Vision Testing

Purpose

This training manual provides a concise outline of how to perform vision testing including visual acuity, visual fields and colour blindness testing.

Scope

This training manual provides relevant information for all health professionals and medical screeners who conduct pre-employment medical assessments as part of their clinical duties. The training manual provides the minimum requirements for completing vision testing as part of a pre-employment medical at KINNECT.

Why test vision in a Pre-Employment Medical?

Within the workplace, vision screening is conducted to ensure an applicant has the minimum level of functioning needed to accomplish specific visual tasks. The screening of a potential employee’s vision can provide important information to the company and to the worker. The worker can be placed in the position best suited for his or her visual skills. It can also serve to detect previously undiagnosed disease or refractive error. Identifying and correcting even a small refractive error can greatly increase a worker’s visual efficiency and productivity.

Initial testing should include visual acuity (long and near vision), color vision, visual fields and strabismus testing. Results from these tests can help with proper employee placement and aid in documenting entering visual functioning.

Visual Acuity

Visual Acuity is recorded as a ratio in a numerator and denominator format (i.e. 6/12) using a Snellen Chart. The numerator represents the distance of the subject from the chart (usually 6m or 3m) and the denominator represents the smallest letter line that the applicant identifies.

- Corrected Vision is with spectacles/ glasses or contact lenses
- Uncorrected vision is without spectacles/ glasses or contact lenses
- When you measure aided VA it is important to make sure that the person is wearing the appropriate spectacles/glasses or contact lenses for the distance they are testing.
- If they have distance only spectacles:
  - Measure distance VA with the spectacles
  - Measure near VA without the spectacles
- If they have near only spectacles:
  - Measure distance VA without the spectacles
  - Measure near VA with the spectacles
- If the applicant is wearing contact lenses, then they do not need to be removed any of the vision tests.
Far Visual Acuity

We use the 3 Meter chart – if you use the 6 Meter chart ensure you modify the paperwork.

- Position applicant 3m from Snellen Eye Chart
- Test the applicant with their distance glasses or contact lenses on to identify the best corrected visual acuity
- Ensure that the VA chart is clean and in good light. The chart should be flat and straight on the wall, and not positioned too high or too low.
- Examine each eye individually; ensuring the right eye is tested first, by getting the applicant to occlude the eye not being examined with the PALM of their hand (Beware people peep through or around hands to cheat!).
- The applicant should start at the top of the Visual Acuity Chart and work their way to the bottom. Encourage the person to give you an answer (instead of just telling you they “don’t know”, they might just be embarrassed to make a mistake).

Scoring:
- A line is considered passed if the applicant reads all letters on that line correctly with no more than 2 mistakes. If one mistake is made then a minus 1 may be put on the denominator i.e. 6/6-1. No more than 2 mistakes are tolerated otherwise they fail the line.
- If a person reads all of a line correctly but cannot read any of the next line, their VA is recorded as e.g. 6/12. If a person reads a line correctly and some of the characters on the line below, VA is recorded as the fraction of the whole line that was read correctly, plus the number of characters that were correct on the next line, e.g. 6/12+3.
- See table below for vision categories

<table>
<thead>
<tr>
<th>WHO Category</th>
<th>Vision</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal vision</td>
<td>A person who can see all of the 6/18 line or better. This person sees quite well.</td>
</tr>
<tr>
<td>Visually impaired</td>
<td>A person who cannot see all of the 6/18 line. This person does not see well.</td>
</tr>
<tr>
<td>Blind</td>
<td>A person who cannot see the 6/120 (or 3/60) line. This person can see very little, or nothing at all.</td>
</tr>
</tbody>
</table>
Near Visual Acuity

Position the applicant 40cm from the Hanks Near Chart.

- Test the applicant with their distance glasses or contact lenses on to identify the best corrected visual acuity
- Ensure that the VA chart is clean and in good light. The chart should be flat and straight on the wall, and not positioned too high or too low.
- The applicant should start at the top of the Visual Acuity Chart (The easiest to read) and work their way to the bottom (hardest to read). Encourage the person to give you an answer (instead of just telling you they “don’t know”, they might just be embarrassed to make a mistake).

Scoring:

- A category is considered passed if the applicant reads all the entire paragraph successfully
- Examine each eye individually; ensuring the right eye is tested first, by getting the applicant to occlude the eye not being examined with the PALM of their hand (Beware people peep through or around hands to cheat!).
- Record the N score for the paragraph that has been successfully read
- Vision categories to correspond with Far Vision are:
  - Normal = N5
  - Impaired = N10
  - Blind = N26
**Visual Fields**

- Performed using either your fingers or a pen
- Both applicant and examiner’s head should be level (preferred in a sitting position)
- Test each eye separately and the applicant should remove his or her glasses
- Applicants head should be at arm’s length from examiner and the eye not being tested is covered with the palm of the applicants hand
- If the applicant’s right eye is being tested, the applicant should look straight in to the examiner’s left eye.
- The target (hat-pin) is brought into the applicant’s visual field from four main directions, in a diagonal manner towards the centre of the field of vision.
- Superior temporal, superior nasal, inferior nasal and inferior temporal quadrants are examined.
- The applicant is asked to identify when they first visualize the target and if it disappears throughout its range of motion
- The blind spot is also mapped out by noting the applicant’s subjective acknowledgement of the disappearance of the target (pin-head) around the centre of the field of vision for each eye. Compare size of applicant’s blind spot to you own and note as being “normal” or “abnormal” based upon your judgement.
- Record the applicants degrees of visual field on the paperwork making note if it is within the abnormal zone.

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**Chart:**

```
<table>
<thead>
<tr>
<th></th>
<th>Frontal Axis</th>
<th>Vertical Axis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>Temporal</td>
<td>60</td>
<td>40</td>
</tr>
</tbody>
</table>
|       | 100 90 80 70 60 50 40 30 20 10 0 | 10 20 30 40 50 60 10 20 30 40 50 60 10 20 30 40 50 60 10 20 30 40 50 60
|       | 20           | 20           |
|       | (Abnormal)   | (Abnormal)   |
|       | 20           | 20           |
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Strabismus

Strabismus is a condition where the eyes are not properly aligned to one another. This condition is often a result of an imbalance or lack of coordination between the extra-ocular muscles. Typically one eye will move in a typical pattern, while the other points in (esotropia or “crossed eyes”), out (exotropia), up (hypertropia) or down (hypotropia).

Six different muscles surround each eye and work "as a team" so that both eyes can focus on the same object.

In someone with strabismus, these muscles do not work together. As a result, one eye looks at one object, while the other eye turns in a different direction and is focused on another object.

The Hirschberg test to determine the type and degree of Strabismus:

- Both applicant and examiner’s head should be level (preferred in a sitting position)
- The applicant should remove his or her glasses
- The applicant should look directly into the assessors eyes
- Use a small penlight and direct it toward the eyes.
- Observe the reflected point on the applicants’ eyes. The reflected point of light will reveal the type and degree of Strabismus.
- Normal eyes - will have the light in the centre of the pupils.
- Positive or negative angle Kappa - Displacement (1 mm is considered) based on the below angle of displacement:
Colour Vision

- Hold the ishihara colour plates 75cm from the subject and tilted so that the plane of the paper is at a right angle to the line of vision.
- Vary the order of the plates IF it is suspected that there is a deliberate deception on the part of the subject.
- Answers to be given within 3 seconds

<table>
<thead>
<tr>
<th>Plate</th>
<th>Normal</th>
<th>Red-Green Deficiencies</th>
<th>Total Colour Blindness</th>
<th>Plate</th>
<th>Normal</th>
<th>Red-Green Deficiencies</th>
<th>Total Colour Blindness</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>2</td>
<td>8</td>
<td>3</td>
<td>X</td>
</tr>
<tr>
<td>3</td>
<td>29</td>
<td>70</td>
<td>X</td>
<td>4</td>
<td>5</td>
<td>2</td>
<td>X</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>5</td>
<td>X</td>
<td>6</td>
<td>15</td>
<td>17</td>
<td>X</td>
</tr>
<tr>
<td>7</td>
<td>74</td>
<td>21</td>
<td>X</td>
<td>8</td>
<td>6</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>9</td>
<td>45</td>
<td>X</td>
<td>X</td>
<td>10</td>
<td>5</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>11</td>
<td>7</td>
<td>X</td>
<td>X</td>
<td>12</td>
<td>16</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>13</td>
<td>73</td>
<td>X</td>
<td>X</td>
<td>14***</td>
<td>X</td>
<td>5</td>
<td>X</td>
</tr>
<tr>
<td>15***</td>
<td>X</td>
<td>45</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The mark X shows that the plate cannot be read.
** The numerals in brackets () show that they can be read but they are comparatively unclear

NOTE: If plates 14 and 15 are read easier than those on plates 10 and 9 = abormal vision

Scoring

<table>
<thead>
<tr>
<th>Number of plates read correctly</th>
<th>Colour Vision is..</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 or less are read normally</td>
<td>Deficient</td>
</tr>
<tr>
<td>13 or more plates read normally</td>
<td>Normal</td>
</tr>
<tr>
<td>14 – 16 plates</td>
<td>Rare- requires the use of other colour vision tests, including the anomaloscope</td>
</tr>
</tbody>
</table>
Plates 18 – 24 must be tested if:

- Person is unable to read numerals; or
- Colour deficiency is suspected based on plates 1-17 – must be tested before diagnosing red-green deficiency
- The winding lines between the two X’s are traced with the brush
- Each tracing should be completed within ten seconds

<table>
<thead>
<tr>
<th>Plate</th>
<th>Normal</th>
<th>Red-Green Deficiencies</th>
<th>Total Colour Blindness</th>
<th>Plate</th>
<th>Normal</th>
<th>Red-Green Deficiencies</th>
<th>Total Colour Blindness</th>
</tr>
</thead>
<tbody>
<tr>
<td>19</td>
<td>X</td>
<td>Can trace the line</td>
<td>X</td>
<td>20</td>
<td>Bluish-green line</td>
<td>Unable to follow the line/ follow incorrect line</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Orange line</td>
<td>Unable to follow the line/ follow incorrect line</td>
<td>Unable to follow the line/ follow incorrect line</td>
<td>22</td>
<td>Line connecting bluish-green and yellowish-green</td>
<td>Line connecting bluish-green and purple</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>Line connecting purple and orange</td>
<td>Line connecting bluish-green and purple</td>
<td>X</td>
<td>24</td>
<td>Winding line</td>
<td>Winding line</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Purple &amp; red lines</td>
<td>(red) purple Mild Protan</td>
<td>Only purple line Strong Protan</td>
<td></td>
<td>(purple) red Mild Deutan</td>
<td>Only red line Strong Deutan</td>
<td></td>
</tr>
</tbody>
</table>

** The colours in brackets () show that they can be read but they are comparatively unclear
*The mark X shows that the plate cannot be read.
Farnsworth Test

Instructions
1) The box is opened with the inner retaining flap set exposing the desired test.
2) With the outer box lid open, it is now possible to slide the 15 test caps out of the open right end of the box onto the testing surface. If this is done carefully, the caps will all remain upright.
3) The caps should be arranged randomly on the surface.
4) The patient is then instructed to locate the cap within the group of 15 that is closest in color to the starter cap, which remains fixed in the storage box.
5) Once located, the first cap selected should be placed in the box adjacent to the starter cap.
6) Next, the patient should choose the next cap, which is now closest in color to the one that was just put into the box. This cap is then placed in the box in a similar manner to the first.
7) This process is repeated until all the caps on the testing surface are now back in the storage box.
8) At this point the patient is allowed to make any final adjustments they might wish to make to the position of any test cap, with the goal of making the caps proceed logically from left to right in terms of their spectral hue progression.
9) At this point the inner flap of the storage box may be flipped to the alternate position to enable performance of the other test panel. (NOTE: Desaturated cap numbers are circled)

Scoring
1) When all testing is completed, the outer lid of the storage box is closed to prevent spilling, soiling or fading of the caps.
2) Once closed, the box is then turned over exposing the clear plastic bottom.
3) For each test performed, the order of the cap placement is recorded on the appropriate portion of the Gulden test score sheet.
4) Connecting the dots on the circular plotting form for each test then plots this order.

Score Sheet Template for 15 Disc Color Vision Test

Name: ___________________________  DOB: _________  Test Date: _________

Mode:  Binocular _____  or  OD ____  OS _______  Tester: ____________________

Copy this template onto your medical history or plain paper
Interpretation

Complete passing of either test occurs when the sequence of cap placement is exactly correct and the circular plot for that test has no crossovers (Figure A). A mild failure of either test occurs when there are crossovers occurring around the circle, usually involving 1 or 2 cap positions. Major errors occur when the crossovers go across the circle graph, often defining an axis of the color deficiency type (figure B).