36” was significantly worse ($p<.01$) than the mean of 23” from a sample of 19 patients for whom no stereovision impairments were suspected and who served as a clinical control group.

A group of nursery children (N=30) aged 4 years tested at 6m by colleagues in Newcastle[8] produced a mean of 30”, SD=13”. This is too small a sample to estimate a usable confidence limit and work is in progress to enlarge it, but it may serve as a useful guide in the meantime.

Data from nursery children (ages 3-5 years, N=30) using a 4 metres test distance suggest that the FD2 norm for these young children at that distance may be about 34”, SD=21”. Again, this needs confirmation.

We anticipate these preliminary results being checked and refined as experience with the FD2 continues to grow over the next few years and the same will happen we hope with the NFD2 (Read *et al,* press, have begun this process with a large study aimed at establishing test norms).

FD2 Maintenance Few problems have emerged. However, sometimes careless handling has led to a shape being broken off its support rod. A shape can be refixed using a small quantity of an adhesive of the *Super Glue* type, making sure that the shape is kept perpendicular to the rod. Be sure to glue at the 5 sec arc end of the rod.

References

1. Davis, H., Frisby, J.P., Walters, B.C. (2002) The Frisby Davis Distance Stereotest. *Transactions of the 27th European Strabismological Association, 33-36.*
2. Holmes, J.M. & Fawcett, S.L. (2005) Testing distance stereoacuity with the Frisby-Davis 2 (FD2) test. *Am J Ophthalmol*139: 193-195
3. Davis, Toft, Buckley & Frisby, (2005) Evaluation and circumvention of monocular cues in the FD2. Poster at European Strabismological Association, Killarney, Eire.
4. Jiménez, R., Pérez, M.A., García, & González, M.D. (2004) Statistical normal values of visual parameters that characterize binocular function in children. *Ophthal Physiol Opt* 24: 528-542
5. MacLachlan, C. & Howland, H.C. (2002) Normal values and standard deviations for pupil diameter and interpupillary distance in subjects aged 1 month to 19 years. *Ophthal Physiol Opt* 22: 175-182
6. Frisby, J.P., Patchick' E., R. Edgar' R & Davis, H. (2004) Does stereoacuity correlate with interpupillary distance for normal observers? Proceedings of Xth International Orthoptics Congress, November 2004, Melbourne, Australia.
7. Frisby, J.P., Davis, H. (2003) Clinical tests of distance stereopsis: the state of the art. Progress in Strabismology *the 9th International Strabismological Association*, 187-190.
8. Adams, W, Richardson, S., Haggerty,H., Hrisos, S., Clarke,M.P. (2005) Distance Stereopsis Testing In Children Using The Frisby - Davis Distance Stereopsis Test (FD2). *Submitted.*
9. Young, B.J., Wylie, J.M. & Kaye, S.B. (2005) The Frisby Davis Distance (FD2) Stereotest Investigated at Different Distances Using Combined, Monocular and Binocular Depth Discrimination Thresholds. *Invest. Ophthalmol. Vis. Sci*. 46: E-Abstract 5638.
10. Holmes, J.R, Birch E.E.,Leske, D., Fu, V.L., Mahoney, B.G. (2007) New tests of distance stereoacuity and their role in evaluating intermittent exotropia. *Ophthalmology* **14** (6): 1215-1220.
11. Leske, D., Birch E.E., Holmes, J.R. (2006) Real depth vs Randot stereotests. *American Journal of Ophthalmology* **142** (4) 699-701.

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For further information

See our website at www.frisbystereotest.co.uk for further advice and details on ordering. You can also email us direct in Sheffield:-

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Notes Page

Notes Page

Table of FD2™ STEREOACUITIES

Rounded to 5 sec arc for clinical practice. Rod marks show values for 6m from the support frame of the shapes and for IPD 6.5cm. The table gives conversions for 4m and 3m. ***Caution*** – Be sure to use the monocular test phase for 4m and 3m, see *Test Instructions*.

6m	*4m*	*3m*
50	115	200
45	100	180
40	90	160
35	80	140
30	70	120
25	55	100
20	45	80
15	35	60
10	25	40
5	10	20

FD2 6 metre Norms for Normal Adults 19-22yrs
Mean c. 10sec arc
Confidence Limit 25 sec arc or better