

Computer Vision Care – It's Impact on the Optometric Practice


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Our Media World is Shrinking...



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70% or more of the day is arm's length and beyond

Lecture Description

- This lecture presents an overview of computer-related vision problems presenting to the optometric practice.
- What are the components of computer vision care?
- Prescribing and lens design strategies will be included as it relates to your patients.

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Computer Vision Syndrome (CVS) -

- The American Optometric Association defines Computer Vision Syndrome as
 - "...The complex of eye and vision problems related to near work which are experienced during or related to computer use. Computer Vision Syndrome is characterized by visual symptoms which result from interaction with a computer display or its environment. In most cases, *symptoms occur because the visual demands of the task exceed the visual abilities of the individual to comfortably perform the task...*"

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Prevalence of CVS

- Research has shown that for workers using computers more than 2 hours per day, as many as 90% will have vision-related symptoms¹



¹Saliberrri & Nilsen. Is there a typical VDT patient? A demographic analysis. J. Am Optom Assoc 1995; 479-83.

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Occupational Concerns

- This study found:
 - a direct correlation between proper vision correction and productivity.
 - the time to complete a computer-related task was longer when wearing glasses with less than the optimum correction.
 - small uncorrected refractive errors can contribute up to a 20% productivity decline.

"Our study strongly suggests that improving the visual status of workers using computers results in greater productivity in the workplace, as well as improved visual comfort" Kent Daum, OD, PhD

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Impact on Vision Care Providers

- Visual symptoms reported by 50-90% of computer workers
 - eyestrain, fatigue
 - headaches
 - burning, red, dry eyes
 - blurring of the screen
 - post-VDT distance blur
 - intermittant diplopia



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Confidence in Solving CVS Complaints

- Difficulty in diagnosing CVS
- OD's have a reduced confidence level with Dx and Tx plan
 - non-computer patients : 7.3%
 - computer-related problems : 13.4%



The Optometric Exam

- Pre-Exam Questionnaire / History
 - How many hours a day are you on the computer at the office? at home?
 - What type of lighting is at the workplace?
 - How far away are your eyes from the screen?
 - Do you wear a correction while working on the computer? What kind?
 - Medications (OTC and Rx)

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Dry Eye Syndrome

- Many office environments contribute to eye irritation for workers because of the dry atmosphere
- Use of computers is associated with a decreased frequency of blinking and increased tear evaporation

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Eye Blinking During VDT Use

- Measured the spontaneous eye-blink rate (SEBR) in patients with moderately dry eyes
- Median age 44.8 years
- Only complete blinks were recorded
 - During 10 minutes of conversation
 - During the initial 10 minutes VDT use
 - After 30 minutes of VDT use, for 10 min

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Eye Blinking During VDT Use

■ SEBR	Blinks/Min
■ Conversation	_____
■ Initial VDT use	_____
■ After 30 mins. VDT use	_____

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Eye Blinking During VDT Use

■ SEBR	Blinks/Min
■ Conversation	16.8
■ Initial VDT use	6.6
■ After 30 mins. VDT use	5.9

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Eye Blinking During VDT Use

- The reduction of the SEBR during VDT use is primarily determined by **marked visual attention** resulting in an exacerbation of dry eye symptoms in individuals predisposed to the condition

Schlote, Kadner, Freudenthaler. *Graefes Arch Clin Exper Ophthalmol* 2004; 28 Jan

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Causes of Visual Symptoms

- Anterior Segment Dry Eye Evaluation
 - TBUT < 10 seconds
 - Tear meniscus < 1 mm
 - Vital Dyes
 - Schirmer < 15 mm in 5 min., lissamine green (stings less vs. rose bengal)
 - MGD
 - Digital expression
 - Warm compresses (lid hyperthermia)
 - Does the meibum mix with the tears?

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Plus at Near

- Accommodative disorders are the most prevalent among symptomatic computer users
- In one survey, accommodative disorders were found to be **twice** as common as binocular disorders

Optometry Today 1993; 33: 23-9.

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Computer Glasses

- Butzon study looked at **presbyopic** computer users who already had symptoms
- Compared effectiveness of computer Rx to an ergonomic self-assessment tool (ESAT) to relieving symptoms
- ESAT questionnaire allowed the computer users to determine likely environmental problems as possible causes for their symptoms

Butzon, Sheedy, Nilsen. The efficacy of computer glasses in reduction of computer worker symptoms. Optometry 2002;73:221-230.

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Computer Glasses

- Percentage reduction in pre-study symptoms attributed to each treatment
 - Computer glasses 80.7%
 - ESAT 19.3%

Butzon, Sheedy, Nilsen. The efficacy of computer glasses in reduction of computer worker symptoms. Optometry 2002;73:221-230.

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Accommodative Response

- "dark" focus or RPA
- lag of accommodation
- How do you know how much plus to Rx?



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Which nearpoint test is used most often for assessing computer users?

- Study in 1997 by Nilsen and Salibello surveyed 1,230 optometrists to determine what tests were most performed in assessment of the computer user in typical practice

Nilsen E, Salibello C. Survey of US optometrists regarding prevalence and treatment of visual stress symptoms. Proceedings of the Seventh International Conference on Human-Computer Interaction. San Francisco, 1997:663-666.

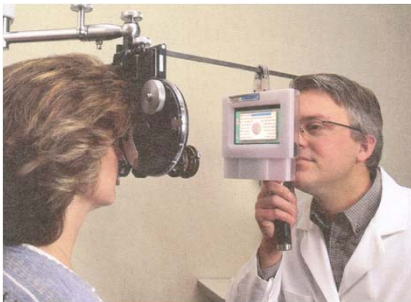
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Nilsen and Salibello Study Results

- The most commonly reported tests were
 - Best acuity with reduced Snellen chart 91.1%
 - NRA/PRA midpoint 70.5%
 - Fused cross cylinder 62.6%
 - Fixation disparity 20.4%
 - VDT simulator (PRIO) 9.2%

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PRIO Computer Vision Testing



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Which nearpoint test is most accurate?

- Study by Kolker, Hutchinson and Nilsen in 2002 compared
 - Best VA @ near
 - NRA/PRA
 - Fused Cross Cyl
 - PRIO

Comparison of tests of accommodation for computer users

Robert Kolker, M.D., Robert Hutchinson, M.D., and Erik Nilsen, Ph.D.

Abstract

The objective of this computer use accommodation test of 10 subjects was to compare the accuracy of four different tests of accommodation: Best VA @ near, NRA/PRA, Fused Cross Cyl, and PRIO. The results showed that the accuracy of the tests was similar, with the PRIO test showing the highest accuracy.

Kolker, Hutchinson and Nilsen Study Results

- Presbyopes
 - Similar results between methods
 - Near power determined was more a function of the testing distance (55 cm)
 - No significant difference using a printed test target or a Gaussian image
 - No matter what test used, results predictable

Kolker, Hutchinson and Nilsen Study Results

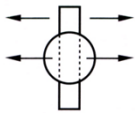
- Prepresbyopes
 - Tests gave different near prescriptions
 - Test results were highly variable for different subjects using the same test
 - **Highest** variability with NRA/PRA and the reduced Snellen VA test
 - **Lowest** variability with dynamic retinoscopy and cross-cylinder tests

Accommodative Response to PRIO versus Printed Text

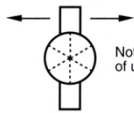
- Compared PRIO versus MEM
 - Accommodative response (AR) to the MEM target and the PRIO system is **the same**
 - Mean AR for PRIO system 1.14 D
 - Mean AR for MEM 1.22 D

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Monocular Estimation Method (MEM) and Low Neutral (LN) Retinoscopy



"with" motion of retinoscopic streak



uniform reflex or no motion

Note: pupil is full of light of uniform intensity

Assure that the patient is attending to the accommodative target by reading the letters *backwards*



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Workstation Ergonomics



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Causes of Visual Symptoms

- Accommodation and Working Distance
 - avg. resting point of accommodation is 31".
 - accommodative demand increases 2.5x when viewing the monitor at 12" versus 30"
- Accommodation and Viewing Angle
 - accommodative amplitudes increase 25% by viewing down at "usual reading position" vs. straight ahead gaze.

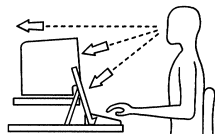
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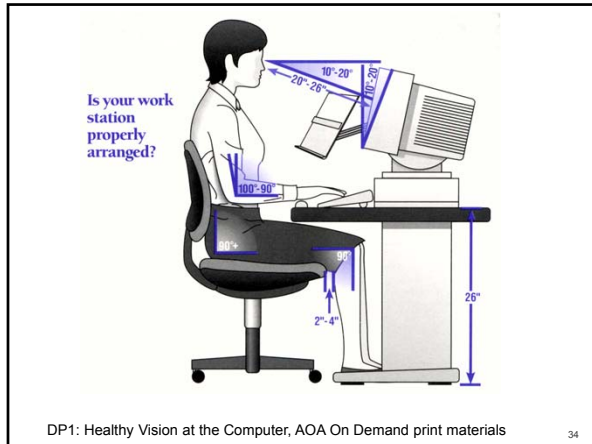
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Causes of Visual Symptoms

- Environment - Screen height
 - work surface height at 26" vs. conventional 29" desks and tables
 - top of screen should be slightly below eye level
 - accommodative amplitudes are increased with the eyes depressed
 - tilt the top of the screen away 10-20°




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Vision Correction and Design

- Be sure the prescription glasses meet the demands of your patient's job/hobby.
 - Determine tasks and viewing distances
 - One all purpose Rx seldom solves the problem
 - Train optical staff on occupational lens designs utilizing lens vendors during staff mtgs.
 - Become familiar with fitting guidelines and frame limitations



Single Vision Intermediate Lenses

- Case Example: Bill, 50 y/o, works at his computer all day, rarely leaving his desk. All his tasks are at an intermediate distance.
- Refraction: OD) +1.00 DS Add: +2.00
 OS) +1.75 DS +2.00
- Computer Rx (SV Intermediate)
 OD) +2.00
 OS) +2.75

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Bifocal (Intermediate/Near)

- Case Example: Mary, 50 y/o, works at her computer all day, rarely leaving her desk. Tasks are a mix of near and intermediate distances.
- Refraction: OD) +1.00 DS Add: +2.00
 OS) +1.75 DS +2.00
- Bifocal Rx (Intermediate/Near)
OD) +2.00 DS Add: +1.00 DS
OS) +2.75 DS Add: +1.00 DS



What About the Pre-Presbyopes?

- This may be the pt. that has asthenopic complaints after prolonged near or intermediate tasks
- Exam findings may include:
 - Unbalanced NRA/PRA with higher NRA
 - Eso posture at near (CI)
 - Reduced NPA
 - Accommodative lag

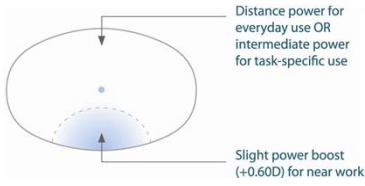
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Shamir Relax and Essilor Anti-Fatigue™

- Designed for those "under 40" and those just starting to need help for reading
- Single vision lens with a "power boost" in lower portion of lens
- Can be prescribed for task-specific and primary wear

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Shamir Relax and Essilor Anti-Fatigue



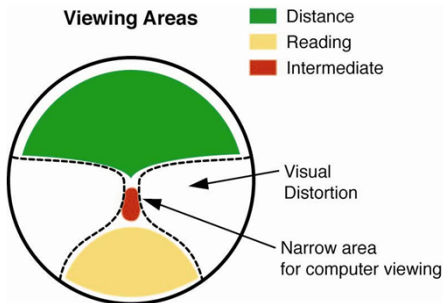
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Lens Design and Prescribing

- Variable Focus lens options
 - extends the intermediate range over reading glasses
 - provides wider intermediate field compared to conventional PALS
 - task-specific lenses for viewing distances from 14" to 4 feet.

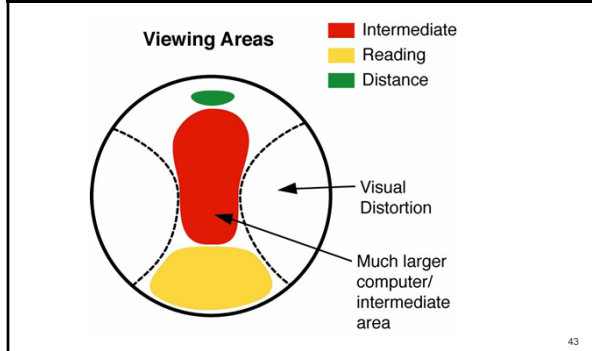
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Typical General-Purpose PAL



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Typical Computer Lens



Pt. Benefits - Workplace

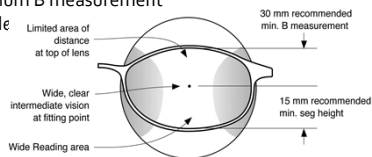
- Wide clear intermediate area to see the entire screen (or other intermediate objects)
- Wide near area
- Some viewing at distance, to see across office



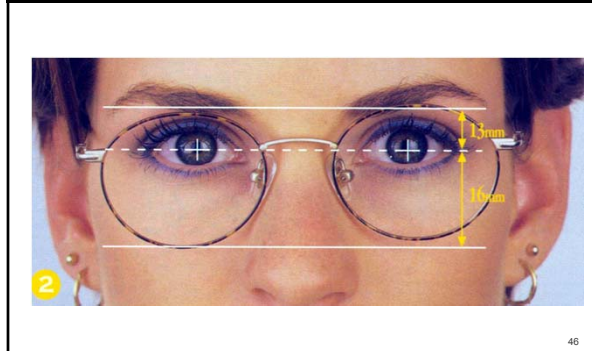
Typical Computer Lens Fitting

Order like typical progressive:

- Presbyopic Script
- Monocular Distance PDs
- 15 mm minimum Seg Ht
- 30 mm minimum B measurement
- Always include AR

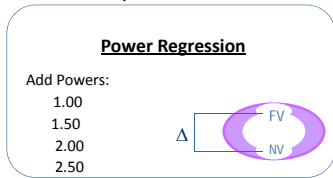


Frame Selection Guidelines



Typical Computer Lens Design

- Power regression (the change from the total near power at the top of the lens) is usually based on the add power



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Prescribing and Ordering

- Lab does the conversion!
- Lab software will convert the Rx to TNP and select the correct power regression
 - One exception is the Zeiss Gradal RD
 - More on this later...

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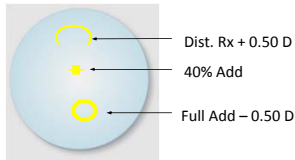
Variable Focus Lenses to Name a Few...

- **Essilor Computer Lens:** regression based on add power, has a *true* distance “window”
- **Zeiss Gradal RD** adds +0.50D to distance Rx (you calculate and order accordingly)
- **Zeiss Business:** 1.0D and 1.5D regression
- **Kodak Monitor View:** 24” set working distance
- **Hoya Tact Eyepoint:** 40% and 60% of add regression
- **Shamir Office:** 0.75D to 2.25D regression

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Zeiss Gradal RD

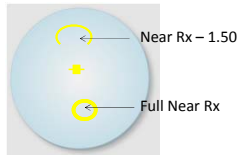
- ZEISS Gradal RD is a computer progressive lens specifically designed for “room distance” utility



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Lenses That Utilize “Power Regression”

- **Essilor Computer Lens**
 - Supports adds from +1.00 to 3.50D
- **Zeiss Business 1.0 and 1.50**
 - 1.0 for adds up to 1.75D
 - 1.5 for adds 2.00D and above
- **Kodak Monitor View**
 - 24” set working distance



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emPower: combining optics with electronics



viewing through PAL

emPower: combining optics with electronics



viewing through emPower!

emPower: electronic adds



simple touch – on or off

emPower: electronic adds



swipe – auto mode

Case Study

- 28 WF, dental assistant, office manager, receptionist
- Hobbies: mountain biking, racquetball
- Computer 4-6 hrs. daily
- Subjective complaints (mostly during work week)
 - daily HA, ocular fatigue, eyestrain
 - near to far blur
 - dry, irritated eyes



Objective Findings (cont.)

- Retinoscopy: +1.25 - 0.50 x 090 OU
- SRx: +0.50 - 0.50 x 090 OU
- Phorias: Ortho / 4EP'
- BI: x/4/o BO: x/16/10
- NRA / PRA: +2.50 / -1.00
- Other tests indicated?



Other Tests Indicated?

- Accommodative Amps
 - +6 OD, +6 OS
- MEM
 - lag +1.25 @ 40 cm. OD, OS
- Gradient +1/4
- Rx indicated? / Lens design?



More information on CVS

- Website: www.allaboutvision.com/cvs/ – Computer Vision Syndrome information at All About Vision
- Website: www.osha.gov/SLTC/etools/computerworkstations/index.html – A site on computer workstation ergonomic recommendations from the OHSA
- Website: www.healthycomputing.com – A site dedicated to safe computer use and office ergonomics
- Website: www.aoa.org/x5374.xml – The American Optometric Association’s site on Computer Vision Syndrome

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More Information on CVS

- There are many resources available that provide extensive information on Computer Vision Syndrome and its treatment:
 - Reading: Sheedy, J and Shaw-McMinn, P. *Diagnosing and Treating Computer-Related Vision Problems*. Boston: Butterworth-Heinemann, 2003
 - Reading: Anshel, J. *Visual Ergonomics in the Workplace*. Philadelphia: Taylor & Francis, 1998
 - Website: www.doctorergo.com – A site dedicated to Computer Vision Syndrome resources and support

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