



BEST VISION SPHERE REFRACTION

THINK

A metal worker comes to you for an eye examination. After taking a case history and measuring his visual acuity, you think that he has a refractive error – but you are not sure what sort of refractive error he might have.

A best vision sphere refraction is the first part of a refraction examination that you should do for all people who you suspect have a refractive error.

AIM

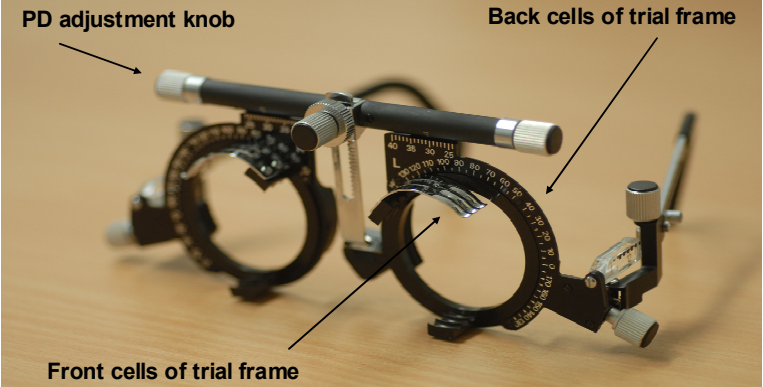
This unit teaches you how to do a subjective best vision sphere (BVS) refraction.

WHAT YOU WILL LEARN

When you have worked through this unit you should be able to:

- explain what is meant by the BVS
- explain the limitations of the BVS for people who have astigmatism
- demonstrate how to do a BVS refraction
- recognise when a BVS refraction is being affected by uncontrolled accommodation and know what to do about it.




REVIEW: BEST VISION SPHERE REFRACTION

REFRACTIVE ERROR	<ul style="list-style-type: none"> A person who has a refractive error will need to wear spectacles (glasses) or contact lenses, so that they can see clearly and comfortably. This is because their eye is not the correct size and shape. There are four main types of refractive error: myopia, hyperopia, astigmatism and presbyopia. Myopia, hyperopia and presbyopia are corrected by spherical lenses. Astigmatism is corrected by cylindrical lenses.
MEASURING INTERPUPILLARY DISTANCE (PD)	<ul style="list-style-type: none"> PD is the distance (in mm) between a person's pupils. Distance PD is the distance between the pupils when the person is looking at something far away. Near PD is the distance between the pupils when the person is looking at something close. Distance PD is always greater than near PD because the eyes converge when they look at things that are close to them.
TRIAL FRAME	 <p>The image shows a trial frame, a device used to hold trial lenses. It has a central bridge with a PD adjustment knob. The front and back cells are labeled, and the frame is shown with its various adjustment points.</p>
TRIAL LENS SET	<ul style="list-style-type: none"> A trial lens set is a collection of spherical, cylindrical and prism lenses, as well as some accessory lenses. These lenses are used to measure a person's refractive error. Plus and minus trial lenses (spherical lenses) are either labelled with a "+" or "-" sign, or surrounded by a coloured rim. Cylindrical trial lenses come in plus and minus powers, but usually we only use the minus cylinders to do a refraction. Cylindrical lenses have two small axis marks that show the direction of the axis of the cylinder.
GOALS OF REFRACTION	<ul style="list-style-type: none"> A refraction must determine: <ul style="list-style-type: none"> the lenses that give the person the clearest vision, and the lenses that give the person the most comfortable vision. The clearest and most comfortable lens is always the lens that has the least amount of minus power (or most amount of plus power), but still gives the best visual acuity (VA).

REVIEW: BEST VISION SPHERE REFRACTION (cont.)

MEASURING REFRACTIVE ERROR	<ul style="list-style-type: none"> Objective refraction methods include: <ul style="list-style-type: none"> – retinoscopy – auto-refraction. Subjective refraction methods include: <ul style="list-style-type: none"> – best vision sphere (BVS) refraction – sphero-cylindrical refraction – near refraction.
CONTROLLING ACCOMMODATION	<ul style="list-style-type: none"> The most common mistake that examiners make when they do a refraction is giving the person more minus than they need (or not enough plus). The person might tell you that their vision looks the same (or even better) if too much minus is added but their VA will not get better. If spectacles with too much minus (or not enough plus) are prescribed, the person will need to accommodate to see clearly. This can cause asthenopia (eye strain and headaches). People do not usually know that they are accommodating. They will only tell you that their eyes feel sore or tired. Over-minused = too much minus in the person's spectacles Under-plussed = not enough plus in the person's spectacles.
THE CLEAREST AND MOST COMFORTABLE LENS	<ul style="list-style-type: none"> The clearest and most comfortable lens is the least minus (or most plus) lens that gives the best VA. Because they have good accommodation, young people often see the VA chart clearly when more minus is placed in front of the BVS. The most comfortable of these lenses is the BVS. The BVS lens is the least minus (or most plus) lens that still gives good VA – and this is the lens that you should prescribe. You must find the balance between the clearest lens and the most comfortable lens.
AVOIDING OVER-MINUSING	<ul style="list-style-type: none"> When you are doing a refraction you must: <ul style="list-style-type: none"> – control the person's accommodation – check to make sure that the person has not been given too much minus.





CORRECTING REFRACTIVE ERROR

SUBJECTIVE REFRACTION	<p>Refractive error can be measured objectively or subjectively. A subjective refraction measures the refractive error of a person by asking them what they see on a visual acuity (VA) chart when lenses of different powers are put in front of their eyes.</p> <ul style="list-style-type: none"> • There are three main types of subjective refraction: • Best vision sphere (BVS) refraction → measures hyperopia and myopia • Sphero-cylindrical refraction → measures hyperopia, myopia and astigmatism • Near refraction → measures presbyopia. <p>The first step of both a sphero-cylindrical refraction and a near refraction is to find the BVS.</p> <div data-bbox="432 622 560 734">  </div> <p>When you have finished doing a BVS refraction, you will know whether you need to do a sphero-cylindrical refraction, or if you can go on to the next step.</p>
BEST VISION SPHERE (BVS)	<p>Refractive error can be measured objectively or subjectively. A subjective refraction measures the refractive error of a person by asking them what they see on a visual acuity (VA) chart when lenses of different powers are put in front of their eyes.</p> <ul style="list-style-type: none"> • There are three main types of subjective refraction: • Best vision sphere (BVS) refraction → measures hyperopia and myopia • Sphero-cylindrical refraction → measures hyperopia, myopia and astigmatism • Near refraction → measures presbyopia. <p>The first step of both a sphero-cylindrical refraction and a near refraction is to find the BVS.</p> <div data-bbox="432 1106 560 1218">  </div> <p>If the BVS is plano (zero power), the person does not have a distance spherical refractive error.</p>
ASTIGMATISM AND BVS	<p>If a person has astigmatism, the BVS will give the person the best vision that is possible with a spherical lens, but it will not correct their astigmatism. This means that BVS VA for a person with astigmatism is poor. A person with astigmatism needs a cylindrical lens in addition to the BVS to correct their astigmatism and give them good vision.</p> <div data-bbox="432 1391 560 1503">  </div> <p>Spherical lenses correct hyperopia, myopia and presbyopia. Spherical lenses do not correct astigmatism. Cylindrical lenses correct astigmatism.</p> <p>Sometimes cylindrical lenses are not available or are too expensive. If there is only a small amount of astigmatism, the BVS is sometimes good enough to improve a person's vision, and can therefore be given as their spectacle prescription.</p>

METHOD

PERFORMING A BVS REFRACTION	<p>The best way to learn how to do a BVS refraction is to do it yourself as often as possible. With practice you will become fast and accurate. This unit will show you how to do a BVS refraction using three learning methods:</p> <ul style="list-style-type: none"> • Step-by-step instructions • Case studies • Flow charts (in the summary). <p>Then you will be ready to do your first BVS refraction.</p>
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STEP-BY-STEP INSTRUCTIONS

STEP 1	Measure and write down the unaided VA for each eye.
STEP 2	Measure the interpupillary distance (PD) and adjust the trial frame for that PD.
STEP 3	<p>Put an occluder in the trial frame in front of the left eye.</p> <div>  <p>It is good practice to always refract the right eye first.</p> </div>
STEP 4	<p>Look at the unaided distance VA for the right eye to help you decide which lens to start with.</p> <p>If the unaided vision is:</p> <ul style="list-style-type: none"> • 6/18 or better → start with +0.50 D then -0.50 D • worse than 6/18 (but better than 6/60) → start with +1.50 D then -1.50 D • worse than 6/60 or maybe even: → start with +3.00 D then -3.00 D → start with +5.00 D then -5.00 D <p>You might choose to use a ± 5.00 D lens instead of a ± 3.00 D lens if the person's VA is extremely poor.</p> <div>  <p>Always use plus lenses before minus lenses to control accommodation. Only use minus lenses if the VA gets worse with plus lenses.</p> </div>
STEP 5	<p>Hold the trial lens that you have chosen in front of the right eye.</p> <p>Tell the person: <i>"Look at the letter chart."</i> <i>"Look at the smallest line that you can see."</i></p> <p>Ask the person: <i>"Does this lens make the chart look BETTER, WORSE, or the SAME?"</i></p> <p>You might need to show the person the chart with and without the lens a few times.</p> <div>  <p>Always check the VA to make sure that the vision really is what the person says it is ("better", "worse" or "the same").</p> <p>Sometimes people get confused and tell you that their vision is "better" when really it is "the same". You need to be extremely careful!</p> <p>This is especially important when you are adding minus lenses, and particularly when refracting young people.</p> </div> <p>Another way you can ask the question is: <i>"Does this lens make it look CLEARER, or only SMALLER and DARKER?"</i></p> <p>This question is especially useful if you are trying minus lenses.</p> <div>  <p>If it only looks "<i>smaller and darker</i>" it is the same as the person telling you that it looks "<i>the same</i>" → and that is the BVS.</p> </div>

STEP-BY-STEP INSTRUCTIONS (cont.)

STEP 6

If the person sees:

- Better: → put the lens in the trial frame
- Worse: → do not put the lens in the trial frame
- Same: If it is a plus lens → put the lens in the trial frame
If it is a minus lens → do *not* put the lens in the trial frame.



If it only looks “*smaller and darker*” it is the same as the person telling you that it looks “*the same*”
→ and that is the BVS.

- If you did not put a new lens into the trial frame:
 - If the lens you tried was a plus lens → now try the minus lens and repeat Steps 5 and 6.
 - If the lens you tried was a minus lens → go to Step 9.

- If you did put a new lens into the trial frame:

Measure the VA with this new lens.

Use the VA you measure to decide which trial lens to try next.

If vision is:

- **6/6 or better** → use **+0.25 D** then **–0.25 D**
- **6/6 to 6/18** → use **+0.50 D** then **–0.50 D**
- **6/18 to 6/60** → use **+1.50 D** then **–1.50 D**
- **Worse than 6/60** → use **+3.00 D** then **–3.00 D**

Combine trial lenses if you need to. If you have two or three lenses in front of one eye, the trial frame can be heavy on the person’s nose. It is also harder for the person to see through several layers of glass than it is just one. You can add up the total power of all the spherical lenses and replace them with just one lens which has the total power.

STEP 7

Example

There are two spherical lenses in the right cell of the trial frame:

+1.00 D and –0.25 D. You can add these two lenses together:

→ put a +0.75 D lens into the trial frame and remove the +1.00 D and –0.25 D lenses.



To help control accommodation:

When you are replacing several lenses with just one...

- plus lens → put the new plus lens into the trial frame before removing the other lenses
- minus lens → remove the other lenses before putting the new minus lens into the trial frame.

Repeat Steps 5 and 6 until you find a lens that:

- after adding +0.25 D makes the VA worse
- after adding –0.25 D makes the VA worse, or does not change the VA.



WARNING:

Young people especially will often tell you that the minus lens that you are trying makes their vision look “*better*”...

...but when you check their vision they can only see the same line on the VA chart

– so their vision is not really improving.

When this happens you know that the person is accommodating → they do not need the minus lens, so you do not add the minus lens to the trial frame.