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Differences in ametropia prevalence obtained different methods of refraction

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Purpose This study was carried out to establish the ideal cut-off point (COP) for cycloplegic (C) and non-cycloplegic (NC) refraction with different methods against subjective cycloplegic refraction (Sx) considered as the "gold standard"

Methods A population sample of 199 young adults were randomly selected and examined with autorefraction (AR), retinoscopy (Rx) and subjective refraction (Sx). The results obtained were converted into spherical equivalent refraction (SER) to classify myopia (M), emetropia and hyperopia (H)

Results The prevalence of M and H obtained with CSx was 20.6% and 49.7%, respectively. For all methods of measurements using cycloplegia there were not statistically significant differences in the prevalence of ametropia. For the CAR the prevalence was 21.6% and 50.8% for M and H respectively ($p=0.808$) and 20.6% and 45.2% for M and H respectively ($p=0.343$) obtained with CRx. For the NCSx, NCRx and NCAR the COP of ± 0.50 D do not reflect the actual prevalence of the ametropia as obtained with CSx. For the NCAR the ideal COP for M was $SER \leq -1.25$ D and $SER \geq 0.25$ for H ($p=0.148$). For the NCSx and NCRx the ideal COP for M and H were $SER < 0.50$ D ($p=0.057$) and $SER \geq 0.25$ ($p=0.052$), respectively

Conclusion For a population of Caucasian young adults, similar prevalence of refractive conditions were found under cycloplegic conditions irrespective of the method used. However, under non-cycloplegic conditions, it is necessary to change cut-off points by at least 0.50 D in order to meet similar results than those found using the gold standard. World wide uniformization of methods to define ametropia is mandatory to obtain more accurate information on the impact of myopia among different ethnic groups.

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Functional visual performance assessed with and without correction of ocular aberrations

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Purpose Adaptive Optics (AO) technology enables us to dynamically compensate for ocular aberrations beyond spherocylindrical errors that are corrected traditionally with ophthalmic prescriptions or laser surgery. The visual benefit gained with AO has recently been demonstrated for dilated eyes under photopic conditions. We have extended these studies by investigating the effect of AO on functional visual performance under a range of light levels that cover the photopic and the mesopic range.

Methods An AO system was designed to correct dynamically the higher-order aberrations of the eye. The system also included facilities for the measurement of contrast acuity. The initial study was restricted to a group of normal, young subjects with good vision. A QUEST psychophysical procedure was used to measure contrast acuity threshold under different background light adaptation conditions with and without AO correction of higher-order aberrations.

Results The AO system produced good correction of higher-order aberrations and made it possible to measure the relation between AO visual benefit and retinal illuminance. Measurements with dilated and natural pupils were compared.

Conclusion The use of a combined AO / optical stimulator system made it possible to investigate how changes in natural pupil size, ocular aberrations and the resolution of the retina and visual pathways affect visual performance as a function of light level. The preliminary findings suggest that correction of higher order aberrations benefits visual performance for large pupil sizes under photopic conditions. The results also suggest that the resolving power of the retina is a factor that limits visual performance in the mesopic range.

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Accommodative changes as measured by optical biometry

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Purpose Accommodation for all age groups is of large interest. To study the physiologic mechanisms we applied optical biometry. Longitudinal relations in the optical axis during accommodation and desaccommodation in volunteers of different age and lens status were studied.

Methods 3 groups of 15 emmetropic subjects of 10.5 \pm 1.9, 21.9 \pm 2.1 and 55.7 \pm 7.3 years each and 15 pseudophakic patients of 59.9 \pm 7.8 years were examined by IOL-Master. A custom made special unit stimulating accommodation either in the ipsilateral or contralateral eye during measurement was used to obtain near accommodation or distance desaccommodation. Reproducibility of the method was tested by repeat testing and by using 2 observers.

Results Results of repeat testing and of 2 different observers correlated significantly ($r>0.98$, $p<0.004$). In the desaccommodative state anterior chamber depth (ACD) increased with age from children (3.62 \pm 0.19mm) to young adults (3.76 \pm 0.23mm) with a significant decrease in older adults (3.21 \pm 0.33mm). Near accommodation in young adults induced the largest ACD decrease (0.14 \pm 0.03mm) followed by children (0.11 \pm 0.03mm) and older adults (0.07 \pm 0.02mm) and no change in pseudophakic patients. Axial length increased in all groups during near accommodation by 0.01 \pm 0.01mm ($p<0.01$).

Conclusion In children and young adults pronounced changes in ACD were measured in comparison to older adults reflecting the curvature change of the lens during accommodation. The measured anterior posterior elongation of 0.01 mm in some subjects may be attributed to IOL-Master accuracy in regard to oscillations due to the cardiac cycle and breathing. At near sighted stimulus we did not find any changes in anterior chamber depth and thus lens position in pseudophakic patients compared to desaccommodation.