Eine neuartige Strabismus-Video-Brille zur automatisierten Schielwinkel-Messung

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Disclosure

• K. P. Weber and H. G. MacDougall act as unpaid consultants and have received funding for travel from Otometrics.

• K. P. Weber and H. G. MacDougall have patents issued and pending in the US, European Union, China and Japan for head mountable devices for measuring eye movements.
Strabismus (‘crossed eyes’)  
• Misalignment of the eyes  
  ➢ Amblyopia (‘lazy eye’): vision loss, only reversible in childhood!  
  ➢ Loss of stereopsis  
  ➢ Double vision  
  ➢ Cosmetics  
• Very frequent disorder (~5% of population)  
• Different forms of strabismus  
  • Congenital (children)  
  • Acquired (children and adults)  
• Making the right diagnosis is important for finding the cause! (congenital, tumour, stroke...)  
• Measuring strabismus is important for choosing the right treatment! (eye muscle surgery, occlusion therapy...)
Alternate Cover Test

qualitative

cubjectatvæ
Hess Screen Test

Cooperation often limited in children
Strabismus Video Goggles

• Binocular eye movement tracking with infrared video cameras
• Integrated LCD shutters for alternate eye occlusion
• Head-mounted laser target projection
• Fast self-calibrating paradigm (~ 2 minutes)
• Prototype weight ~100g

41 patients (6-81 years)
  • 4 third nerve palsies
  • 16 fourth nerve palsies
  • 5 sixth nerve palsies
  • 13 comitant strabismus
  • 3 various diagnoses

17 normal subjects
Strabismus
Video Goggles
Strabismus Video Goggles – Raw Data

Left Eye Deviation

Right Eye Deviation

position
Strabismus Video Goggles – Final Result

Left Eye Deviation

Right Eye Deviation

Left Trochlear Nerve Palsy

Vertical position
Traditional Hess Screen Test

Left Eye Deviation

Right Eye Deviation

Left Trochlear Nerve Palsy
Global Correlation
Strabismus Video Goggles vs. Hess Screen Test

Horizontal and Vertical Correlation

\[ \text{ICCH} = 0.83 \]
\[ \text{ICCV} = 0.76 \]
Correlation at Different Gaze Directions

Strabismus Video Goggles vs. Hess Screen Test
Left Abducens Nerve Palsy – Preoperative

Left Eye Deviation

Right Eye Deviation

Vertical position [deg]

Horizontal position [deg]
Left Abduccens Nerve Palsy – Postoperative

Left Eye Deviation

Right Eye Deviation

Vertical position [deg]

Horizontal position [deg]
Infantile Strabismus with Consecutive Exotropia and Visual Suppression

Hess Screen Test

Harms Tangent Screen

Prism Cover Test:
Far: Exo 60^
Near: Exo 60^
Infantile Strabismus with Consecutive Exotropia and Visual Suppression
Conclusions

• The Strabismus Video Goggles are simple, fast & accurate
• Good agreement between strabismus video goggles and Hess screen test
• Applicable in children ≥ 6 years
• Work in strabismus patients with visual suppression

Outlook

• Currently pre-production prototype
• Clinical software implementation
• Market-Readiness within about 1 year

Thank you!

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The Goggles Team

Strabismus Video Goggles
Traditional Hess Screen Test
Deviation (left – right)

d empirical cumulative distribution