STUDY OF ADULT STRABISMUS TESTING PROCEDURES MANUAL

Version 3.0
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Table of Contents

Convergence Insufficiency Symptom Survey (CISS)

Convergence Insufficiency Symptom Survey (CISS)

Description
The CISS is a 15-item self-administered questionnaire designed to assess the severity of the subject's convergence insufficiency (CI) symptoms. At each follow-up visit, the survey must be completed before any clinical testing, unless otherwise instructed.

Procedure
1. Give the subject the symptom survey and instruct them to respond to each question by indicating the response that best reflects how their eyes feel when reading or doing close work.
2. Instruct subjects to choose only one response for each question.
3. If the subject has been wearing glasses (with or without prism) or contact lenses, subjects should respond as if they are wearing them, unless otherwise instructed.
4. Check responses for completeness while the subject is still in the office.
5. For scoring purposes, if a subject provides more than 1 response on a statement, ask the subject to select only one response. If the subject has left the office and is no longer present, record the response that is the more central response (closest to "sometimes").
6. Score each response on a scale of 0 to 4, with 0 representing the lowest frequency of symptom occurrence (i.e., never) and 4 representing the highest frequency of symptom occurrence (i.e., always) (Refer to bottom of form.)
7. After determining the score for each of the 5 columns, add column scores together to obtain the total CISS score.

Table of Contents

Diplopia Questionnaire

Diplopia Questionnaire

Description
The Diplopia Questionnaire is an 8-item self-administered questionnaire designed to assess the presence and frequency of diplopia in specific gaze positions. At each follow-up visit, the questionnaire must be completed before any clinical testing, unless otherwise instructed.

Procedure
1. Give the subject the questionnaire and instruct them to respond to each question by indicating the response that best reflects how their eyes feel when reading or doing close work.
2. Instruct subjects to choose only one response for each question.
3. If the subject has been wearing glasses (with or without prism) or contact lenses, subjects should respond as if they are wearing them, unless otherwise instructed.
4. Check responses for completeness while the subject is still in the office.
5. For scoring purposes, if a subject provides more than 1 response on a statement, ask the subject to select only one response. If the subject is no longer present, record the response that is the more central response (closest to "sometimes").

[Table of Contents](#)

Adult Strabismus 20 (AS-20) Questionnaire

Adult Strabismus 20 (AS-20) Questionnaire

Description
The AS-20 is a 20-item self-administered questionnaire designed to assess the impact of strabismus on the subject's health related quality of life. At each follow-up visit, the questionnaire must be completed before any clinical testing, unless otherwise instructed.

Procedure
1. Give the subject the AS-20 and instruct them to respond to each statement by circling the response that best reflects how they feel based on their experience over the past month.
2. Instruct subjects to circle only one response for each statement.
3. If the subject has been wearing glasses (with or without prism) or contact lenses, subjects should respond as if they are wearing them, unless otherwise instructed.
4. Check questionnaire responses for completeness while the subject is still in the office.
6. For scoring purposes, if a subject circles more than 1 response on a statement, ask the subject to select only one response. If the subject is no longer present, record the response that is the more central response (closest to "sometimes").

Ocular Alignment Testing

Required Equipment
- Opaque (not translucent) occluder
- Loose plastic prism set [increments 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 16, 18, 20, 25, 30, 40, 45, 50 prism diopters (Δ)]

General Instructions for all Cover Testing Procedures

- Cover testing must be performed by a pediatric ophthalmologist, pediatric optometrist, or a certified orthoptist.

- The patient should be wearing his/her optical correction.
  - If prism has been prescribed, testing should be performed without prism.

- If the patient has an anomalous head position (i.e., face turn, head tilt, chin tip), straighten the patient's head position for primary gaze measurements.

- Select a detailed target that has features to control the patient's attention and accommodation. If the patient has reduced visual acuity, select a threshold target for the amblyopic eye.

- Both distance and near target placement should be in the patient's primary gaze. Use normal room illumination.

- Alignment testing should be done in the following order:
  1. Cover-uncover
  2. Simultaneous Prism and Cover Test (SPCT)
  3. Prism and Alternate Cover Test (PACT)

General Instructions for Measurement with Prisms

- Alignment should be measured using plastic prisms (not glass).

- Loose prisms or prism bars may be used.

- Prisms should be held in the frontal plane position with patient looking in the straight ahead (primary) position.

- **A single (versus split) prism** should be used for measuring angles ≤ 50 PD (see Table 1).

- **Two nearly-equally-split prisms** (one prism over each eye) should be used for measuring angles > 50 PD (*applies to PACT only*) (see PACT).

<u>Selection of Prism(s)</u>
The prisms to be used for measuring ocular alignment are described in Table 1:

Table 1: Measurements with Prisms

Deviation Magnitude	Prism Measurement Steps	SPCT: Prism Measurement	PACT: Prism Measurement
1 – 10Δ	1Δ	Single prism*	Single prism
11 - 20Δ	2Δ	Single prism*	Single prism
21 – 50Δ	5Δ	Single prism*	Single prism
>50Δ	5Δ	Do not measure: Record ">50Δ"	Split prism OD/OS according to Table 2

*For SPCT, the single prism should be held over the deviating eye detected on the cover-uncover test.

<u>For measuring angles larger than 50PD by PACT:</u>

Use two prisms with the total amount of prism nearly-equally split between the prisms to be held over each eye. Because various combinations of prisms totaling the same amount (i.e., 50 and 10, 35 and 25) represent different true deviations, a specific combination of prisms should be used for each recorded value. Table 2 contains the appropriate combinations of prisms to use. The specific combination should be two different prisms which nearly-equally split their sum, with the sum being the recorded value.

Table 2: Combinations of Split Prisms for Measuring Angles >50 PD by PACT

Total	Prism 1	Prism 2
55	30	25
60	35	25
65	35	30
70	40	30
75	40	35
80	45	35
85	45	40
90	50	40
95	50	45

Prism 1 should be held over one eye and Prism 2 should be held over the other eye.

The first column is the value to be data entered as the measurement (i.e., the sum of the two labeled prisms).

Cover-Uncover Test

Description
The cover–uncover test is used to determine whether a tropia is present or not. The examiner is looking for re-fixational movements of one eye as the fellow eye is covered. If the unoccluded eye moves to take up fixation a manifest deviation, or tropia, is present. If a tropia is present, the direction, frequency, and eye laterality are determined. The test is performed first at distance fixation (6 m) and then at near fixation (1/3 m or 33 cm).

Procedure
1. Testing should be done with the subject wearing his/her refractive correction if applicable.
2. While the patient looks at a distance fixation target at 6 meters, the examiner covers one eye with an opaque occluder. While covering the eye, the examiner looks for any re-fixational movements of the fellow eye. If the unoccluded eye moves to take up fixation, a manifest deviation (i.e., a tropia) of that eye is present.
    - The occluder should be held in front of the eye, allowing time for re-fixational movements before removing the occluder, after which the occluder is removed to allow binocular viewing conditions.
    - This procedure should be repeated several times to rule out false-positive movements due to poor fixation or inattention.
3. The test is repeated covering the other eye at distance.
4. Testing is repeated for near fixation at 1/3 meter (33cm).

Simultaneous Prism and Cover Test (SPCT)

Description

The Simultaneous Prism and Cover Test (SPCT) is used to measure a tropia under binocular viewing conditions. The SPCT is performed at both distance (6 m) and near (1/3 m or 33 cm) fixation using an accommodative target (never a fixation light). Plastic (not glass) loose prisms or a prism bar should be held in the frontal plane position.

Set-up
1. SPCT testing should only be performed on subjects with identified strabismus based on cover/uncover testing.
2. In addition, SPCT should only be performed at the fixation distance/s where the deviation was manifest.

Procedure

1. Determine the fixating eye by a cover-uncover test.
2. Start with binocular viewing for the subject.
3. Rapidly and simultaneously, position a cover paddle before the fixating eye while placing a single appropriately-oriented prism(s) before the deviating eye.
4. As the paddle and prism(s) are introduced, watch for movement of the deviating eye.
5. Remove the cover paddle and prism(s).
6. Repeat steps #2-4, adjusting the power of the prism(s) until no movement of the deviated eye is seen. Increase the magnitude of prism(s) until a reversal of the movement of the deviating eye is seen i.e., the prism overcorrects the deviation. Record the magnitude of prism(s) that is closest to producing no movement (neutral).

Note: If the patient has an intermittent tropia, which is not of sufficient duration to measure the SPCT, the type of tropia will be recorded and the size of the SPCT measurement will be recorded as 0 PD.

Note: In some cases (e.g., paretic or restrictive strabismus), the amount of deviation will differ depending on which eye has the prism in front of it.

SPCT should always be performed before PACT.

Prism and Alternate Cover Test (PACT)

Description

The Prism and Alternate Cover Test (PACT) is used to measure the full magnitude of a patient's strabismus, which includes the manifest tropia and any latent deviation. The PACT is performed at distance (6 m) and near (1/3 m or 33 cm) fixation (sometimes at remote distance fixation also) using an accommodative target (never a non-accommodative target such as a fixation light). Plastic (not glass) loose prisms or a prism bar should be held in the frontal plane position.

Procedure

1. Place an appropriately-oriented prism(s) in the frontal plane position before one eye.*
2. Alternately, occlude the eyes with a cover paddle and observe the re-fixation movement of the just-unoccluded eye.
    a. Move the paddle briskly between the right and left eyes to maintain dissociation. However, hold the paddle in front of each eye long enough to allow time for re-fixational movements before changing paddle position.
    b. Take care to completely occlude the eyes when covering.
3. Incrementally increase the prism(s) amount until reversal of the deviation is seen.
4. Record the magnitude of prism(s) that is closest to producing no movement (neutral).
5. Record the direction of the movement.

*When measuring angles larger than 50PD by PACT, use two prisms with the total amount of prism nearly-equally split between the prisms to be held over each eye. See Table 2 above for the specific combination of prisms that should be used for each recorded value.

Note: In some cases (e.g., paretic or restrictive strabismus), the amount of deviation will differ depending on which eye has the prism in front of it.

PACT should always be performed after SPCT.

Double Maddox Rod Test

Required Equipment
- Two Maddox rod trial lenses
- Focused handheld light source
- Trial frame

Double Maddox Rod Test

Description
This test is for subjective measurement of cyclotropia.

Procedure
1. Subject is placed in trial frames with Maddox rod lenses placed before each eye.
2. Hold the light source 1/3 meters from the subject and ask the subject to look toward the light.
3. Confirm that the subject sees 2 lines.
4. If the patient does not see 2 lines, consider turning the dials so that they are away from the vertical or horizontal and/or dimming the lights and/or holding up a small vertical prism in front of one lens until 2 separate lines are seen.
5. Ask the subject to turn the torsion knobs until the 2 lines are parallel to each other. It may be helpful to say, "Are the 2 lines going the same direction, parallel, like railroad tracks?"
6. Read the amount of torsion from the scale on the trial frame for each eye and record on the data form. If no cyclotorsion, select no cyclotorsion for that eye.
   a. NOTE: The amount of cyclotorsion is measured to the nearest degree as a difference between the straight up (90 degrees) or the straight across (180 degrees) and the value read on the scale. Select incyclotorsion or excyclotorsion.
      i. For example, a reading of 93 degrees on the right eye would be recorded as 3 degrees of excyclotorsion of the right eye. If no cyclotorsion is present (a reading of 90 degrees or 180 degrees) then select no cyclotorsion for that eye.
7. The net total amount of cyclotorsion will be calculated in analysis (e.g., 3 degrees of right excyclotorsion and 2 degrees of left incyclotorsion, will be analyzed as 1 degree of overall excyclotorsion

Fusion with Prism in Space

Fusion with Prism in Space

Required Equipment
- Loose plastic prism set [increments 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 16, 18, 20, 25, 30, 40, 45, 50 prism diopters (Δ)]
- Fixation target at 6 meters (20/50 optotype)

Description
Testing fusion with prism in space is a method to determine whether a diplopic subject has the ability to fuse the target in space.

Procedure
1. Ask the subject to view the 20/50 optotype at 6 meters.
2. Determine if any combination of prism(s) allows the subject to have single vision.

Table of Contents

Near Point of Convergence (NPC)

Near Point of Convergence (NPC)

Description
The near point of convergence (NPC) test is a measure of how well the eyes are able to converge when viewing a target that is brought progressively closer to the bridge of the nose.

Required Equipment
- Near Point Rule (rod with a moveable target and metric markings) (Gulden Ophthalmics #15150 or similar)

Procedure
1. Make sure the subject is wearing his/her refractive correction.
2. Ensure good illumination using ambient and overhead lighting
3. Position the Near Point Rule so that it is set at the brow right above and between the eyes (see figure).
4. Start with the moveable target on the rod at 40 cm from the subject and confirm single vision. If the subject reports double vision, then move the target further away until the subject reports single vision.
5. Instruct the subject to "keep the target single as long as possible".
6. Slowly move the target towards the subject at approximately 1 to 2 cm/s until the subject reports double vision or until a loss of fusion is observed.
7. If the target becomes double, stop moving the target and ask the subject "can you make it 1 or does it stay 2".
8. If the subject is able to regain single vision, go to Step 5. If the patient cannot regain single vision, record this value as the NPC break to the nearest ½ centimeter and go to the next step.
9. Slowly move the target away from the subject until the subject reports single vision or until a recovery of fusion is observed.
10. Record this value as the NPC recovery to the nearest ½ centimeter.

   NOTE: If diplopia is not reported but examiner notes a manifest tropia, the distance at which fusion is lost will be recorded as the "break" finding. Likewise, an examiner's observation of recovery of fusion will be recorded as "recovery."

Positive Fusional Vergence (PFV) at Near

Description
Positive fusional vergence (PFV) at near is a measure of how well a subject can converge his/her eyes using fusional vergence while maintaining the accommodative plane at 40 cm.

Required Equipment
- Horizontal prism bar (Gulden B-16 or equivalent: increments 1, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 25, 30, 35, 40, and 45 prism diopters)
- Hand-held fixation target – 20/50 equivalent single letter column at 40 cm (Gulden Fixation Stick #15302)

Procedure
1. Ensure good illumination using ambient and overhead lighting.
2. If the patient becomes tropic prior to the PFV assessment, enter the prism amount (PD) used to establish single vision.
3. Testing should be done with the subject wearing his/her refractive correction.
4. Hold the target 40 cm in front of the subject at eye level.
5. Instruct the subject to "try and keep the target single and clear as long as possible" as base-out prism is slowly introduced before one eye.
6. Ask the subject <u>at each prism level</u> if the target is single and clear.
7. Ask the subject to report when he/she experiences blurred or double vision.
8. Increase the amount of base-out prism in front of the eye at approximately 1 prism bar increment every 2 seconds until the subject reports that the target blurs or doubles.
9. If the subject reports blur, note the prism increment where this was reported, and ask the subject to tell you when the target breaks into 2.
10. If the target becomes double, ask the subject, "can you make it 1 or does it stay 2". If the subject reports that the target is now 1, increase the prism amount until diplopia is reported. When the subject can no longer keep the target single, record this value as the break point.
11. If you note that a break in motor fusion (a manifest tropia) has occurred and the subject does not report diplopia (the subject may then be suppressing), record this value as the break point.
12. Ask the subject to report when he/she can get the target back together into one.
13. Reduce the base-out prism at a rate of about 1 prism bar every 2 seconds until the subject regains single vision.
14. Record the blur, break, and recovery findings. If no blur occurs, you will record an 'X' for the blur finding on the form.

> **NOTE**: If diplopia is not reported but examiner notes manifest tropia, the prism through which orthotropia is lost will be recorded as the "break" finding. Likewise, an examiner's observation of recovery of orthotropia will be recorded as "recovery."

> **NOTE**: If the subject is able to fuse the largest (45Δ) prism, record 50Δ for the break value and have the subject close or cover one eye to break fusion so that recovery can be measured. Record the amount of prism through which the subject was able to regain fusion (maximum value would be 45Δ).

Negative Fusional Vergence (NFV) at Distance

Description

Negative fusional vergence (NFV) is a measure of how well a subject can diverge his/her eyes using fusional vergence while maintaining accommodation at 6 meters.

Required Equipment
- Horizontal prism bar (Gulden B-16 or equivalent: increments 1, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 25, 30, 35, 40, and 45 prism diopters)
- Fixation target at 6 meters (20/50 optotype)

Procedure
1. Ensure good illumination using ambient lighting.
2. If the patient becomes tropic prior to the NFV assessment, enter the prism amount (PD) used to establish single vision.
3. Testing should be done with the subject wearing his/her refractive correction.
4. Instruct the subject to view an accommodative target 6 m in front of the subject at eye level.
5. Instruct the subject to "try and keep the target single and clear as long as possible" as base-in prism is slowly introduced before one eye.
6. Ask the subject at each prism level if the target is single and clear.
7. Ask the subject to report when he/she experiences blurred or double vision.
8. Increase the amount of base-in prism in front of the eye at approximately 1 prism bar increment every 2 seconds until the subject reports that the target blurs or doubles.
9. If the subject reports blur, note the prism increment where this was reported, and ask the subject to tell you when it breaks into 2.
10. If the target becomes double, ask the subject "can you make it single or does it stay 2". If the subject reports that the target is now 1, increase the prism amount again until diplopia is reported. When the subject can no longer keep the target single, record this value as the break point.
11. If examiner notes break in motor fusion (a manifest tropia) and the subject does not report diplopia (the subject may then be suppressing), record this value as the break point.
12. Ask the subject to report when he/she can get the target back together into one.
13. Reduce the base-in prism at a rate of about 1 prism bar increment every 2 seconds until the subject regains single vision.
14. Record the blur, break, and recovery findings. If no blur occurs you will record an 'X' for the blur finding on the form."

> **NOTE**: If diplopia is not reported but examiner notes a loss of fusion, the prism through which fusion is lost will be recorded as the "break" finding. Likewise, an examiner's observation of recovery of fusion will be recorded as "recovery."

> **NOTE**: If the subject is able to fuse the largest (45Δ) prism, record 50Δ for the break value and have the subject close or cover one eye to break fusion so that recovery can be measured. Record the amount of prism through which the subject was able to regain fusion (maximum value would be 45Δ).

Vertical Fusional Amplitudes at Distance

<u>**Vertical Fusional Amplitudes**</u>

Description
Vertical fusional amplitudes are a measure of how well a subject can vertically align his/her eyes using fusional vergence while maintaining accommodation at 6 meters.

Required Equipment
- Vertical prism bar (Gulden BV-15: increments 1, 2, 4, 5, 6, 8, 10, 12, 14, 16, 18, 20, 25, and 30 prism diopters)
- Fixation target at 6 meters (20/50 optotype)

Procedure
1. Ensure good illumination using ambient lighting.
2. Vertical deviation should be corrected at least with sufficient prism to give the subject single vision either in current correction (if wearing prism) or with prism in trial frames.
3. Instruct the subject to view an accommodative target 6 m in front of the subject at eye level.
4. Instruct the subject to "try and keep the target single and clear as long as possible" as base-up prism is slowly introduced before one eye.
5. Ask the subject <u>at each prism level</u> if the target is single.
6. Ask the subject to report if he/she experiences double vision.
7. Increase the amount of base-up prism in front of the eye at 1 prism bar step every 2 seconds, stopping when the subject reports that the target doubles.
8. If the target becomes double, ask the subject, "can you make it 1 or does it stay 2". If the subject reports that the target is now 1, increase the prism amount until diplopia is reported. When the subject can no longer keep the target single, record this value as the base-up break.
9. If you note that a break in motor fusion (a manifest tropia) has occurred and the subject does not report diplopia (the subject may then be suppressing), record this value as the base-up break.
10. Ask the subject to report when he/she can get the target back together into one.
11. Reduce the base-up prism at a rate of 1 prism bar every 2 seconds until the subject regains single vision.
12. Record the base-up break and recovery findings.
13. Repeat the above procedure with base-down prism using the same eye tested in steps 4-11, waiting 10 seconds between measurements, and record the base-down break and recovery findings.

   NOTE: If diplopia is not reported but examiner notes a manifest tropia, the prism through which fusion is lost will be recorded as the "break" finding. Likewise, an examiner's observation of recovery of fusion will be recorded as "recovery."

   NOTE: If the subject is able to fuse the largest (30Δ) prism, record 35Δ for the break value and have the subject close or cover one eye to break fusion so that recovery can be measured. Record the amount of prism through which the subject was able to regain fusion (maximum value would be 30Δ).