Program Number: 5975
Presentation Time: 12:00 PM–12:15 PM
Disinvestment study of population-wide eye screening in the Netherlands: effect of omission of preverbal eye screening at age 6-9 months

Purpose: Around 1980 preverbal screening was added to preschool screening at the Child Health Centers (CHC’s) that screen 97% of all Dutch children. Dutch children are eye-screened 7 times in the age range 0-5 years. The RAMSES birth-cohort study showed that preverbal eye screening contributed little to the detection of refractive amblyopia and that half of strabismic amblyopia cases were discovered outside of screening. Effect of abolishment of eye screening at age of 6-9 months was investigated.

Methods: In a large rural area and a suburb of Amsterdam preverbal screening (cover test, Hirschberg test, eye movements, cornea and pupillary reflexes) was abolished in one of 2 birth cohorts. All children were screened at 1-2 and 3-4 months, but at 6-9 months only the control group (born July-December 2011) was screened. Children in the intervention group (born January-June 2012) did attend consultations at the CHC’s for all other basic screening and vaccinations. Eye screening, in the intervention group, was only performed based on inspection or information from parents. Data was collected from screening records, anonymous questionnaires and on-site observations.

Results: 57 out of 6188 children (0.9%) in the screened group were referred to an orthoptist or ophthalmologist. In the unscreened group 48 out of 5623 children (0.9%) were referred to an orthoptist or ophthalmologist. 11 children in the screened group and 6 in the unscreened group were referred based on the screening tests. All other cases were referred based on strabismus observed by parents or screening physician or because of other visual apparent problems. Amblyopia was diagnosed in 7 (screened group) versus 6 children (unscreened group). Only 1 of these children, in either group, was referred based on the screening test. All cases of diagnosed amblyopia were strabismic or combined-mechanism amblyopia.

Conclusions: Equal numbers of children were referred and found to have amblyopia in the screened and unscreened group. Conscious strabismus was noted by parents or screening physicians, while no cases of refractive amblyopia were detected in either group. Weaknesses were that screening physicians were familiar with eye screening in both groups and that in a third of unscreened children the evidence that the child indeed had not been screened was not fully conclusive.

Commercial Relationships: Frea Sloom, None; Aya Sami, None; Hatice Karaman, None; Sjoukje E. Loudon, None; Trijntje Sjoeerdmsa, None; Janine Benjamins, None; Hein Raat, None; Huibert J. Simonsz, None
Clinical Trial: NCT01675193

Program Number: 5976
Presentation Time: 12:15 PM–12:30 PM
Prevalence of amblyopia in school-aged children and variations by ethnicity: a multi-country refractive error study in children
Ou Xiao, Ian G. Morgan, Leon Ellwein, Mingguang He.

Purpose: Amblyopia is one of the most common causes of uncorrectable visual impairment in children. The objective of this analysis is to estimate the age-, gender-, and ethnicity-specific prevalence of amblyopia using data from eight sites in the multi-country Refractive Error Study in Children (RESC)

Methods: Population-based, cross-sectional samples of children aged 5 to 15 years were selected through random cluster sampling. The examination included visual acuity measurements, evaluation of ocular alignment and refractive error under cycloplegia, as well as examination of the external eye, anterior segment, media, and fundus.

Amblyopia was defined as best-corrected visual acuity of 20/40 or less in either eye, with tropia, anisometropia (2 spherical equivalent diptors or more) or hyperopia (+6 spherical equivalent diptors or more), after excluding children with fundus or anterior segment abnormalities.

Results: Among 46,260 children who were enumerated, 39,551 had a detailed ocular examination and a reliable visual acuity measurement in one or both eyes. Information on ethnicity was available for 39,321 of these participants. The overall prevalence of amblyopia was 0.74% (95% confidence interval: 0.64%-0.83%) with significant (p<0.001) variation across ethnic groups: 1.43% in Hispanic, 0.93% in Chinese, 0.62% in Indian, 0.52% in Malay, 0.35% in Nepali and 0.28% in African children. Amblyopia was not associated with age or gender. The most common cause of amblyopia was anisometropia.

Conclusions: On average, amblyopia affected approximately 7 per thousand school-aged children in this study. Amblyopia was more prevalent in people of Hispanic and Chinese ethnicity. Most cases are unilateral and appear to develop before the age of 5 years.

Commercial Relationships: Ou Xiao, None; Ian G. Morgan, None; Leon Ellwein, None; Mingguang He, None
Support: World Health Organization under National Institute of Health contract N01-EY-2103

Program Number: 5977
Presentation Time: 12:30 PM–12:45 PM
Simulating Amblyopic Noise: Reduction in Saccadic Adaptation in Controls
Rana Arham Raashid, Herbert C. Goltz, Alan Blakeman, Agnes M. Wong.

Purpose: Anisometropic amblyopia patients have increased saccadic endpoint variability. We showed that they also exhibit reduced short-term saccadic gain adaptation compared to controls (Raashid et al., 2013), possibly driven by imprecise postaccommodation visuomotor errors. Here we quantify the postaccurate error distribution difference between anisometric amblyopia patients and controls.

We apply this additional variability to the intrasaccadic target step (ISS) in controls during saccadic adaptation, and test whether their performance diminishes in response to a noisier “amblyopic” adapting step.

Commercial Relationships: Rana Arham Raashid, None; Herbert C. Goltz, Alan Blakeman, Agnes M. Wong.
Clinical Trial: NCT01675193
Methods: Five visually-normal adults performed a double-step adaptation task (±19°, followed by a mean 4° ISS back-step) during nondominant eye monocular viewing under two conditions: “consistent error” control, where the trial-by-trial ISS size was a constant 4° and “variable error”, where the ISSs were distributed normally around 4.0±1.0°. We modeled the probability distribution of saccadic amplitudes to ±19° visual targets in 8 anisometropic amblyopia patients (n=1000) and 11 visually-normal controls (n=1800) viewing with their ambylopic/non-dominant eye. Saccadic amplitude variance for controls was subtracted from that of patients to yield the variance of the second target step for our “variable error” condition. Percentage and time constants of adaptation were measured and compared across conditions.

Results: Percentage adaptation within controls decreased significantly during the “variable error” condition (49±5%) compared to the “consistent error” condition (73±8%; mean ± 95% CI) during nondominant eye viewing. This adaptation magnitude decrement in controls (49±5%) was comparable to our published percentage adaptation values in anisometropic amblyopia patients during an identical “consistent error” condition with their ambylopic eye viewing (45±7°, Raashid et al., 2013). Adaptation time constants did not differ in controls between conditions (consistent: 24±13; variable: 12±7 trials), or compared to patients during the “consistent error” condition (19±7 trials).

Conclusions: Our preliminary findings suggest that adding exogenous spatial noise consistent with ambylopic saccadic endpoint variability to the intrasaccadic step results in reduced adaptation in healthy individuals. We suggest that post-saccadic error variability inherent in anisometropic amblyopia may be one of the predictors of impaired adaptation in these patients.

Commercial Relationships: Rana Arham Raashid, None; Herbert C. Golz, None; Alan Blakeman, None; Agnes M. Wong, None
Support: CIHR. MOP 106663

Program Number: 5978
Presentation Time: 12:45 PM–1:00 PM
The Effect of Prenatal Exposure to Recreational Drugs on Global Motion Perception at 4.5 Years of Age
Arijit Chakraborty, Nicola Anstice, Robert J. Jacobs, Benjamin Thompson, Trecia Wouldes. 'Optometry & Vision Science, The University of Auckland, Auckland, New Zealand; 2Psychological Medicine, The University of Auckland, Auckland, New Zealand.

Purpose: Prenatal exposure to recreational drugs such as alcohol, nicotine, marijuana and methamphetamine influences cognitive and physical development. The aim of this study was to assess the effect of prenatal drug exposure on global motion perception, a function of the dorsal visual stream, which is thought to be particularly vulnerable to abnormal development.

Methods: One hundred and thirty five-month-old children (71 male) who were enrolled in the IDEAL (Infant Development, Environment and Lifestyle study) cohort took part in this study. Global motion perception was assessed psychophysically using random dot kinematograms (100 dots, dot speed 6°/sec) whereby motion coherence thresholds (MCT) were measured using a 2-down 1-up staircase approach. Stereocuity was assessed using the VAO stereotest and unaided visual acuity was measured with the crowded Keeler LogMAR chart. Children were also screened for ocular motility and ocular health problems.

Results: 75.4% of the children had prenatal exposure to nicotine, 55.4% to alcohol, 46.2% to methamphetamine, 43.8% to marijuana and 79.2% of children were exposed to multiple drugs. The effect of nicotine exposure on MCTs differed significantly between males and females (F = 4.9, p = 0.03) whereby nicotine exposure impaired MCTs to a greater extent for males than females. In addition there was a significant interaction between marijuana and alcohol exposure (F = 4.7, p = 0.03) whereby exposure to marijuana in the absence of alcohol tended to improve MCTs. No effects of methamphetamine exposure on MCTs were observed and no effects of drug exposure on stereopsis or visual acuity were found. MCTs were significantly correlated with stereopsis (ρ = 0.4, p<0.001) but not visual acuity (ρ = 0.092, p=0.300).

Conclusions: Prenatal exposure to recreational drugs may influence the development of global motion perception, however factors such as gender and multiple drug exposure appear to moderate this effect.

Commercial Relationships: Arijit Chakraborty, None; Nicola Anstice, None; Robert J. Jacobs, None; Benjamin Thompson, None; Trecia Wouldes, None
Support: National Institute on Drug Abuse (R01DA021757) and Auckland Medical Research Foundation

Program Number: 5979
Presentation Time: 1:00 PM–1:15 PM
Oculomotor signs during epileptic seizures in children
Alexandra Hoeh, Susanne Schubert-Bast, Christina Beisse. 'Department of Ophthalmology, University of Heidelberg, Heidelberg, Germany; 2Department of Pediatric Neurology, University of Heidelberg, Heidelberg, Germany.

Purpose: Epileptic seizures in children can be accompanied by oculomotor manifestations such as tonic gaze deviation, nystagmus and eyelid myoclonus. To date, not many studies on oculomotor manifestations in children exist, and neurophysiological mechanisms controlling these eye movements during seizures remain controversial. This study was designed to examine the pattern of oculomotor signs in children in relation to the epileptic focus in the EEG (electroencephalography).

Methods: Seven patients (6 male, 1 female) aged 1.5 months to 15 years (median age: 1 year) were enrolled in this retrospective study. All patients had epilepsy associated with oculomotor manifestations. Simultaneous video-EEGs were recorded for a minimum of 24 hours. Gaze deviation, nystagmus and eyelid myoclonus recorded on the videos were analyzed in relation to the ictal epileptic activity in the EEG.

Results: Etiology of epilepsy was diverse including epilepsy originating from occipital or frontocentral regions, epileptic encephalopathy and left-hemispheric epilepsy due to hemimegalencephaly. On the video-EEG tonic gaze deviation was present in 5 patients. Nystagmus was observed in 3 patients and eyelid myoclonus in 2 patients. Three of the 5 patients with gaze deviation had a horizontal deviation that was directed to the contralateral hemisphere of the ictal epileptic discharges. Two patients had tonic up- or downgaze associated with bilateral epileptic discharges. The slow conjugate jerk nystagmus with large amplitude observed in 3 patients correlated with occipital epileptic activity. Nystagmus was horizontal in two of these children and beating contralateral to the main ictal epileptic discharges. Slow upbeat nystagmus in combination with tonic downgaze in the other child was associated with bilateral occipital epileptic activity. Eyelid myoclonus was only present in patients with gaze deviation.

Conclusions: In this study, all patients with epileptic nystagmus showed an occipital focus in the EEG recording. Horizontal nystagmus and horizontal gaze deviation were always directed to the contralateral side of the main ictal discharges. In cases with upbeat nystagmus or vertical gaze deviation main epileptic activity involved both hemispheres. Associated eyelid myoclonus was only present in patients with frontal epileptic activity. In conclusion, oculomotor signs can help to localize the epileptic focus in children.
Purpose: To use spectral domain hand-held optical coherence tomography (SD-HH-OCT) to characterise the development of the optic nerve head (ONH) in infants between birth and seven years of age with infantile idiopathic nystagmus (IIN) and nystagmus associated to albinism, in comparison to normal controls.

Methods: 38 participants with IIN, 53 with albinism and 176 controls, aged between 0 and 7 years had optic nerves imaged using SD HH-OCT. The central B scan was identified as the point of the nerve with the deepest cup. Parameters included disk, cup and rim dimensions and peripapillary retinal thickness and retinal nerve fibre layer (RNFL) were correlated to log gestational age (logGA).

Results: There was a significant increase in disk diameter with logGA in all three groups (p<0.001) with no significant inter-group differences. Cup diameter also increased with logGA in albinism (p=0.009), but not in the IIN group. Consequently changes in cup to disk ratio with logGA were insignificant in all groups. The rim area was significantly greater in IIN than in controls (p=0.035), also showing a greater rate of increase with logGA than controls (p=0.036; IIN: r=0.615; Ctrl: r=0.230), mainly because of increase in the nasal rim. In contrast larger increase occurred in the temporal rim in albinism in relation to logGA (p=0.004). Temporal rim area was significantly thicker in albinism compared to controls (p=0.042), and increased at a faster rate (p=0.021).

Nasal and temporal peripapillary retinal thickness was greater in IIN compared to controls (nasal: p=0.003; temporal: p=0.005) and increased at a faster rate (nasal: p=0.003; temporal: 0.005). In the albinism these changes were limited to temporal retinal thickness (compared to controls: p=0.015; interaction with logGA: p=0.023). Although RNFL changed with logGA there were no significant differences between the three groups.

Conclusions: We describe different patterns of the optic nerve development between the three groups. The IIN group shows a greater rate of increase in neural tissue on nasal and temporal sides of the ONH with age with the greatest changes being observed for the nasal side. Only temporal neural tissue shows a significantly higher rate of thickening in the albinism group. These data show there are significant changes in the development of the optic nerve in infants with idiopathic infantile nystagmus and nystagmus associated to albinism.

Commercial Relationships: Ravi Purohit, None; Helena Lee, None; Aarti Patel, None; Viral Sheth, None; Gail Maconachie, None; Eleni Papageorgiou, None; Rebecca J. McLean, None; Irene Gottlob, None; Frank A. Proudlock, None
Support: Medical Research Council, London, UK (grant number: MR/J004189/1), Ulverscroft Foundation, Leicester, UK, Nystagmus Network UK.

Program Number: 5980
Presentation Time: 1:15 PM–1:30 PM
The developing optic nerve head in infantile idiopathic nystagmus and nystagmus associated to albinism

Helena Lee

Commercial Relationships: Alexandra Hoeh, None; Susanne Schubert-Bast, None; Christina Beisse, None

Program Number: 5981
Presentation Time: 1:30 PM–1:45 PM
An Exploratory Study of a Novel Home-Based Binocular Therapy for Childhood Amblyopia

Manuela Bossi, Elaine J. Anderson, Vijay Tailor, Peter J. Bex, John A. Greenwood, Annegrêt Dahlmann-Noor, Steven C. Dakin

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Purpose: Amblyopia is a common developmental visual disorder characterized by interocular acuity differences and associated with low functional vision. It is typically treated by refractive correction followed by either patching or pharmacological blurring of the better seeing eye. Such treatments have imperfect efficacy (success rates: acuity, 20% to 90%; stereoacuity, <50%) and poor compliance (44-57%), and they show a high risk of recurrence after cessation (~30% at one year follow-up). We propose a treatment for amblyopia that addresses these limitations.

Methods: We tested a novel “binocular balanced viewing” (BBV) therapy on 8 children (7-12yrs) with anisometropic unilateral amblyopia (2 or more logMAR lines interocular difference in best corrected visual acuity after full refractive adaptation). Children spent ~50min/day watching movies at home while wearing goggles-mounted 3D-shutter glasses. We “balanced” the visibility of the movie across eyes by applying sufficient Gaussian blur to the image presented to the unaffected eye to reduce its crowded-acuity to the level of the affected eye. Although 2D movies were used, image-disparity was modulated slowly over time to provide stimulation at a range of depth-planes. During movie playback children also made a series of perceptual judgements (treatment’s active component, involving dichoptic video-game characters) and their performance yielded a day-to-day index of compliance and inter-ocular suppression.

Results: After ~60 hours of treatment (achieved in ~8 weeks) we observed substantial improvement (average 3.20 logMAR lines) in acuity in the affected eye and near-normal stereo vision (Frisby test: 85 seconds of arc or better; mean improvement of 180 sec arc) in all but one participant. One child did not attend the post-treatment review and was excluded from analysis. At our daily measurements, compliance was high (average 50min/day; mean daily compliance 70%) and inter-ocular suppression remained largely unaffected by treatment, even in cases where substantial gains in acuity were achieved.

Conclusions: These exploratory findings are encouraging and suggest that BBV therapy may have wider applicability in the treatment of amblyopia. It leads to rapid and substantial functional gains compared to standard interventions while being, unlike occlusion therapy, popular with patients and parents (maximizing compliance and outcome).

Commercial Relationships: Manuela Bossi, None; Elaine J. Anderson, None; Vijay Tailor, None; Peter J. Bex, None; John A. Greenwood, None; Annegrêt Dahlmann-Noor, None; Steven C. Dakin, None
Support: Special Trustees of Moorfields Eye Hospital and University College London (UCL impact awards)