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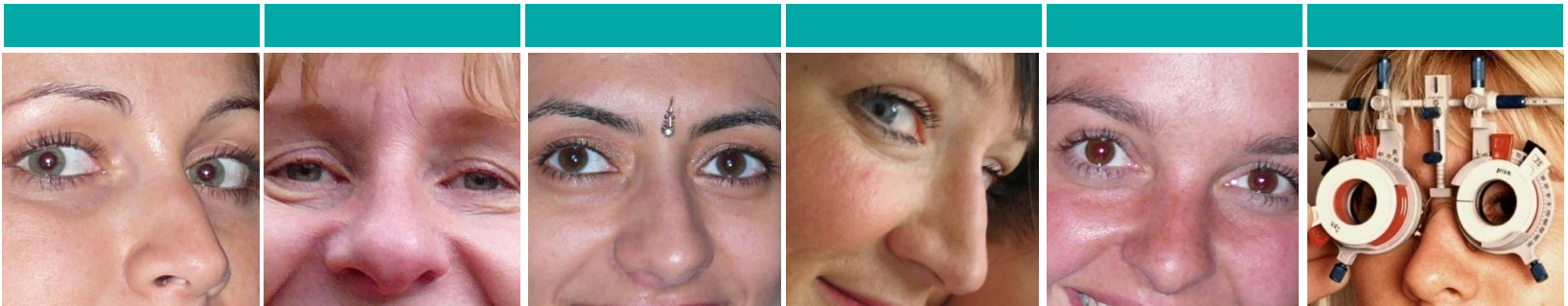


European Academy 2011 Prague



# The Dominant Eye

Peter Moest



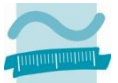


# The Dominant Eye



**Peter Moest**

**Beuth University of Applied Sciences Berlin** 

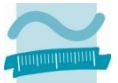


What do we know today?

## The shared work of the eyes

- Both eyes work
  - but not completely equally
  - but not completely simultaneously
- One eye transmits its message faster to the brain, this eye we call the **Dominant Eye**
- The other eye supports the visual evaluation, this eye has no established name, let's call it today **Partner Eye**
- We feel more comfortable, if we keep in mind the role of the dominant eye





# Observations and expectations

- Approach to presbyopia correction using contact lenses
- Approach to residual astigmatism with contact lenses





## Presbyopia correction using contact lenses

### Monovision

- Worldwide most presbyopes are corrected using monovision
- Everyone agrees: The dominant eye should get the distance correction
- But, which eye is the dominant eye?

### Modified Monovision

- „Specialists for binocular vision“ tend to hesitate and prefer to fit multifocal contact lenses
- But today it is common practice to differentiate between the dominant eye and the partner eye with regard to multifocal contact lenses (e.g. CooperVision and Galifa propose different first trial lenses)
- The dominant eye is aligned to the distance correction,
- The partner eye is more aligned to the near correction
- But, which eye is the dominant eye?





## Residual astigmatism with contact lens corrections

We prefer to fit rotational symmetric (RS) lenses instead of toric lenses

- RS lenses are more comfortable
- RS lenses are cheaper
- RS lenses are more readily available in the disposable segment
- The partner eye can cope better with residual astigmatism than the dominant eye
- But, which eye is the dominant eye ?

### Limitation of contact lens parameters

- Disposable lenses are not available with all cylinders and/or additions
- The dominant eye needs an exact cylinder correction
- The partner eye needs an exact addition
- But, which eye is the dominant eye ?





## Dominant Eye

- *dominant eye, controlling eye, directing eye, lead eye, master eye, predominant eye*
- **Hofstetter:** The eye that is dominant when ocular dominance exists. **Sighting ocular dominance** is a type of motor ocular dominance, **Perceptual ocular dominance** is based on a sensory superiority of one eye over the other rather than on a motor difference between the two eyes
- **Businger:** The information of the dominant eye appears in the visual cortex 14 ms earlier
- **Goersch:** The eye that assumes control of eye movements in binocular vision  
(in German)
- **Spohn:** The perception of one eye is prioritised in control of visual processing. Thus this eye assumes the control of eye movements and fixation on objects  
(Baron/Ebel, in German)





- **The German ophthalmologist Sachsenweger writes:**
  - 65% of people are right dominant
  - 20% of people are left dominant
  - 15% of people are equidominant (ambidextrous)
- **Beuth University did two special studies on the dominant eye**
  - In 2001 **Silke Krüger** carried out a first study with 30 subjects
  - In 2007 **Cornelia Fischer** carried out a more detailed study with 19 subjects

	Sachsenweger	Beuth Berlin 2001	Beuth Berlin 2007
right dominant	65%	17 (57%)	12 (63%)
left dominant	20%	7 (23%)	7 (37%)
alternating dominant	15%	6 (20%)	0







# Assessment procedures to determine the dominant eye

- Authors (and manufacturers) propose a large range of procedures to determine the dominant eye (about 20 or more)
- To date there is no (internationally accepted) “gold standard”, and the inter-test agreement is very poor (J&J, BCLA 2010)
- In principle there are 3 different types of assessment procedures
  - **Sighting tests**, that evaluate which eye is used to find and position a given direction of sight
  - **Perceptual tests**, that evaluate, which eye achieves acceptance of its perception in binocular vision
  - **„Anatomic“ tests**, that evaluate other and non-visual functions of the body to assess the prevalence for one side of the patient



## Procedures used to assess the dominant eye

### Ocular sighting dominance

- Ring sighting test
- Hand sighting test
- Pencil sighting test
- Thumb sighting test
- V-scope test (Miles)

### Perceptual ocular dominance

- Trial lens +0.5 dpt test
- “Worth” test
- Binocular lustre test  
(Sachsenweger)
- Inhibitions using a Polatest
- Binocular rivalry  
using a stereoscope

### Other tests of dominance

- Best monocular visual acuity
- Single eye closure test
- Dominant hand
- Nearpoint of convergence



## Assessment of the dominant eye using the **Ring sighting test**

- The patient holds with both hands a pinhole in a distance of about 40 cm
- He has to view a distant object through the pinhole
- One eye can see the object, this is the dominant eye





## Assessment of the dominant eye using a **Trial lens +0.5 dpt**

- The patient is binocular looking to a vision test (letters, optotypes,...)
- The optometrist alternately places a **+0.5 dpt trial lens** in front of each eye
- The eye that is more affected by the plus lens is the dominant eye
- This is the most common sensory test





# Assessment of the dominant eye

Silke Krüger (thesis 2001)

Cornelia Fischer (thesis 2007)

## Sighting tests

Which eye is used to determine the direction of sight ?

## Perceptual tests

What eye prevails with its perception ?

## Visual acuity

What eye has better visual acuity ?

## Dominant hand

Are right handed patients also right eye dominant?



# Assessment of the dominant eye

Silke Krüger (thesis 2001)

30 subjects (students of Beuth University)

## Sighting tests

**>95% correct**

**1 person 1 test wrong**

## Perceptual tests

**55% correct**

**25% wrong**

**20% not possible**

## Visual acuity

**20% correct**

**10% wrong**

**70% not possible**

## Dominant hand

**70% correct**

**30% wrong**



# Assessment of the dominant eye

Cornelia Fischer (thesis 2007)

17 subjects (students of Beuth University)

## Sighting tests

100% correct

0% wrong

## Perceptual tests

30% correct

30% wrong

40% not possible

## Visual acuity

30% correct

20% wrong

50% not possible

## Dominant hand

60% correct

40% wrong



# Assessment of the dominant eye

Final results of the studies

Silke Krüger (2001) and Cornelia Fischer (2007)

## Sighting tests

100% correct

0% wrong

## Perceptual tests

30% correct

30% wrong

40% not possible

## Visual acuity

30% correct

20% wrong

50% not possible

## Dominant hand

60% correct

40% wrong





# Assessment of the dominant eye

Final results of the studies


Silke Krüger (2001) and Cornelia Fischer (2007)

## The winner is the sighting test

It is recommended as the best assessment of the dominant eye

The ring sighting test can be a part of the purchase order form

Or it is designed as a part of an advertisement

**PS 45 ANPASSUNG**  *Individuelle Kontaktlinsen*

Anpasser: \_\_\_\_\_  
Komm.: \_\_\_\_\_  
Datum: \_\_\_\_\_

**EIGNUNG** a) Ferne -8.00 bis -5.00 dpt. c) Addition bis +2.25 dpt.  
b) Astigmatismus bis 1.00 dpt. d) Hornhautradius 7.4 - 8.6 mm

**1. Dominantes Auge** (unbedingt ankreuzen) ☐ R ☐ L

**2. Hornhautradius** R: \_\_\_\_\_ L: \_\_\_\_\_


**3. Rückflächennutzen KL** 8.3 bei HH Mittel bis 7.5 mm (nur Minus-Linsen) ☐ ☐  
8.7 bei HH Mittel 7.4 - 7.9 mm und Iris bis 11 mm  
9.1 bei HH Mittel 7.8 - 8.6 mm und Iris ab 11.5 mm  
9.1 bei HH Mittel ab 8.0 mm

**4. Refraktion** R: \_\_\_\_\_ L: \_\_\_\_\_  
Bester sphärischer Fernwert mit Minus-Zylinder

**5. Fernwert KL** R: \_\_\_\_\_ L: \_\_\_\_\_  
Beste Sphäre + Zylinder: HSA = 0

**6. Probefernse** Fernwert KL: \_\_\_\_\_ + 1.75 dpt. = dpt. ☐ ☐  
nach: Minus ablesen falls nicht im Anpasser

**7. Probefernse nicht-** Fernwert KL: \_\_\_\_\_ + 2.00 dpt. = dpt. ☐ ☐  
dominantes Auge: nach: Plus ablesen falls nicht im Anpasser

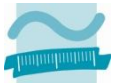
**8. Probefernse einsetzen**  ☐ ☐  
• Sitzbeurteilung wie gewohnt  
• Bewegung nicht stärker als 1 mm  
• Ocularmeter b. der Linse  
• Fernvisus/Nahvisus subjektiv erfragen  
• Keine periphere Verzeichnung, Nähe z. B. 10° Zerstreuung  
• Lösung: wenn es gemessen wird, min. 0.5 dpt.  
• sonst andere Probefernse  
• Sehleistung steigt erfahrungsgemäß nach mehrstündigem Tragen

**9. Überrefraktion** ☐ ☐  
• Linsen min. 60 Min. im Auge lassen  
• Bindehäute Ferne und Nähe?  
• Überrefraktion binokular, beide Augen offen (nicht abgedeckt)  
• kein Phoropter, gute Randsehschärfe, kein Überrefraktor 0.50 dpt.  
• Geringe Überrefraktion mit Probeglas in Ferne und Nähe, für die Hornhaut-Pur wie möglich  
• Überrefraktion = \_\_\_\_\_ dpt. ☐ ☐

**10. Rezeptieren PS 45** Durchmesser nur 14,0 mm ☐ ☐  
Radius in mm ☐ ☐  
Brennkraft \_\_\_\_\_ dpt. ☐ ☐

**11. Kontrolle** Sitz in Ordnung? Evtl. anderer Radius? \_\_\_\_\_  
Visus in Ordnung? Evtl. weitere Überrefraktion oder/und anderer Radius \_\_\_\_\_  
Neue Rezepturen \_\_\_\_\_ dpt. ☐ ☐

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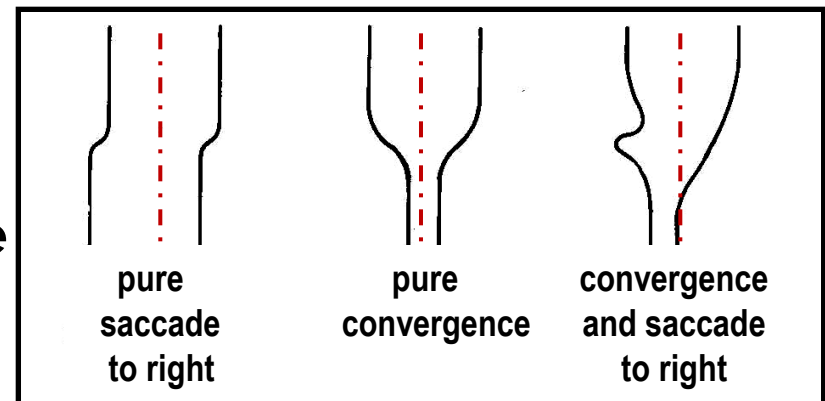
# Superiority of sighting tests

- Research studies about eye movements by Hartmann in Munich in the 80s support these results
- It is essential during eye movement to determine and reach the direction of the fixation object
- This is exactly the question addressed by sighting tests:  
**What eye plays the role of recognising and reaching the new direction**



# Superiority of sighting tests

- Pure versions and pure vergences show little or no influence of the dominant eye
- But combinations of version and vergence show very different motions of the dominant and the partner eye
- Only the movement of the dominant eye is target-oriented
- The movement of the partner eye is strongly affected



Hartmann 1988



# Sighting test procedure

- **Sighting tests need a distance of ~40 cm from the eye**  
Otherwise the resemblance to an optical instrument (camera, microscope,..) can give a wrong result
- **Sighting tests should be carried out using both hands**  
Otherwise the test can show the dominant hand instead of the dominant eye
- **Manufacturers of contact lenses offer sighting tests**
  - Conta Optic: a pinhole in the order form
  - Johnson&Johnson: an eye-shaped post card with a pupil
  - Ciba Vision, Bausch+Lomb, Techno-Lens: a pinhole in the fitting instruction
  - We hope for more and more in the future





# Sighting tests of the CL-companies

**PureVision® Multi-Focal Kontaktlinsen**  
Klare, scharfe Sicht auf jede Entfernung

**Alterssichtigkeit (Presbyopie)**  
Im Alter verliert das Auge zunehmend die Fähigkeit, den Nahbereich so einzustellen, so dass ein scharfes Bild entsteht. Bei der Naheinstellung muss sich die Linse zur „Kugel“ wölben. Da im Lauf des Lebens Zellzahl und Gesamtzellgewicht der Linsen zunehmen, kommt es zu einer ständigen Verdichtung der Linsensubstanz. Dadurch nimmt die Verformbarkeit der Linse ab.

**TECHNO-LENS®**  
Lentilles multifocales  
détermination de l'oeil directeur

Mehrstärkenlinsen  
Bestimmung des Führungsauges

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www.technolens.de

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**DOMINANZTESTKARTE ZUR BESTIMMUNG DES FÜHRUNGSAugES**

1. Lassen Sie die Dominanztestkarte vor Ihrem Kunden mit ausgestreckten Armen halten und durch das Loch ein Objekt in mindestens 2m Entfernung binokular fixieren.
2. Docken Sie abwechselnd nun zunächst das rechte und danach das linke Auge Ihres Kunden ab (okkludieren).
3. Fragen Sie Ihren Kunden, mit welchem Auge er das Objekt weiterhin durch das Loch in der Karte fixieren kann. Die Dominanztestkarte darf dabei nicht verschoben werden.

AIR OPTIX™ Kontaktlinsen ... und Ihre Augen atmen auf.

**MULTIFOCAL**  
AIR OPTIX AQUA  
COMBIVISION

**PS 45 ANPASSUNG**  
Jahreszahl Kontaktlinsen

**EIGNUNG**  
a) Ferne -8.00 bis -5.00 dpt.  
b) Astigmatismus bis 1.00 dpt.  
c) Add-on b) +2.25 dpt.  
d) Hornhautradius 7.4 - 8.6 mm

**1. Dominantes Auge**  
R: ☐ L: ☐ (unbedingt ankreuzen)

**2. Hornhautradius**  
R:  L:

**3. Rückflächenradius KL**  
8.3 bei HH Mittel bis 7.5 mm (nur Minus-Linsen)  
9.1 bei HH Mittel 7.4 - 7.9 mm und bis 11 mm  
9.1 bei HH Mittel 7.8 - 8.6 mm und bis 11.5 mm  
9.1 bei HH Mittel ab 8.0 mm

**4. Refraktion**  
R:  L:

**5. Fernwert KL**  
R:  L:   
Bester spherischer Fernwert mit Minus-Zylinder  
Beste Sphäre + Fern HSA = 0

**6. Probierlins dominantes Auge:**  
Fernwert KL:  + 1.75 dpt. = dpt.   
nach: Messen der Augen (falls nicht an Anpasser)

**7. Probierlins nicht-dominantes Auge:**  
Fernwert KL:  + 2.00 dpt. = dpt.   
nach: Messen der Augen (falls nicht an Anpasser)

**8. Probieren einsetzen**  
• Sitzbeurteilung wie gewohnt  
Bewegen Sie nicht stärker als 1 mm  
Oktometer b) der

**9. Überrefraktion**  
• Linsen min. 60 Min. im Auge lassen  
• Überprüfen Sie Ferne und Nähe?  
• Überprüfen Sie binokular, beide Augen  
• kein Phoropter, eine Rundbrille  
• Genaue Überrefraktion  
• Ferne und Nähe

• Fernvisus/Nahvisus subjektiv erfragen  
• keine neue Visusprüfung, Nähe z. B. = Zeitung  
• immer andere Probierlinsen  
• Sehleistung steigt erfahrungsgemäß nach mehrstimmigen Tragen

**ACUVUE® BIFOCAL**

Austausch-Kontaktlinsen von Johnson & Johnson Vision Care



## Summary

### 1. Identifying of the dominant eye

- To determine the dominant eye pinhole ring sighting tests are most suitable, the CL-manufacturers offer these tests
- The dominant eye should be determined at each optometric examination

### 2. Significance of the dominant eye

- Presbyopia corrections using contact lenses should give the distance correction to the dominant eye. The partner eye can look more to the near vision
- Using contact lenses the dominant eye mostly is more affected by residual astigmatism than the partner eye. Therefore it is good for the patient to have full correction of astigmatism on the dominant eye. The partner eye can match a portion of residual astigmatism.







**Thank you for listening and  
best wishes from Beuth University Berlin**





P.S.

Why don't you come  
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