

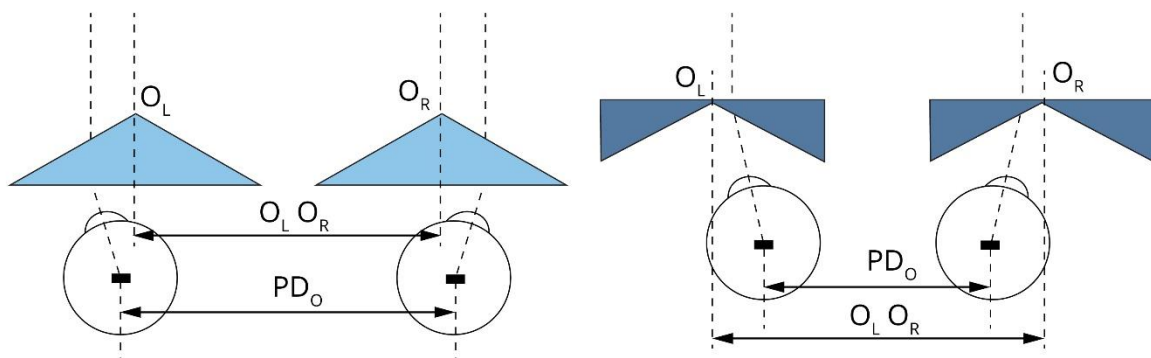
13 Normative centering tolerance in case of spherical lens centering

13.1 Introduction

Association of Czech opticians and optometrist released in 2006 spectacle lens tolerance table (Benes et al. 2010). In incorrectly centered spherical spectacle lenses is induced unwanted prism effect. We distinguish more and less critical direction in incorrect spectacle lens centration. This errors cause problems with simple binocular vision.

Table 13.1: Evaluation of unwanted prism and its effect on binocular vision (Benes et al. 2010)

	deviation of centration	prism base	vergence
hyperopia	in nasaly	base in critical direction	divergence critical direction
correction with plus lenses	out temporally	base out critical direction	convergence less critical
myopia	in	base out les critical	convergence less critical
correction with minus lenses	out	base in critical direction	divergence critical direction



Picture 13.1: Critical directions in spectacle lenses for correction of myopia and hyperopia ($O_{R,L}$ – optic center of the spectacle lens, Benes et al. 2010).

In table 13.2 are presented maximal possible decentration which we can cause during centration of spectacle lens.

Table 13.2: Maximal possible tolerance in millimeters during spectacle lens centration (Benes et al. 2010).

vertex refraction number including	horizontal direction		vertical direction
	base out	base in	
1,0	5	5	2,5
2,0	3	2,5	1,25
3,0	3	1,5	1
4,0	2,5	1,25	1
5,0	2	1	1
10,0	1	1	1
20,0	1	1	1
50,0	1	1	1

13.2 Goals

- Calculate prism effect induced on spectacle lens in horizontal direction. We suppose binocular prism effect.
- Calculate prism effect induced on spectacle lens in vertical direction. We suppose binocular prism effect.

13.3 Equipment

Spectacle lens, writing equipment, calculator

13.4 Methods

For calculations use Prentice rule/formula (P – prismatic effect, S'_B – vertex refraction of the lens, d – decentration in mm)

$$P = \frac{S'_B \cdot d [mm]}{10} \quad P [pD], d [mm], S'_B [D] \quad (14)$$

13.5 Results

Calculate prismatic effect induced on spectacle lens if we incorrectly center 3 mm horizontally out direction. Is it possible to use this lens to correction of refractive error? We suppose binocular prism effect.

$P_1 =$

Calculate prism effect induced on spectacle lens if we incorrectly center 3 mm vertically. Is it possible to use this lens to correction of refractive error? We suppose binocular prism effect.

$P_2 =$

13.6 Discussion

If we center spectacle lenses we want to center correctly. In standard single-focus lenses we choose centration which enables point imaging. But in anisometropia we induce unequal prism effect which can go over tolerated normative value. That is why anisometric correction with single-focus lenses is centered on pupil during distance viewing.

13.7 Conclusion, notes, comments

Which direction need more exact centration – vertical or horizontal?

Is possible to accept error of horizontal centration in plus lens out direction? We shifted 5 mm out with lens +5 D?