Instructions for Use

LANG-STEREOPAD®

Content

Purpose and Indication 4
How the Test works 4
Screening and Assessment of Stereopsis 7
- Subjects with Stereopsis 7
- Subjects with poor or absent Stereopsis 7
Preferential Looking Procedure 9
- Subjects with Stereopsis 9
- Subjects with poor or absent Stereopsis 9
- Triple-selection Arrangement 9
Assessment of Stereo Threshold with Staircase Method 11
- Disparities and Stereo Objects of the six Test Cards 12
- Combination of Staircase and Preferential Looking method 12
Test Design and Objectives 14
Detection of Random Dot Stereopsis 15
Preferential Looking Procedure especially for Preverbal Children and Infants 16
General Recommendations and Notes 17
- Visual Acuity, Refractive Anomalies 17
- Viewing Position 17
- Orientation of the Test plate, Arrangement of the Test Cards 17
- Cooperation of the Subject 18
- Examination of Preverbal Infants and Adults with Loss of Speech (Aphasia) 18
- Test Card Back Side 19
- Stacking and Automatic Alignment 19
Difficulties in Testing 20
Interpretation and Test Repetition 21
Storage and Care, Warnings 22

Purpose and indication

Purpose: The LANG-STEREOPAD® (Ref 501) is an orthoptic product for binocular diagnosis and screening of stereopsis disorders in all age groups from 6 months of age onwards, applicable by healthcare professionals.
Indication: Loss of stereopsis is considered a key symptom of amblyopia (weak eye). Therefore, non-recognition of random dot stereograms may indicate a previously undetected, treatable disorder of binocularity (e.g., microstrabismus, anisometropia).
Contraindication: There are no contraindications for the use of the LANG-STEREOPAD®.

How the Test works

Please familiarise yourself with the LANG-STEREOPAD® by placing the STAR 1000 magnetic test card on the centre of the test panel in portrait position, with the grooves of the lenticular lens oriented vertically (Fig. 1). First, examine the test card with both eyes at your usual reading distance of 35–40cm. Then cover one of your eyes for viewing. Please use your corrective glasses or reading glasses for this exam.

For those with binocular stereo vision, the observer easily recognises the test object with both eyes, which clearly stands out from the equally patterned background. This depth effect is generated solely by the disparity of the test object from the background. If only one eye examines the test card, the test object disappears.

Now turn the test panel counterclockwise 90° so that it is now in landscape position (Fig. 2). The grooves of the lenticular lens on the test

card now also run in the horizontal direction. The test object is not recognisable in this position either with double-eyed or with one-eyed observation. A further 90° rotation of the test panel and/or the test card in the same direction of rotation causes the grooves of the test card again to run vertically, and the test object is now seen upside down.

Fig. 1
Test panel in portrait position, test card with vertical grooves of lenticular lens: Test object recognisable.

Fig. 2
Test panel rotated 90° counterclockwise, now in landscape position, test card with horizontal lenticular lens: Test object not recognisable.

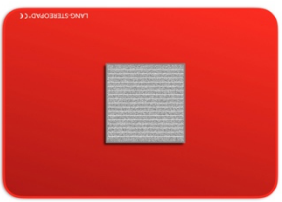


Fig. 3
Test card stack: The test cards are magnetically attached to each other. Their grooves are automatically aligned in the same way.

Examiners with limited or no binocular stereo vision can also use the test. The names of the various test objects and cross-disparations are noted on the back of the test cards. There is also a rounded indentation in the lower quarter of the back to help align the test card on the examination plate.

Please note that the test should always be performed with the test plate and test cards resting on it, but never with the test cards alone. The test plate should always be held still by the tester, not by the test person.

On pages 7-13 you will find a short introduction to the possible applications of this test: Screening, Preferential Looking Method and Stereo Threshold.

Detailed information on the application as well as technical specifications can be found from page14 onwards, general information as well as help in case of difficulties from page 17 onwards.

Screening and Assessment of Stereopsis

The subject is presented a single test card in the middle of the test panel (portrait or landscape position) with vertical orientation of the grooves of the lenticular lens (page 5, Fig. 1).

Subjects with Stereopsis

Subjects with stereopsis usually recognise the test object within a few seconds.

There are two ways to confirm this result:

1. Turn the test panel 90° counterclockwise (from portrait to landscape position). The test object disappears. Turn the test panel again 90° (from landscape to upside down portrait position): The test object can be identified upside down. The subject should comment on the observed changes at each step (page 8, Fig. 4).

2. Attaching a second test card with a different disparity below or next to the first test card on the test panel, also with vertical lenticular lens. The subject should then point to the test object which stands out more prominently from the background (Fig. 5).

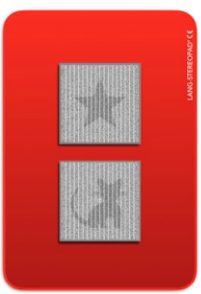
Subjects with poor or absent Stereopsis

When being asked what they can see, subjects without stereopsis typically keep searching for recognisable test objects, until they answer 'nothing'.

The examiner should avoid providing the subject with assistance, for example by asking questions in a suggestive manner or presenting a one-eye-visible image of the test object.

Fig. 4
Confirmation step 1 in subjects with stereopsis:
Turning the test panel 90° counterclockwise will cause the test object to disappear. Further rotation of the test panel 90° in the counterclockwise direction leads to the reappearance of the test object, but upside down.

Fig. 5
Confirmation step 2 in subjects with stereopsis:
By attaching a second test card with different disparity on the panel, the two test objects show a different prominence from the image plane, which is to be compared by the subjects.



Preferential Looking Procedure

In this procedure two test cards are attached to the test panel of the LANG-STEREOPAD® at the same time: one with vertically aligned grooves of the lenticular lens and thus a recognisable stereogram, the other next to or below it with a horizontal lenticular lens and therefore an unrecognisable stereogram (Fig. 6).

Subjects with Stereopsis

The subject with stereopsis will tend to turn to the card with the recognisable stereogram.

The finding can be confirmed as follows:

Rotate the test panel 90° counter-clockwise (Fig. 7). The subject with stereopsis now recognises the test object on the second test card, which was previously not recognisable. The previously identified test object has now disappeared.

Subjects with poor or absent Stereopsis

In the absence of stereopsis, however, the subject's gaze alternates between the test cards, before it begins to wander.

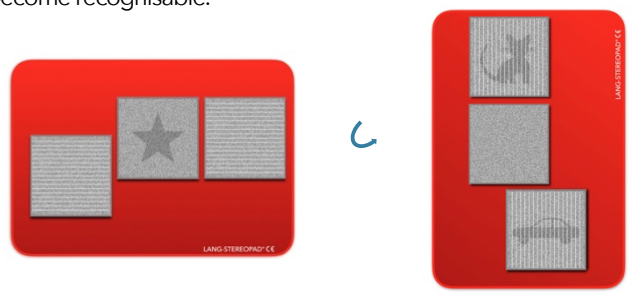
Triple Selection Arrangement

Instead of using two test cards (two-alternative forced-choice task), the same procedure can be used simultaneously with three test cards (Fig. 8). The probability of a random hit is thereby reduced from 50% to 33%.

Fig. 6
Test panel in landscape position, right test card with identifiable STAR 1000, left test card with horizontal lenticular lens and hidden CAT 400.

Fig. 7
Confirmation step by turning the test setup 90° counterclockwise: The now above STAR 1000 is hidden. The test object CAT 400 becomes visible on the test chart with vertical lenticular lens below.

Fig. 8
Example of triple selection: After rotating the test arrangement by 90° counterclockwise from landscape to portrait position, the STAR 1000 in the middle disappears. Instead, the CAT 400 (top) and the CAR 600 (bottom right) become recognisable.



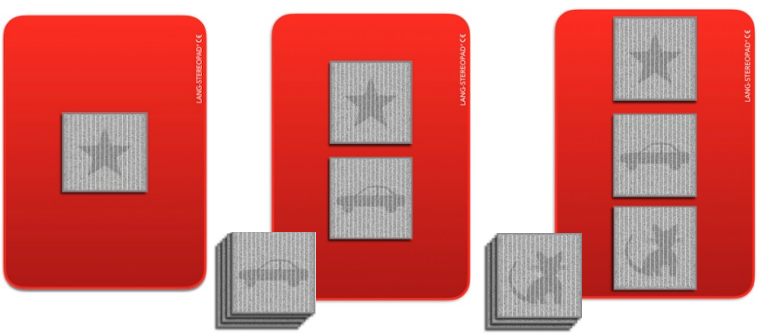
Assessment of Stereo Threshold with Staircase Method

The stereo threshold is defined as the lowest disparity that a test object must have for the subject to see it against the background.

After stereopsis has been detected during screening, the stereo threshold can be determined in a further step. In this case, starting from the screening test arrangement with the test card with the largest transverse disparity (STAR 1000), test cards with descending transverse disparity are presented successively (staircase method). The disparity of the test object with the least disparity, which is still recognised by the subject, is recorded as the stereo threshold.

The cards CAR 600, CAT 400, MOON 200, SUN 100, and finally STAR 50 are placed step by step on the test panel below the first test card. Already recognised test cards can be continuously pushed upwards and removed or left for comparison (Fig. 9).

Fig. 9 Determination of the stereo threshold: first three steps



Disparities and Stereo Objects of the six Test Cards

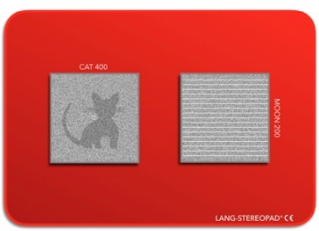
STAR 1000″	MOON 200″
CAR 600″	SUN 100″
CAT 400″	STAR 50″

Combination of Staircase and Preferential Looking Method

A combination of the stepwise (or staircase) method and preferential looking techniques may also be used. For this purpose, two test cards with test objects are arranged in descending disparity on the front and back of the test panel in such a way that the test card with the next smallest disparity becomes recognisable after 90° rotation or turning of the test panel (Fig. 10, Fig. 11).

Fig. 10
Example with four disparity steps: 400-200-100-50: Preparation of test panel.

Front: left CAT 400 recognisable, right MOON 200 invisible.



Back: left STAR 50 recognisable, right SUN 100 invisible.

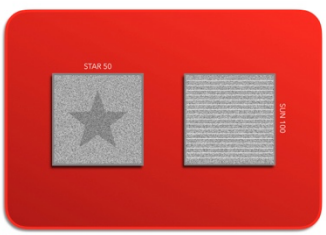
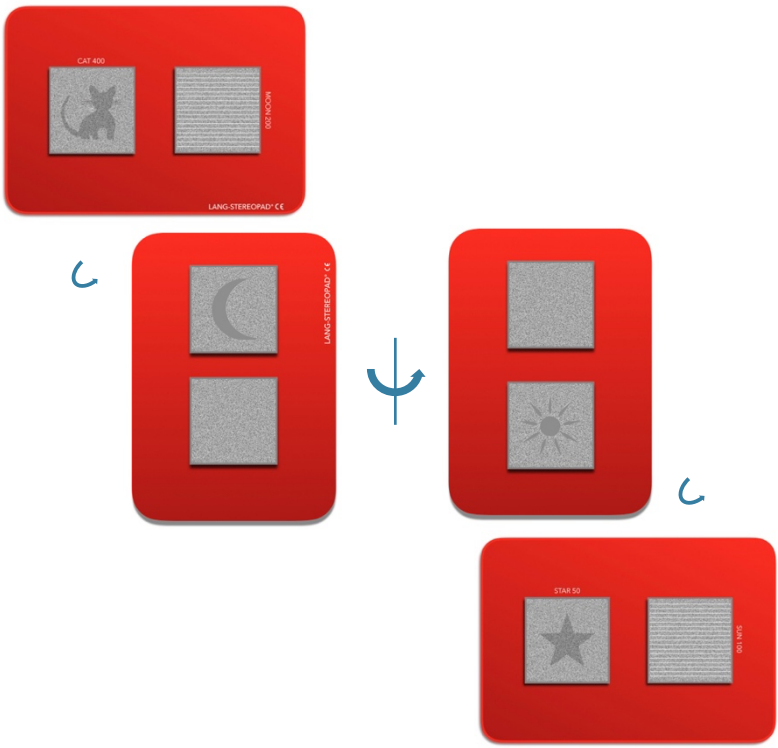


Fig. 11

1. Presentation of front in landscape position: CAT 400 visible on test card.
2. 90° counterclockwise rotation to portrait position: CAT disappears, and MOON 200 appears on upper test card.
3. Turn to back: SUN 100 visible on lower test card.
4. 90°counterclockwise rotation to landscape position STAR 50 visible on left card, while SUN 100 disappears.



Test Design and Objective

The LANG-STEREOPAD® is a test system for the detection and assessment of binocular stereoscopic vision in adults and children. It examines global near stereopsis using random-dot stereograms. Random dots are patterns that serve to camouflage the test objects against the same patterned background. The image separation of the stereograms is performed by an optical lenticular lens, hence no haploscopic test glasses are needed.

The LANG-STEREOPAD® uses the same technical principle as the LANG-STEREOTEST®, but allows more sophisticated examination possibilities. The test cards are presented by the examiner individually or in groups on the test panel. The order and arrangement of the test cards can be varied depending on the purpose of the examination. The variability of arrangement and sequence provides – in contrast to many other stereo tests – particularly reliable and easier-to-interpret test results. The guessing of the test objects or recognition in the case of monocular viewing is prevented by the perfect camouflage of the test objects and the square shape of the test cards.

The test consists of a red test panel with a soft PVC surface and a stainless-steel core, as well as six square magnetic test cards, which can be placed in any position on either side of the test panel. Each test card contains one of five different test objects that can be seen in presence of binocular stereoscopic vision. The test objects have disparities in the increments of 1000, 600, 400, 200, 100, and 50 seconds of arc. The respective test object can only be perceived if the test card is oriented so that the lenticular lens runs in the vertical direction. If the test card is viewed with only one eye or rotated 90° so that the lenticular lens is horizontal, the test object remains invisible.

Detection of Random-Dot Stereopsis

Random-dot stereogram testing is widely considered to be one of the most important detection methods of binocular vision. Random-dot stereopsis is a strong indicator of a normally functioning visual system. Random-dot stereopsis can be detected in children from only a few months old. Several congenital or acquired visual disorders and conditions are, however, associated with a limitation or loss of random-dot stereopsis, particularly amblyopia, multiple forms of strabismus and anisometropia.

The LANG-STEREOPAD® (like the LANG-STEREOTEST®) allows the detection of binocular stereo vision, without the use of test glasses. In addition, the random-dot stereo threshold can be determined in six gradations. The stereo threshold depends upon the age of the subject as well as the presence of visual disorders which are associated with limitations of stereopsis. The modular design of the test system allows its use in all age groups, as well as in persons with cerebral impairment with or without aphasia.

Preferential Looking Procedure especially for Preverbal Infants

The preferential looking method is suitable for testing visual functions especially in young children or in persons with a cerebral impairment, who cannot verbally express their perception. Simultaneously, the subject is presented with two images of the same kind. One of them contains a visual stimulus, the other contains no visual stimulus. With simultaneous presentation of both images, the subject's gaze, after the needed time of exposure, usually sticks to the one with the visual stimulus. If both images are considered the same length on average, or if the subject loses interest in the images, it is assumed that he or she lacks the ability to perceive the visual stimulus and distinguish between the two images.

The LANG-STEREOPAD® allows different variants of the preferential looking method which can be used for the examination of preverbal infants and persons with speaking disorders. Two or more test cards are simultaneously presented, of which only one contains the stereoscopic stimulus (card with vertical lenticular grid, see pages 5-6).

It is important that the examiner closely observes the gaze movements of the subject in order to determine whether, after a longer period of observation, the gaze sticks to the test card with the stereoscopically recognisable test object. This specific fixation behaviour is considered a criterion of distinction between subjects with and without stereopsis.

General Recommendations and Notes

Visual acuity, Refraction Anomalies

The LANG-STEREOPAD® was designed primarily for subjects with normal visual acuity. For the examination of children under one year or for patients with reduced visual acuity, the two test cards with the largest cross disparities, STAR 1000 and CAR 600, should preferably be used, as these have a slightly coarser dot pattern than the other test cards. Patients with refractive anomalies should wear their own prescription glasses or contact lenses for the test.

Viewing Position

The viewing should be done at the preferred reading distance (about 35–40cm). The test cards should always be presented or viewed on the test panel. Under no circumstances should they be held by the examiner or the patient during the test. The test panel should either be held steady by the examiner or placed on the stand (sold separately) at the desired angle.

Alignment of the Test Panel, Arrangement of the Test Cards

The test panel can be used on both sides and in both portrait and landscape position. The test cards can be freely placed on it. The simultaneous presentation of more than three test cards is not recommended except for the preferential looking. The test cards should be presented either with a vertical or a horizontal lenticular lens, and not obliquely. The test cards with asymmetrical test objects (CAR 600, CAT 400 and MOON 200) can also be used upside down to assess subjects who are already familiar with the test object. One can ask which direction the car is driving , or on which side the tail of the cat

lies. With the test object moon (MOON 200) the patient can be asked to show the curvature with his or her finger. For the test objects star (STAR 1000, STAR 50) and sun (SUN 100), the number of points or sunbeams can be queried.

Cooperation of the Subject

The cooperation of the patient and any accompanying person is very important. The test should therefore be carried out with sufficient time and in quiet environmental conditions. Pressure from the examiner or other people present should be avoided. The subject should be given some time to adapt and find the ideal viewing position. Subjects should be asked if they can recognise something on the grey surface. Suggestive questions should be avoided. They may be invited to point at the recognised test object and name the object. This is especially useful for the preference looking process.

Examination of Preverbal Infants and Adults with Loss of Speech

The LANG-STEREOPAD®, in contrast to most other stereo tests, offers a multitude of possibilities for examining preverbal children in order to obtain a reliable result. Another application is the assessment of stereopsis in patients with aphasia, for example due to brain damage.
In addition to the cooperation of the accompanying parent, the examination of babies or particularly lively preverbal toddlers requires patience and good preparation. In order to arouse the children's interest, the LANG FIXATION CUBE can be shown in advance.

All more complex examinations, especially with the preferential looking procedure, must be prepared and practiced so that a seamless examination process is ensured, and the subject's attention is not lost

prematurely. It should also be prevented that small children grab and move the test cards on the test panel, and then become more interested in this 'game' than in the recognisable test objects.

Test Card Back Side

The test can also be performed by examiners who themselves have no stereo vision. On the back side of the test cards are the names of the test objects followed by a number corresponding to the transverse disparity in seconds of arc. The orientation of the test card and the lenticular lens can be quickly scanned using the rounded dent in the bottom quarter of the back. However, the back of the test cards should never be shown to the subjects.

Stacking and Automatic Alignment

If the examiner wants to place the test cards in a specific order on the test panel, the test cards can be prepared in a stack. The arrangement of the magnets in the test cards ensures that the test cards align themselves so that the grooves of their lenticular lenses run in the same direction (see page 5, Fig. 3).

Difficulties with Assessment

If a subject is unable to recognise a test object, the examiner should check if the lens grid of the presented test object is aligned vertically, and the viewing position and angle are correct.

Although some patients recognise the test objects as surfaces that are raised from the background, they may be unable to name their shape. For example, a child may identify another familiar object ('fish', 'turtle') instead of the car or recognise a 'dog' or 'mouse' instead of the cat. It is advisable not to rectify this immediately, but to offer the test subject another test card and to have him or her describe which of the two objects continues to stand out from the background.

As a rule, leading questions such as 'Don't you see a car?' should be avoided. On the other hand, the examiner can introduce a one-eye-visible stimulus, e.g., by touching the test object with a pointer. For some subjects, this assistance can lead to 'jumping in' of the corresponding stereo columns in the visual cortex and full random-dot stereo perception.

Especially lively children sometimes feel a certain compulsion to succeed and then try to guess the test objects. By rapidly turning or reversing the test panel – especially when two test cards with different orientations of the lenticular lens are used – those guessing can be easily detected. You can then do some 'magic' with the LANG-STEREOPAD® and perform a quick change of the test objects by means of panel rotation or reversing. The high optical quality of the lenticular lens and dot pattern used makes it impossible to guess or recognise test objects whose lenticular lens is not aligned vertically.

Interpretation, Repetition of Test

The detection of binocular stereo vision by means of LANG-STEREOPAD® does not rule out disorders of the visual system. The stereo threshold achieved on the LANG-STEREOPAD® is age-dependent and may differ from stereo thresholds achieved in other stereo tests. Of course, examination with the LANG-STEREOPAD® does not replace visual acuity testing.

The interpretation of the findings must be made in the clinical context. Patients with conspicuous findings should therefore be further assessed with complementary tests or re-examined later. Screening of stereopsis in children should be repeated according to current guidelines.

The responsibility for diagnostic and therapeutic decisions lies entirely with the user. Any liability for incorrect decisions is rejected.

Storage and Care

The test plate and the test cards are easy to clean but should be handled with care. The surfaces can be cleaned with a damp cloth, if necessary, with a little washing-up liquid. Scratching or abrasive materials and solvents must not be used. When not in use, the test plate and test cards should be stored in the product box supplied.

Warnings

Exposure to high heat or sunlight may cause deformation and discolouration of the test cards or the test plate, rendering them unusable.

The test cards must always be stored in a dry place.

The test cards and the plate support (sold separately) contain magnets that generate a magnetic field that could be harmful to pacemaker wearers.

Avoid exposure of electronic devices (mobile phones, computers, tablets, etc.) to the magnetic parts of the test. No liability is accepted for damage to persons or objects due to magnetic causes.

The LANG-STEREOPAD® should not be left for children to play with.

Check the functionality of the test cards before each use.

Serious incidents must be reported to the manufacturer and the competent authority.

Development, Design, Production and Distribution

LANG-STEREOTEST AG, 8700 Küsnacht, Switzerland

Scientific literature

Rowe, Fiona J. PhD, et al., Strabismus 2019 Jul 22: 1-9
Comparative analysis of the Lang-Stereopad in a non-clinic population.
Piantanida, A.C., et al., Transactions 40th Meeting of the European Strabismological Association Helsinki 2019: 189-194
Statistical Evaluation in Pediatric Patients of the New Lang-Stereopad Test: A Preliminary Report

Online LANG-STEREOPAD® - Intro und Tutorial

https://www.lang-stereotest.com/pages/lang-stereopad-video-introduction-tutorial-results-daily-practice-2018

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