Kongsberg Vision Meeting 2024: Abstracts

Kongsberg Vision Meeting was held at the University of South-Eastern Norway in Kongsberg, for the 16th time, on October 24–25, 2024. The meeting was organised as a two-day event focusing on clinical optometry and vision research. Vibeke Sundling, Ann Elisabeth Ystenæs, Lotte-Guri B. Steen, Tove Lise Morisbakk, Helle K. Falkenberg and Rigmor C. Baraas organised the meeting. The theme this year was related to advancements in primary eye care. Keynote speakers were António Filipe Macedo, Linnæus University, Sweden; Mhairi Day, Glasgow Caledonian University, Scotland; Tony Pansell, Karolinska Institutet and St Erik Eye Hospital, Stockholm, Sweden; Fiona Stapleton, University of New South Wales, Australia; and Maria Liu, UC Berkeley Herbert Wertheim School of Optometry & Vision Science, Berkeley, USA. The abstracts from the other invited and contributed talks on the different days are presented in the order they were given.

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Neovascular age-related macular Degeneration: The patient's journey

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Abstract

In this talk I will share the results of an ongoing research project which aims to characterise the journey of patients with neovascular age-related macular degeneration (nAMD). The project deals with patients' perceptions of several aspects of their life and their vision together with clinical aspects like treatment response in a real-world setting. In the first part I will focus on the patients' perspective by sharing results of standard measures of mental health and vision related quality of life. In the second part I will share longitudinal, functional and structural outcomes and pilot data on explorative blood markers for disease relapses. Finally, I will make a connection between all the aspects by mentioning the touching points and how these can be used to improve management and quality of life for those affected by nAMD.

The effectiveness of optical myopia management interventions

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Abstract

Clinical trials show that widely commercially available optical myopia management interventions significantly reduce the progression of axial length (AL) to mean values of 0.1–0.26 mm/year compared to controls (0.20–0.36 mm/year), a mean reduction of between 0.1–0.175 mm/year (Bao et al., 2022; Chamberlain et al., 2019; Huang et al., 2016; Lam et al., 2020; Liu et al., 2023; Ruiz-Pomeda et al., 2018). Clinical trials have set durations (e.g. 1, 2, 3, 6 years); selected subjects are within a set age bracket (e.g. 8 to 12 years) and have a specific range of spherical equivalent refractive errors (SER, sphere power + 0.5*cylinder power; e.g. -1 to -5 D), and many are conducted in subjects with a Chinese ethnicity. Additionally, the final outcomes reported in clinical trials do not include the results of subjects who have dropped out during the studies.

Using a variety of methods, previous research investigating effectiveness of interventions in a UK clinic population in a small case series showed that, on average, 30% of patients had successful outcomes with the intervention (Kearney et al., 2022). This study aims to extend this case series, including analysis on myopia management spectacle lenses, to investigate the response to optical myopia management interventions in a UK clinic setting.

In this study, data collected from patient clinical records from the myopia clinic, Glasgow Caledonian University, included age, axial length (AL) and intervention method (DIMs, orthokeratology (OK), dual focus (DF) and multifocal (MF) contact lenses)). If data were available, effectiveness was evaluated by three methods: 1) Mean Efficacy Method using the reduction in AL mean values from literature as a target, 2) Emmetropic Growth Method using emmetropic AL growth as a target, 3) Responder/non-responder, a responder demonstrating progression <0.11 mm/year (Prieto-Garrido et al., 2021).

Sixty-three patients were included (DIMs: 28, DF: 15, MF: 11, OK: 8). Results show that at commencement of intervention, mean ± SD SER was -4.56 ± 2.10 DS and AL 25.04 ± 0.95 mm. The AL growth rate before intervention was 0.34 ± 0.26 mm and the mean ± SD AL growth rate during intervention was 0.15 ± 0.12 mm/yr with a significant mean reduction of 0.19 ± 0.27 mm/year.

Across all methods and intervention types, interventions showed success in 39% of patients. Across all interventions, there was success in 49% of eyes using the mean efficacy method, 29% success with the emmetropic growth method and 42% were classed as responders. The average success across the three methods of measurement for each intervention was: DIMS: 44%; DF: 25%; MF: 45%; OK: 33%.

In conclusion, approximately half of patients will not meet the mean AL effectiveness values from clinical trials and the effectiveness of interventions varies greatly across individuals. As optical interventions are a considerable time and monetary investment for patients, the effectiveness of interventions should be discussed with patients in a balanced way and AL measured to accurately evaluate efficacy. Practitioners should consider monitoring the AL before starting an intervention to ensure interventions are offered in an appropriate manner to myopes demonstrating AL progression and to allow for success to be evaluated using methods such as the Mean Efficacy Method.

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Vision and dizziness

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Abstract

Dizziness is a common complaint and might indicate severe illnesses in the body or brain that need further clinical investigation. There is also non-serious dizziness that the optometrist should handle. In this talk, I will present a framework for investigating and correctly handling patients suffering from dizziness. Particular focus is given to vision motion hypersensitivity, also called visual vertigo.

Exploring the association between virtual reality technologies, oculomotor function and postural control

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Abstract

The use of virtual reality (VR) technologies has the potential to provide benefits and advancements in various areas, from entertainment and leisure activities to education and work life. Some of these benefits include increased engagement in learning, the ability to repeat life-like training scenarios as often as needed in safe conditions, as well as enabling efficient long-distance, real-time collaboration.

Despite its benefits, VR presents challenges, particularly regarding vision and oculomotor functions that are critical for depth perception, navigation, and adaptation to natural and virtual environments. In a VR environment, human vision encounters oculomotor challenges such as the vergence-accommodation conflict: a disconnect between vergence and accommodation. Furthermore, vision is one of three sensory systems used to maintain bodily balance. The increased demand on human vision in VR, including the vergence-accommodation conflict, may affect postural control during and immediately after immersion in VR. However, the understanding of the interaction between human vision, postural control and VR technologies, and the role that human vision plays in a VR environment, remains limited. Knowledge about the vergence-accommodation conflict raises the question of how important the function of accommodation and vergence is for continuous and comfortable VR use. Also, how does VR use affect oculomotor function and postural control?

This study examined the association between oculomotor functions, specifically accommodation and vergence, and performance, comfort, and postural control during and after VR gameplay. Also, it explored potential risks and benefits that VR may pose for oculomotor function and postural control. The study included 120 upper secondary school students aged 16–18 years. Comprehensive vision testing was conducted to characterise each participant's visual status, and a set of tests was carried out before and after the VR gameplay to evaluate possible changes in oculomotor function and postural control.

The results suggest that both vergence and accommodation might be important indicators for predicting postural instability after VR gameplay. The findings offer valuable insights into the importance of oculomotor function for more comfortable and effective use of VR. They also explore its potential impact on postural control, informing more inclusive design practices in VR technologies.

Vision and cognitive function in healthy Norwegian school children

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Abstract

Anecdotally, when asking teachers or parents if they believe that having good vision is important for a child's academic performance, many will nod in agreement. Consistent with such a view, a growing body of evidence shows that several aspects of visual functions are associated with academic performance. Visual acuity is shown in numerous studies to be linked to academic performance (Hopkins et al., 2020; Schmitz et al., 2023). Similar trends have been reported for refractive error status (Mavi et al., 2022), and binocular- and accommodative-functions (Shin et al., 2009), but with some degree of uncertainty (Hopkins et al., 2020).

There are several methods to measure academic performance in children, where the most obvious one is looking at their school grades. However, research has shown that, by testing children's cognitive function (such as working memory, inhibition and processing speed), the outcome can predict future academic performance (Roebers et al., 2014).

Therefore, in addition to measuring children's visual status as a part of a school vision program, the SNOW study has also measured their cognitive function (working memory and processing speed) to investigate the possible associations between visual and cognitive functions in a healthy population of Norwegian schoolchildren aged 7–16 years. Preliminary results will be discussed in the context of previously published research.

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Exploring the effects of natural dark/light exposure on myopia — insights from animal models

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Abstract

Numerous studies suggest that spending time outdoors protects humans against developing myopia (Morgan et al., 2021; Rose et al., 2008). However, it is unknown if and how exposure to daylight and darkness in natural outdoor habitat regulates eye growth and protects against developing myopia in mammals. Myopia research generally uses laboratory animal models like guinea pigs, tree-shrews, monkeys, domestic chicken, and mice. Studies on laboratory animals are commonly conducted under regulated lighting conditions, where the animals are typically raised under conditions with a given number of hours of artificial daylight and darkness (Troilo et al., 2019). It remains unclear how transferable these animal models are for humans living in both artificial and natural environmental conditions.

This presentation will provide a preliminary analysis on refractive errors and eye growth in animals, comparing individuals that grew up in laboratory conditions with individuals that live in natural outdoor lighting conditions

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Does method matter? A comparison of a vision-generic and a disease-specific questionnaire in assessing vision-related quality of life in persons with keratoconus

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Abstract

The purpose of this study was to explore the differences between the vision-generic National Eye Institute Visual Functioning Questionnaire (NEI VFQ-25) (Jelin et al., 2019; Mangione et al., 2001) and the disease-specific Keratoconus Outcomes Research Questionnaire (KORQ-NO) (Khadka et al., 2017) in assessment of vision-related quality of life (VR-QoL) in persons with keratoconus. Persons with keratoconus aged 18 years and older were recruited through social media. A digital platform was utilised to collect self-reported data on VR-QoL using the KORQ-NO and NEI VFQ-25 questionnaires. Additionally, data from a clinical study was included. The psychometric properties of the questionnaires were assessed by Rasch analysis using RUMM2030+ (Andrich & Marais, 2019), complimented by a qualitative comparison of the content of the questionnaires. The "Activity limitations" and "Symptoms" subscales of KORQ-NO were analysed independently.

In total, 165 participants completed the two questionnaires. 48.5% were females, and median age was 41 (range 19–72). The "Symptoms" subscale of KORQ-NO demonstrated excellent targeting with mean persons location of 0.35 [*SD* 1.17], suggesting that the symptoms covered by the questions are relevant to persons with keratoconus. The questions were well separated and distributed along the logit scale, capturing and differentiating most persons with various levels of severity of symptoms. Except for two questions on pain and discomfort, NEI VFQ-25 does not consist of questions related to symptoms.

The "Activity limitations" subscale of KORQ-NO exhibited excellent targeting with mean persons location of -0.07 [*SD* 1.66]. Again, the questions were well separated and distributed along the logit scale, differentiating persons with various vision-related activity limitations, suggesting a scale that is valid, accurate, and sensitive to persons with keratoconus. For NEI VFQ-25, Rasch analysis showed multidimensionality (% of statistically significant *t*-tests = 18.79), poor targeting (mean persons location = -2.28 [*SD* 1.23]) and flooring effect.

Both the KORQ "Activity limitations" subscale and NEI VFQ-25 contain questions covering similar dimensions on limitations due to vision, such as distance vision, near vision, and driving. However, KORQ "Activity limitations" covers more aspects of distance vision, as well as interference of oncoming lights and seeing in poor light, whereas the NEI VFQ-25 covers dimensions such as general health, social functioning, mental health, role difficulties, and dependency.

The most relevant NEI VFQ-25 item was found to be "How often do you worry about your vision?". In general, wording and content of the NEI VFQ-25 questions indicate targeting towards persons with low vision. Several of the questions had item locations higher than any persons, including questions related to distance and near vision, colour vision, social functioning, dependency and mental health, suggesting irrelevance to persons with keratoconus.

The disease-specific KORQ-NO is more accurate, valid, and reliable compared to the vision-generic NEI VFQ-25 in the assessment of vision-related quality of life in persons with keratoconus. This supports the use of a disease-specific questionnaire in future assessments of VR-QoL in persons with keratoconus.

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Assessment of a novel protocol for image acquisition of corneal subbasal nerve plexus by laser in vivo confocal microscopy

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Abstract

Neuropathy and other neurodegenerative processes significantly impact both systemic and ocular health. Examination of the peripheral nerve fibres in the transparent cornea can provide an important window into the nerve status in relation to both health and disease. However, non-invasive direct imaging and assessment of nerve fibres remains challenging.

In vivo confocal microscopy (IVCM) generates *en face* high-resolution images of the corneal layers from epithelium to endothelium using a confocal point scanning technique (Patel & McGhee, 2007). IVCM has been used to image corneal subbasal nerves in multiple diseases such as diabetes (Roszkowska et al., 2020), dry eye disease (Chiang et al., 2023), Parkinson's (Che & Yang, 2020), keratoconus (Flockerzi et al., 2020), acanthamoeba- and fungal keratitis (Moshtaghion et al., 2023), and other non-neurological diseases (Gu et al., 2022). The technique has the potential for monitoring peripheral nerve fibre degenerations by a more feasible method than the existing skin biopsy (Lagali et al., 2018). Previously addressed challenges using IVCM to assess the corneal subbasal nerves plexus include the small image size, 400×400 μm, and the inhomogeneous distribution of the corneal nerve fibres (Marfurt et al., 2010; Patel & McGhee, 2005; Winter et al., 2016). Both introduce methodological biases to the results.

Even though studies have demonstrated good repeatability in capturing individual images (Kalteniece et al., 2017; Ostrovski et al., 2015), challenges persist in establishing consistent normative values for the most reported outcome parameter, corneal nerve fibre length (CNFL). In fact, CNFL shows significant variability even among healthy individuals (Parissi et al., 2013; Tavakoli et al., 2015). There are published protocols for IVCM image acquisition, but no standardised imaging protocol exists (Köhler et al., 2016; Schaldemose et al., 2017; Tavakoli & Malik, 2011).

We have developed a novel imaging acquisition protocol, aiming for clinically feasible and repeatable image acquisition of a consistent region of interest. The purpose of this pilot study was to assess a novel method of image acquisition of the corneal subbasal nerve plexus.

The protocol uses an automated moving fixation target in front of the non-examined eye. The image acquisition starts at the structural landmark, the inferior whorl, acquiring approximately 800 images in total. Mosaics are created from the acquired images, and subsequently, the predefined region of interest is analysed.

The pilot study included 25 eyes (13 subjects) from healthy young adults aged 20–30 years. Two operators performed, in total, three examinations per eye, allowing for the calculation of both inter- and intra-repeatability. The method shows promising preliminary qualitative results and has potential for improvement in terms of both time consumption and clinical feasibility.

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The impact of environmental conditions on the ocular surface: TFOS Lifestyle Report

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Abstract

Environmental risk factors likely to have an impact on the ocular surface were reviewed and associations with age and sex, race/ethnicity, geographical area, seasonality, prevalence and possible interactions between risk factors were assessed. Environmental factors can be either climate-related or related to outdoor and indoor pollution. Temperature affects ocular surface homeostasis directly and indirectly, precipitating ocular surface diseases and/or symptoms, including trachoma. Humidity is negatively associated with dry eye disease (DED). High altitude and ultraviolet light exposure are associated with pterygium, ocular surface degenerations and neoplastic diseases. Pollution is associated with DED and conjunctivitis. Living within a potential zone of active volcanic eruption or with indoor pollution is associated with eye irritation. Most ocular surface conditions are multifactorial, and several environmental factors may contribute to specific diseases. The pandemic and pandemic-mitigating measures generally increased symptoms of ocular surface disease. A systematic review was conducted to determine: "What are the associations between outdoor environment pollution and signs or symptoms of DED?". DED is associated with air pollution (from NO_2) and soil pollution (from chromium). These findings can help inform the multifactorial nature of ocular surface diseases and assist with their management.

Advanced therapeutics for ocular allergy management

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Abstract

Ocular allergies are common and can significantly impact patients' quality of life. Optometrists must understand the spectrum of ocular allergy presentations, pathophysiology, and evidence-based treatment options for effective management. This session provides a comprehensive approach to diagnosing and treating ocular allergies, focusing on practical strategies for addressing both common and challenging cases.

Ocular allergies include conditions such as seasonal allergic conjunctivitis (SAC), perennial allergic conjunctivitis (PAC), vernal keratoconjunctivitis (VKC), and atopic keratoconjunctivitis (AKC). This presentation will discuss how to differentiate between these conditions and perform a thorough diagnostic assessment, including case history, slit-lamp examination findings, and in-office testing.

The therapeutic approach will focus on pharmacological options, including dual-action antihistamines/mast cell stabilisers (e.g., olopatadine), corticosteroids (e.g., loteprednol), and immunomodulatory agents (e.g., cyclosporine). Each class of drugs will be discussed in terms of their mechanism of action, indications, dosing, and side effects, particularly focusing on how to balance treatment efficacy with minimising risks, such as corticosteroid-induced intraocular pressure increases.

Non-pharmacological strategies will also be emphasised, including allergen avoidance, environmental modifications, and adjunctive therapies like artificial tears and cold compresses for symptomatic relief. Practical management tips will be provided, including tailoring treatment to specific patient populations, such as contact lens wearers and paediatric patients.

The session will conclude with real-world case studies to reinforce key concepts and provide practical tools for managing ocular allergies in daily clinical practice. By the end of the course, participants will be equipped with the knowledge needed to provide tailored, evidence-based care for patients with ocular allergies.

Latest insights into managing low and moderate hyperopia

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Abstract

Uncorrected refractive error (URE) is the primary cause of childhood vision impairment, affecting approximately 13 million children aged 5–15 years globally. A review and meta-analysis reported significant variation in the prevalence of clinically significant hyperopia across different age groups, and populations. Among children aged 5–15 years, the prevalence of clinically significant hyperopia, based on cycloplegic automated refraction, has been reported to range from 1.6% to 26.0%.

Hyperopia in schoolchildren has been shown to be associated with poorer binocular near VA and larger lags of accommodation. We conducted the first systematic review to demonstrate that uncorrected hyperopia has been shown to have an impact on educational performance, with other studies also reporting this association. However, it remains difficult to identify those hyperopes that would benefit from correction, and thus there

is a lack of clinical consensus regarding when and how to correct hyperopia. Furthermore, vision screening programmes are primarily designed to detect reduced distance vision, and it is difficult to detect hyperopia and determine its magnitude without employing cycloplegic refraction techniques.

This talk will review our current scientific knowledge and consider the other pertinent visual functions that are important to measure in the context of hyperopia. Recent research from our group will be presented, evaluating the impact of uncorrected hyperopia on sustained near tasks. The accommodative behaviour of schoolchildren with and without hyperopic correction while they conducted a reading task for 15 minutes, and watched a movie for 15 minutes was investigated using eccentric infrared photorefraction. We found that refractive correction significantly improves the accuracy of naturally hyperopic children's accommodative responses when undertaking near viewing tasks, but there was no correlation with other near visual function measures. This talk will discuss the implications of this work and other evidence relevant to clinical practice, helping to empower clinicians to decide when there is value to intervene with hyperopic spectacle correction.

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